Sept. 21, 2020

Dear Ms. Engelman Lado and Dr. Mitchell,

I am concerned about every aspect of the climate crisis, but one that particularly animates my passion is the role of trees in mitigating global heating, and the fact that their absence in lower income neighborhoods and neighborhoods of color has a very deleterious impact on residents' physical and emotional health.

When I choose to take a walk, I always gravitate to areas with trees, whether in parks or along streetscapes. Why? It's not only for beauty and shade on hot summer days, because I do the same in winter. Biophilia connects me to the trees in a fundamental way, and everyone should have the opportunity to walk among them, to feel connected to nature outside of themselves.

Trees cool the homes and pavement in urban areas, and when they are lacking, summer temperatures can be significantly higher. This has had deadly impact during heat waves in poor communities. Their leaves also clean the air, absorbing toxic emissions, helping reduce the likelihood of respiratory diseases like asthma and COPD.

And trees, of course, absorb carbon dioxide. In *Drawdown*, protecting tropical forests ranks among the top five best ways to preserve the climate, while protecting temperate forests ranks 12$^{th}$ out of 80.

Millions or billions of trees have been lost globally in recent years to insect damage, fires, floods and other "unnatural disasters," meaning they are worsened by the climate crisis. Tornadoes that occur with ever-increasing frequency in Connecticut have wreaked havoc across the state, most recently in southern Connecticut, in both 2018 and 2020.

I serve on the board of Urban Resources Initiative, and we have planted 9,200 trees since 1995 in New Haven. But that's just a drop in the bucket of what's needed because the city removes about 500 trees a year. That's not counting what the utilities take down. I don't have data for New Haven, but in neighboring Hamden, UI reported that it removed 11,043 trees in 2016 and 6,789 trees in 2018, only a small fraction of which it considered "hazardous." *

So the utilities are clear-cutting our street trees, exacerbating the impacts of climate change.

We must replant the trees that have been lost, in our state and world, and plant additional trees ("afforestation" ranks #15 on the *Drawdown* list) in areas that lack them. This is the best way we can mitigate climate change and mitigate the lack of equity in our neighborhoods where low income and residents of color live.

Sincerely,

Melinda Tuhus
103 Carmalt Rd.
Hamden, CT 06517
203.623.2186

* According to PURA Docket 16-12-37 and the UI VM Plan Exhibit H in 2018

10/6/2020

P.S. to my earlier submission:
This article in the NYT references up to 20 degrees difference among different urban neighborhoods, based partly on tree canopy but also other factors.
Sincerely,
Melinda Tuhus

https://www.nytimes.com/interactive/2020/08/24/climate/racism-redlining-cities-global-warming.html?referringSource=articleShare

Ve Comments on the GC3 Forests Sub-Group Draft Report

From: Gerard Milne, CT-Certified Forester

September 27, 2020

## Where Will Our Wood Come From? The Illusion of Preservation

## Local Wood;  Local Good

I have 40 years of experience managing thousands of acres of Connecticut forests.

I am concerned that only two of the twelve members of the Committee are Connecticut certified foresters. Expertise comes from a combination of practical experience and scientific research. It would seem there would be more foresters on a Forests Sub-Group Committee; people who work in the woods, and not just view them from a computer screen or along a trail.

The Executive Summary states that some of the challenges of addressing a comprehensive climate policy for forests are leakage (the outsourcing of the effects of our demands for wood), and substitution (less carbon is released from harvesting and manufacturing wood products than from mining non-renewable resources such as metals and concrete).

This draft report fails to answer the questions of how we can optimize the storage of carbon in Connecticut's forests and in forest products while meeting Connecticut's need for wood and avoiding leakage.

The main culprit in climate change is greenhouse gas emissions. Reducing those should be the focus. Our forests can do their part in mitigating climate change, but there are many other benefits of forests that should be considered also.

Without realizing it, Connecticut's residents use wood constantly in everyday life, such as construction, cardboard (all those Amazon packages), playground mulch to protect our children from injuries, heating our homes, and as we have learned during the pandemic, toilet paper. As I write this commentary, I am sitting on a wood chair, seated at a wood table, supported by a wood floor, surrounded by a wood-framed house. The house was built in 1860, proving the durability of wood and its potential for long term carbon storage.

If we don't use wood, what will we use instead? All the alternatives, such as steel and concrete, are much more carbon intensive. Wood is produced using nature's solar panels, called leaves. It requires no energy input from humans until it is time to harvest, and then the cycle repeats. It is a simple, carbon-friendly system. Local wood; local  good.

Wood flow crosses state and international borders. The reduced harvests in Connecticut resulting from this draft report will cause trees to be cut elsewhere, in places that may have lower environmental standards. Maybe even from the rain forest. In fact, I saw toilet paper for sale in the local supermarket from Colombia. This is  an example of outsourcing our demands for wood to poorer countries. The carbon footprint of doing this is enormous and contradicts the goals of this report.

Toilet paper from Colombia sold in Connecticut

The recommendations in this report, in particular creating thousands of acres of Core Forest Natural Area Preserves on State Forests, would result in the leakage we all should be trying to avoid.

Carbon sequestration and storage are important, and they are enhanced by providing locally sourced and sustainable wood products from well managed forests that substitute for more carbon intensive materials such as concrete and steel.

Specifically:

**Page 5.** "*core forest, larger blocks of forest that are generally more important for wildlife habitat, … and a sustainable supply of lumber, homeowner firewood, and other forest products."*

I agree with this statement, but the report contradicts this several times, as we shall see later in this commentary.

*"Connecticut's forests are growing older, with less age diversity".* I agree. In fact, the draft 2020 CT Forest Action Plan states that Connecticut needs to be more active in creating a range of age and size classes in its forests. However, the recommendations in this draft report for more passive management of forests do not offer solutions to this problem.

**Page 7.** "*71% of CT's forestlands are privately owned....The objectives of most private woodland owners is beauty/scenery, privacy, wildlife viewing, and nature protection".* I agree that most private landowners are not interested in timber harvesting. In fact, according to the draft 2020 CT Forest Action Plan, the average size private woodlot in Connecticut is only 6.4 acres, which is far too small for a timber harvest. That leaves public woodlands as a necessarily reliable, sustainably managed source of Connecticut's wood. Without a dependable supply of raw material from responsibly managed public forests, companies will go out of business. Timber sales on State Forests routinely have bidders who depend on this wood for their livelihoods.

**Pages 9 and 10 . The acreage under passive management on State Forests is almost double what the report indicates (should be 59% of total DEEP land vs. 33%)**

The discussion on the amount of passively managed State Forests is misleading and confusing. The report states that there are 168,960 acres of State Forests. It also indicates that of the State Forests with management plans (64,960 acres), that the amount of passively managed acreage is 36,249, or 21.4% of the **total** State Forest acreage, **but fails to say that this is 56% of the acreage under management (36,429/64,960).**

**Given this data, if all 168,960 acres of State Forests were under management plans, that same percentage of 56% (94,618 acres) would likely be passively managed also. This would increase the total acreage of Passive Forest Management in Table 1 to 130,500 acres and the % of Total by DEEP Land Passively Managed to 59% (not 33%).**

The discussion of passively managed State Lands should include other State-owned forestland that is passively managed, such as State prisons, airports, and educational institutions. These acreages are substantial.

**Page 11.** The section on Forests and Wildlife describes the vertical structure of a mature forest but does not mention the needs of species that require young forests. How could the importance of early successional and young forests for the 50 species of wildlife of Greatest Conservation Need be ignored? The DEEP 2015 Wildlife Action Plan states that Connecticut's forests lack stand age and structural diversity.

**Page 12.** *"Harvesting timber grown sustainably in our own region can help to reduce transport emissions and global deforestation by avoiding a shift of pressure to harvest primary forests in other nations with less stringent environmental policies".* I agree, but we should substitute **Connecticut for region.** That would reduce transport emissions even more. Connecticut should not regard itself as a "Not In My Backyard" (NIMBY) state. See above image of Colombian toilet paper.

**Page 13.** *"Forests support recreation and relaxation"*

I agree that being outside is good for the body and mind. But the costs of outdoor recreation in soil compaction, erosion, and stresses on wildlife must be factored along with the benefits to people. The forest is a living ecosystem, not a playground. It has a carrying capacity for recreation. A recent publication coauthored by the New Hampshire Fish and Game Department and the US Fish and Wildlife Service, called "Trails for People and Wildlife", stated that trail users can impact mammals up to 400 feet away from a trail. According to the June 2019 issue of "The Wildlife News", mountain biking has more impact to wildlife than hiking (especially with unleashed dogs).

Eroded Blue Trail, Mattatuck State Forest

**Page 14.** The discussion regarding compensatory reforestation and replanting programs in a natural setting (as opposed to urban areas) is naïve and not based on the real world. There are far too many deer in Connecticut to make planting feasible. Deer census studies by the DEEP Wildlife Division routinely report deer populations exceeding 40 deer per square mile in many parts of the State, when 20 deer per square mile is the maximum limit for successful regeneration.

**Page 16.** In the discussion (1.) regarding disturbance, I would include flooding by beavers.

**Page 17.** *"The Resilience of Connecticut's Forests is Threatened and Declining"*

1. This section should include the impact of excessive deer browsing which prevents younger classes from regenerating. It is also why we need active management to create more diverse age classes, species, and structure.

From personal experience, you have to overwhelm the deer with a heavier cut so there is so much food they can't eat it all.

2. This section states that mature forests are more susceptible to multiple stressors. Yet old growth forests can have substantial resilience to disturbance. What magically happens when a "mature forest" becomes "old growth"? The older a forest gets, the more susceptible it becomes. Look at which trees and forests blew over in the 1988 tornado (Cathedral Pines in Cornwall), or Storm Sandy or the May 2018 tornado, or Storm Isaias. It was the older and bigger ones.

**Page 19.** Disagree strongly with "*increasing the reserve (passive management) acreage to promote local and landscape/regional resilience (e.g. as buffers against extinction/extirpation)".* For example, the ruffed grouse has almost disappeared because there has been so much passive management. Reserves will negatively impact many other wildlife species. Reserves will also result in the decline of many tree species that need full sunlight to grow, such as aspen, paper birch, black cherry, tulip poplar, white pine, and American chestnut

For example, the American Chestnut Foundation depends on the sprouting of chestnuts after heavy cuts on State Forests to collect burs to plant new trees. The pollen from these new trees will eventually fertilize the flowers of hybrid chestnuts they have planted to someday bring back the chestnut. Without active management on State Forests, the chestnut will be on the verge of extinction.

Passive management does not protect against extinction or extirpation. Emerald Ash Borer and gypsy moth do not discriminate between actively and passively managed forests.

**Page 19-20.** I disagree that salvage harvests related to gypsy moth or Emerald Ash Borer should not be used on public lands. Wouldn't it make sense to lock up the carbon in durable wood products rather than letting the carbon dioxide go into the atmosphere when the trees die? In addition to gypsy moth and Emerald Ash Borer, there may be other insects, diseases, and pests in the future. Being unable to salvage trees limits the tools available to foresters to manage forests and mitigate climate change.

The notion of revitalizing the Tree Nursery to promote seedling availability is naïve. The Nursery was closed a.) because the Nursery Manager retired, and b.) because virtually all the species being bought were conifers for Christmas tree plantations. Deer populations are too high to successfully plant seedlings of other species.

Nursery grown seedlings are high in nutrients from being fertilized and are preferred by deer over natural regeneration.

The best and most cost-effective way to regenerate forests is through well-planned silviculture, where harvests are timed to coincide with acorn and cone crops, and the deer are overwhelmed with more food than they can eat.

Red oak regeneration from thoughtful silviculture.

In addition to funding firewood and horticulture regulations to limit new introduction of invasive pests, there should be legislation to ban the sale of invasive exotic plants such as burning bush, Japanese barberry, and Norway maple from nurseries and garden centers, as is done in Massachusetts. There are native species that can substitute quite nicely for these invasive species for fall color, fruit production, and aesthetic interest.

**Page 22. "***Strengthen local markets for long-lived forest products…"*

The report should recommend that the State Forests enroll in the Connecticut Grown program.

**Page 25. "***Recent surveys of private forestland owners suggest a relatively low interest in timber harvests on their land…."*

Private landowners own 71% of CT's forestlands. If private landowners are reluctant to actively manage their woodlots, wouldn't it make sense for at least some of this land to be counted as an official part of Connecticut's passively managed forestland, rather than taking well-managed public lands out of production? Maybe pay some private landowners to keep their land as forest, without a requirement for management, but pay a higher premium for active management.

*"There is some concern that Connecticut's forests are being high-graded".*

This could be alleviated by requiring all timber harvests on private lands to be planned and overseen by CT-Certified foresters. Many timber sales on private lands only involve a certified Supervising Forest Products Harvester. Timber harvests on State Lands are only administered by CT-certified Foresters.

**Page 26. "***Permanently Protect at least 50% of Core Forests>250 acres…."*

The issue is what does "protect" mean? Does it mean to keep from being converted to nonforest? Does it mean placing conservation easements on State Forests so they can't be sold? Or does it mean no active management?

This report needs to provide a working definition of "protected".

I am opposed to Core Forests not being available to active management if that is a legitimate use of the land.

*"Short term (1-5 year) Actions)"*

*"Establish Criteria and Designate Core Forest Natural Area Preserves on state conservation lands"*

What is "state conservation land"? Is it State Forests?

Natural Area Preserves created under Connecticut General Statute 23-5a are for "outstanding scientific, educational, biological, geological, paleontological or scenic values". The intent of the Statute is to protect

unique habitats, especially of endangered and threatened species. Large areas of forests, while important, are not necessarily "outstanding".

If there is an increase in DEEP State Forests, enough foresters need to be hired so that there is one DEEP State Lands forester for every 15,000 acres, as suggested by the Journal of Forestry many years ago. Foresters need to have enough time to manage the State Forests well. For example, today there are 1,800 miles of State Forest boundary lines that need to be marked every 7-10 years. Too often in the past, State Land has been acquired without any staff to take care of it. In addition, there need to be more maintainers and EnCon police to patrol these areas.

**Page 28.** "*Greatly reduce clearcutting of mature forests as a habitat management practice benefitting young forest species"*

I am confused by this recommendation. How big of a problem is this? In the overall scheme of things, how much clearcutting of mature forests is occurring to benefit young forest species? This contradicts the report's previous statement on Page 19 that indicates that passive management prevents extirpation. Passive management is causing extirpation, requiring interventions such as clearcuts to create habitat for young forest species.

**Page 29. "***We suggest there are three urgent reasons…designate Core Forest Natural Area Preserves on state conservation lands…On lands already owned by the state, …the land would be taken out of production…"*

This proposal contradicts Page 5 –"*core forests are more important for … a sustainable supply of lumber* and Page 12 –"*Harvesting timber grown sustainably in our own region can help to reduce transport emissions and global deforestation by avoiding a shift of pressure to harvest primary forests in other nations with less stringent environmental policies".*

How is Connecticut going to supply raw material for a viable, locally sourced forest economy by taking so much State Land out of production? The report already states that the vast majority of private landowners are not interested in harvesting wood, so where is the wood to meet our needs to come from? The rain forests of Colombia?

Timber harvests on State Lands are administered by CT-certified foresters under the most transparent conditions. The harvests are visible to anybody who is hiking, hunting, or birdwatching. The harvests are prime examples of forest management and act as demonstration areas for private landowners to see good forestry.

**Page 30**. Currently on State Forests, only 17% of the annual growth is being harvested. As I already mentioned, if all State Forests had management plans, probably 56% of the acreage would be passively managed based on the lands that do have management plans. There are plenty of areas that are being passively managed that can act as "controls".

The Natural Area Preserves Statute should not be amended to include Core Forest Natural Area Preserves. Creating Core Natural Area Preserves would lead to leakage – the illusion of preservation.

CT DEEP needs the flexibility to manage State Forests to respond to changes caused by insects, diseases, storms, and unforeseeable events. Natural Area Preserves would not allow this option.

**Page 31. "***Implement the New England Forestry Foundation's "Exemplary Forestry" in managed forests"*

"Exemplary Forestry" can be considered as a guideline, but the ultimate decision on how to manage forests is too complex for "cookbook recipes" or one size fits all recommendations. It must be left to the forester with the most on the ground knowledge of a specific site to account for soils, slope, aspect, species, past land

use, deer population, invasive plants, past experience, etc. “Exemplary Forestry” can be used in conjunction with other techniques, but it cannot be the only one.

*“Reduce salvage harvests….”*

I disagree with reducing salvage harvests. Salvaged trees can store carbon in durable wood products. Dead trees make good wildlife habitat, but we can salvage some trees and still keep many snags for wildlife.

**Page 35-36** I agree with the idea of substituting wood for more carbon-dense materials, but it should not be buried here on Page 35, but featured in the sections on Pages 12, 19, 24, and 25.

**Page 40.** If the recommendation is to increase the acreage of State Forests, then there must also be a recommendation to increase the number of CT-certified foresters to manage them, using a ratio of 1 forester per 15,000 acres.

**Page 49 “***Top Priority Actions: Best Management Practices”*

*“Increase active management of upland forests and reduce non-climatic stressors”*

I agree with this recommendation from the 2011 Connecticut Climate Change Preparedness Plan.

In 2018, the Governor’s Council on Climate Change wrote a report called “Building a Low Carbon Future”. There were four goals:

1. Reduce greenhouse gas emissions by 45% by 2030,
2. Incentivize clean, efficient, and resilient buildings,
3. Provide more clean transportation,
4. Aim for zero carbon electricity generation.

**There was no mention of passively managing forests because the solution to climate change is *to reduce greenhouse gas emissions.***

**The three sectors in Connecticut with the largest Greenhouse Gas footprint were transportation (38%), electric power (23%), and residential building (15.5%).**

**That is where our efforts should be focused, not on limiting the management of public forests.**

**Our State Forests:**

1. **promote carbon sequestration and storage;**
2. **provide locally sourced and sustainable wood products that substitute for more carbon intensive materials;**
3. **Improve biodiversity and the capacity of ecosystems in Connecticut to withstand and adapt to the impacts of climate change.**

Greetings,

I would like to submit the following questions/comments for this afternoon's forum. Hopefully some of these will be addressed in the discussions.

1. What is the role of CT Certified Foresters in the implementation of forest management plans and practices as part of this report and in the future implementation of its recommendations? (I saw no reference to these certified professionals in the report. They are charged with specific responsibilities under state statutes/regulations. CT Certified Foresters are trained in the "art and science of growing trees" -*the practice of silviculture*- and are legally certified to practice forestry in CT.)

2. Should this report be commenting on and recommending silvicultural practices for public and private forests?

For example the report states:

"Retain large trees and forest cover... improve forestry practices... by extending harvest rotations and retaining more large trees"... "reduce salvage harvests and establish policies to help retain dead trees in managed forests hit by insects except in areas where they are a public safety hazard...

"Implement New England Forestry Foundation's "Exemplary Forestry" in managed forests..."

2. What is the role that forest soils play in carbon storage? How does this relate to forest carbon management and forestry activities?

3. What is the definition of the following in the context of this report?

-unmanaged forest reserves
-permanently protected lands
-core forest natural area preserves

4. How would adaptive forest management procedures and increased active management be applied in lands designated as "protected" (pg. 52)?

5. What specific role could the CT Agricultural Experiment Station play in implementing report recommendations? What about the role of other research institutions and universities?

Thank you for the opportunity to comment.

Sincerely,
Carol Youell
CT Certified Forester #46
MFS Yale University School of Forestry and Environmental Studies

Thanks, Brian. One small change requested, on page 13 Sustainable CT is referenced (thank you for that!).

When first referenced, can we be noted as: Sustainable CT at Eastern Connecticut State University and for the second mention (same page), Sustainable CT at ECSU.

Thanks for considering the edit.

Kind regards,

Jess

Jessica LeClair

leclairj@easternct.edu

hi Rebecca,

Please note that my current work is focused on the value of forests along riparian corridors, especially urban-suburban riparian corridors, such as the North Branch Park River. This work highlights the need to focus limited management resources on comprehensive planning, rather than specialized silos.

Note I just returned to Connecticut, having traveled by car from Kansas. Every corn field (and most soybean fields) passed while driving across Missouri, Indiana, southern Illinois, parts of Kentucky, Ohio and Pennsylvania were burn to a crisp, having been damaged by drought. CT DEEP needs to focus on the value/capacity of riparian corridors to support ecosystem functionality given increasing temperatures (evaporation rates) and prolonged droughts.

Also, this is a very rushed public input phase, which was only recently announced. Taking more time to involve the public in this process, reviewing GC3 reports (as well as extensive information gathered) could help further educate the public about the perils of the acceleration of our climate emergency.

Will there be an announcement in the newspapers or on public radio stations?

bests,

Mary

Mary Pelletier

maryp@parkwatershed.org

Hello;

I would like to compliment the great work done by these many experts - their generous contributions of time and expertise is making Connecticut an even better place to live.

I have a few comments to share (by Report and Section);

**Working and Natural Lands: Forest Subgroup report**:
Protecting carbon sinks (forests, wetlands, soils) does not yet enjoy the same propelling economic force as technologies such as EVs and offshore wind. Therefore, in addition to the many great recommendations in the report we should also consider these;

- Actively help forest landowners participate in carbon sequestration markets, through education and other methods.

- Increase public appreciation of forests by targeted communications/education.

- Once the proper carbon accounting method is established, ask the legislature to formally recognize the carbon sink value/impact of Connecticut forests.

**Science and Technology (Page 21 - the role of continuous public education):**

- We all have a role in mitigation, so DEEP could build/support an educational series (e.g. library programs, school curriculum) that shows Connecticut residents how to calculate their carbon footprint and understand the options available (costs & savings) when they reduce their footprint. The education should include factors such as food choices, home/building heating systems, vehicles/travel, electricity use, and other factors. I have found that our family carbon footprint can be reduced 85% over time and we can save thousands of dollars in annual fuel costs.

**Mitigation – Buildings section**

- Regarding the "Strategy to incentivize installation of renewable thermal technologies in new construction", and the proposed Building Performance Office – the BPO should collect and curate appropriate data to enable consumer decisions such as; how much will I reduce my fuel oil bill if I install an air-source heat pump? Unlike vehicle fuel economy data, which enables easy comparisons – the data on the impact of alternative heating systems is not readily available to consumers.

- "Revise zoning regulations and building codes to require a minimum number of ZEV parking spaces for new construction in both multi-unit dwellings and commercial properties and to require all new residential construction to be EV-ready." Specifically, require electric vehicle charging capability within existing and new land developments of a certain size and type.

**Mitigation – Electricity section**

- Executive Order 3 specifies “66% percent zero carbon electricity by 2030”; so DEEP should partner with ISO-NE to determine the impact of the Killingly gas plant on the ability to achieve the Executive order climate goals.

- Recognizing the competing interests of solar field developers and our need to maintain core forests, zoning regulations should inhibit the placement of solar energy systems in areas that destroy significant forests, wetlands or important agricultural lands.

**Mitigation – Transportation section**

- “Investment in a full range of electric vehicles (EVs): Connecticut should more intentionally integrate small electric vehicles, including ultra-compact EV cars, e-bikes, and e-scooters, into its EV planning.” Specifically, given the current high cost of batteries, and the very high cost of full-size EVs (>$30,000 after incentives), Connecticut should work with other states and the federal government to explore the safest use paradigm for ultra-compact EVs.

- Hybrid cars and plug-in hybrids are a more affordable and realistic option for many consumers while we await affordable, long-range EVs and expanded charging networks. What is the logic behind the largest incentives assigned to EVs under the CHEAPR program? A quick scan of Edmunds.com for used EVs vs used hybrids reveals that hybrids are used to travel many more miles than EVs, so they may deliver more avoided CO2 than EVs. In a very simple analysis, I searched for used vehicles from the 2018 model year to see their average odometer mileage (10 cars of each model), with these results; 2018 Leaf (15,149), 2018 Tesla Model 3 (19,539), 2018 Prius (26,918), 2018 Chevy Volt (42,257). The hybrid cars are driven for more miles on average than the EVs, and therefore displace more high-carbon miles of the vehicles they replace – so they may deserve a greater share of the CHEAPR incentive. Please consider if CHEAPR rebates should be identical for any EV, plug-in hybrid, or high-mpg hybrid model.

Thank you,

Alan Poirier 860-823-9972
Old Lyme
alanfpoirier10@gmail.com

Greetings,

It has come to my attention in some states and provinces, laws have been passed that make it harder for HOAs to say “no” to your EV charging request. Known as “Right to Charge” laws, these laws prevent an HOA or condo board from denying a resident’s request to install a charging station in an assigned parking spot when certain conditions are met. California, Colorado, Florida, Ontario and Oregon have all adopted “Right to Charge Laws." Please consider adding such a recommendation to the mitigation section.

Thanks you

**Kai Starn**
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Joseph Orefice, PhD
18 Old Barrows Rd
Union, Connecticut 06076

October 1, 2020

Governor's Council on Climate Change,

Thank you for providing the draft report from the GC3 Agriculture and Soils Sub-Group. I have a few comments I hope will be considered as the final report comes together. I included a brief bio at the end of this letter for reference.

I was glad to see a number of soil conservation and carbon sequestration practices suggested in the report. Some of these (for example agroforestry and rotational grazing) are well studied as beneficial carbon farming practices while others (such as contour farming which can be destructive to establish) are relatively understudied. However, all of these practices are in need of significant research regarding their applications in Connecticut. Connecticut is a small state with engaged farmers, I think agroforestry has significant potential to benefit both the farms in our state and our climate, and research funding would help ensure we adopt these practices appropriately.

While I think research is important, I hope the final report will highlight the equal level of importance for a significant extension campaign to help farmers adopt and adapt to climate smart farming. UConn extension and other organizations in the state will need significant support and staffing to help farmers with new systems. These extension agents will also need to be trained themselves in new techniques. I think the report would benefit by clearly stating the need for a two tiered educational campaign: 1. To increase knowledge and resources of extension staff regarding climate smart farming practices such as agroforestry and advanced grazing (train the trainer type of work) 2. To develop demonstration areas on working farms and research farms to host farmer training events (extension agent to farmer training and farmer to farmer training type of work).

Farmers are going to need significant financial support for transitions to climate smart agriculture. A dairy farmer switching to grazing systems or a row crop farmer investing in alley cropping is a big change and will require new knowledge and financial resources. Farmers will all need support to get these practices off the ground and through the establishment period when tree crops need care but are not yet providing revenue to support the practice.

Farmland preservation is an important need highlighted in this report. As a farmer owning 134 acres that were slated to be a golf course before my ownership, I want to echo the need for farmland preservation and the need to finance this preservation. Quality farmland is incredibly expensive in Connecticut and if it were not for receiving a premium for the farm I restored and sold in New York when I moved back to CT, our land would likely be house lots right now. Mortgages make it very difficult to split the development rights from farmland and without significant funding to meet these needs, it is likely that many farms in the state will be developed when the land is transferred.

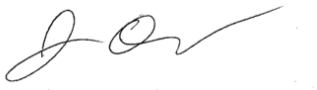
An additional challenge is that there are not financial programs in the state to help farmers purchase raw land in a reasonable amount of time. Most banks require 50% cash down on raw land mortgages and Farm Credit east requires 30% down but with enormous rates that keep farmers in debt.

Connecticut should consider new financial models for helping farmers purchase raw land and ways to encourage local banks to support working people on working lands. There are many examples out there from other regions, including land trusts who hold the mortgage on farms and development right purchase programs that require sale of farmland to go to working farmers. Coupling farmland preservation programs with land access and tenure efforts should be a highlight of this report.

Solar panels on agricultural land are mentioned in the report and I'm pessimistic about these. While I think solar panels on farms are critical, I would hope that these are incentivized to occur on farm buildings and hardtop rather than on quality cropland. We can put solar panels on structures but we cannot transport cropland. Also, why put a solar panel where a tree could go?

Lastly, regulation is a poor remedy for a lack of education and resources on farms. Connecticut's farmers will be best able to adapt to and help mitigate climate change when they have the resources and knowledge to do so. The Connecticut Department of Agriculture should receive, and use, resources to develop and promote climate friendly agriculture to a greater degree than those which are allocated to regulating it.

Sincerely,



Joseph Orefice, PhD

Brief Biography:
Joseph Orefice, Ph.D. is a native of Connecticut and serves as a Lecturer and Director of Forest & Agricultural Operations at The Forest School at The Yale School of the Environment. He teaches courses in agroforestry and forest management and he also oversees forestry operations and applied educational opportunities on the 10,880 acre Yale Forests system. His research focus is in temperate agroforestry and applied forest management. Prior to joining Yale in 2018 Joe served as Cornell's Northern New York Maple Specialist, Director of Cornell's Uihlein Research Forest, and as an Associate Professor of Forestry at Paul Smith's College. Joe's current work is in maple extension and temperate silvopasture regeneration and carbon dynamics. His passion outside of academia is farming, where he integrates agroforestry and forest management into Hidden Blossom Farm, which he owns and operates in Union, CT.

Joseph Orefice, PhD
18 Old Barrows Rd
Union, Connecticut 06076

October 1, 2020

Governor's Council on Climate Change,

I am writing with significant concern over the composition and resulting recommendations of the GC3 Forests Working Sub-Group. I have included a short biography at the end as not to take up space here. While the report provides many important suggestions, some of the recommendations in this group's draft report are incredibly divisive and, frankly, ignorant of forest science and management. My perception is that this is the result of a severe, and hopefully not intentional, oversight made during the groups formation by not including representatives from the forestry profession. **I strongly suggest you require that this working group have direct participation from those who steward Connecticut's forests prior to submitting a final draft.**

Comparing the composition of the Agriculture/Soils Sub-Group with that of the Forests Sub-Group makes my point about lack of representation and knowledge of working forests in the Forests Sub-Group explicitly clear. To highlight:

- The Agriculture/Soils Sub-Group was chaired by the Commissioner of the Connecticut Department of Agriculture yet the Forests Sub-Group was chaired by Connecticut Forest & Park Association whose primary mission according to their current strategic plan is hiking trails.
- The Forests Sub-Group included no members from the Connecticut DEEP, nor did it include any members from public watersheds. The lack of inclusion here is incredible as these organizations, especially DEEP Forestry Division, steward the vast majority of Connecticut's forest land, and they do it for the public good.
- The Agriculture Sub-Group included representatives from professional organizations (The Farm Bureau, Organic Farmers Association, Working Lands Alliance) yet the Forests Sub-Group had no representation from any forest related professional and practitioner organizations (The Society of American Foresters, Timber Producers Association of Connecticut, Eastern Connecticut Forest Landowners, Association of Consulting Foresters were all excluded).
- The Agriculture Sub-Group had strong representative from public agencies associated with working lands conservation (CT Resource Conservation and Development, CT Agricultural Experiment Station, Natural Resources Conservation Service, CT Council on Soil and Water Conservation) yet the Forests Sub-Group had no public agency representation. Only possible exception being that academics from UConn were included in both groups.
- The Agriculture Sub-Group included two active farmers yet the Forests Sub-Group included no members who were invited as active foresters, loggers, or family forest owners.

It is explicitly clear that the Agriculture Sub-Group was inclusive of those who manage agricultural lands. It is incredibly alarming that the Forests Sub-Group severely lacked representation from those who steward Connecticut's woodlands every day. It comes as no surprise therefor that the Agriculture Sub-

Group made recommendations for ways in which working farms and farm products can help to mitigate climate change while the Forests Sub-Group largely ignored the importance of forest management in CT to provide renewable and sustainable alternatives (aka "green alternatives") to fossil fuel intensive materials and energy sources.

**Sequestering carbon is important, but having sustainable alternatives to consumption of more fossil fuels is vastly more critical in the fight against climate change.** The amazing thing is that these needs are not mutually exclusive in Connecticut's Forests, our forests have been providing both (carbon sequestration and renewable alternates to fossil fuel consumption) for over a century via the leadership of the forestry profession in our state. Particularly counterproductive, damaging, and divisive portions of the forestry draft report are detailed below.

First of all, Proforestation and preventing timber harvesting is listed in the document as "*likely the most effective solution to preserve and foster further growth of accumulated carbon storage in woodlands*" page 24, and "*the most effective solution to preserve accumulated carbon storage and enable it to continue to increase*" page 28.

The claims here are both skewed and improperly cited, the authors should read the literature in which they cite and I detail this in my next paragraph. **The validity of proforestation is an opinion and NOT scientific consensus**. It is based on a single article published last year in the opinion section of a publication. It is so much of a single opinion that it is labeled above the title as a "perspective" by the journal so as not to confuse it with science. There are global teams of researchers, and even an entire mass timber movement, that are absolutely counter to the idea of passive forest management as a climate mitigation strategy. Yet, the Forest Sub-Group draft excludes these perspectives and science.

Neither citation #88 (Nunery & Keeton 2010) nor #89 (Catanzaro and D'Amato 2019) reference proforestation yet the draft report lists them as supportive of the claims I quoted above. Both of these cited publications suggest that substituting wood products for non-renewables might sequester more carbon than simply preventing timber harvesting in forests. Catanzaro and D'Amato (2019) actually highlight the risk of passive management to periodic massive losses of forest carbon due to future disturbances. They also explicitly state that it is critically important to factor in the amount of carbon stored in forest products and the amount of carbon saved by using wood instead of fossil fuel demanding carbon alternatives, something proforestation outright ignores.

Additionally, the draft claims that proforestation "*it is based upon considerable scientific evidence that continuous forest growth in protected reserves is the most effective immediate solutions to preserve accumulated carbon storage and enable it to continue to increase*." This claim is ignorant of both the value of storing carbon in forest products and using forest products to reduce non-renewable resources and fuels. Worse yet, this claim assumes that there is no leakage of not-managing our forests in Connecticut. With proforestation, Connecticut would import more wood products from globally insecure forests and areas where unsustainable extraction is leading to deforestation and degradation such as the northern forest and tropical hardwood regions.

The draft also call's proforestation a "*low-cost solution*" page 29. Passive management is not low cost. It would mean that our state forests would generate no revenue and thus taxpayers solely would cover the cost of forest health monitoring, boundary encroachments, infrastructure, and damage from illegal uses like off-road vehicles on our State Forests. Passive management is a higher cost to taxpayers and could additionally result in unhealthy forests. Management of state forests keeps them self-supporting,

which provides a long term incentive to keep those forests as forests and is the reason we have so many mature and beautiful State Forests today.

I will also note that we do not need a "*control*" of profrestation as called for on page 29 of the draft to study passive forest management in Connecticut. 56% of CT State Forests acres with management plans are already under a passive management recommendation, meaning we already have far more control areas than are needed for a scientific study. We also have dedicated research forests in the State, such as Yale-Myers Forest which I manage, that can serve in this role. For example, Yale-Myers Forest has one third of our 7,800+ acre forest in permanent reserve for the very purpose of replicated studies and knowledge.

It is complete speculation that unmanaged forests in CT will sequester or hold more carbon than managed forests of mid-tolerant hardwoods. Late successional species (hemlock, beech) both suffer from invasive insect problems. Sugar maple is likely to decline in its range in CT due to drought and climate stress. It is very possible that unmanaged forests will sequester and hold less carbon as they transition to higher percentages of late successional species with disease problems. These species might stay alive enough to keep holding ground but are not guaranteed to sequester or hold more carbon than the oak forests we have today which are a result of human disturbance. There is significant research to be conducted in this realm and we are fortunate to already have a vast resource of control and managed forests to study. Forest ecologists are not in need of more controls for our work, controls are abundant here, we are in need of funding to conduct research.

The fairytale of proforestation is so pervasive in this draft that the single and only article that mentions it is listed twice in the references: #87 and #126. Simply put, the inclusion of proforestation in this draft is a clear result an author who is bias toward Not-In-My-Backyard (NIMBY) recreation and ignoring a critical component of forest carbon science, renewable forest products. **At most, proforestation should be briefly mentioned in the draft as an untested opinion for further study, and nothing more.**

Connecticut has a significant opportunity to produce its most renewable product, wood, from public and private lands, all while balancing this resource use with some of the best sustainable forest management in the world. This is something foresters in Connecticut been perfecting for over a century in spite of the challenges they've faced through invasive species and now climate change.

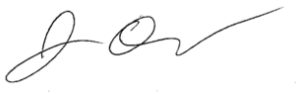
State Forest management has served as an exemplary demonstration of how to practice sustainable forestry since its founding. Without this leadership the quality of forest management on private lands in the state is sure to decline**. The Forest Sub-Group should be highlighting the need for State Forest management, and promoting it as a model the world can learn from, not denouncing it for a NIMBY agenda.** Our model of forestry is known in the profession and around the world because of the amount of science it is based upon and our ability to maintain mature forests while providing high value products. Additionally, it was forestry in CT that played a major role in spawning conservation movements around the globe and the Forests Sub-Group should recognize that history in our State and use it to inspire the future.

Lastly, **the report should specifically state that active forest management is not counter to natural processes, recreation, biodiversity, or carbon sequestration and retention**. In fact, all of these will benefit from the ecologically based forest practices and natural regeneration methods widely used here in CT. Long term, sustainable timber harvesting has been what has enabled Connecticut's forests to stay forests among a serious development risk because these forests provide their own financial support. We

are fortunate to have forests which produce high value forest products at maturity – incentivizing land owners (including the State) to grow stands to maturity before harvesting.

**The work to generate this report is incomplete and a full set of stakeholders need to be involved or I fear the State will further divide our people and degrade our greenest and most regenerative environmental sector.**

Sincerely,



Joseph Orefice, PhD

Brief Biography:
Joseph Orefice, Ph.D. is a native of Connecticut and serves as a Lecturer and Director of Forest & Agricultural Operations at The Forest School at The Yale School of the Environment. He teaches courses in agroforestry and forest management and he also oversees forestry operations and applied educational opportunities on the 10,880 acre Yale Forests system. His research focus is in temperate agroforestry and applied forest management. Prior to joining Yale in 2018 Joe served as Cornell's Northern New York Maple Specialist, Director of Cornell's Uihlein Research Forest, and as an Associate Professor of Forestry at Paul Smith's College. Joe's current work is in maple extension and temperate silvopasture regeneration and carbon dynamics. His passion outside of academia is farming, where he integrates agroforestry and forest management into Hidden Blossom Farm, which he owns and operates in Union, CT.

Dear Sir or Madam:

Thank you for the opportunity to comment on the GC3 2020 Transportation Report. I have a few suggestions to make.

1. There is no reference to *rail* electrification, even though CTDOT has at least nebulous plans to electrify several corridors with an overhead contact system (OCS). OCS electrification eliminates substantial weight and moving parts from rail vehicles, increasing speeds and decreasing operating costs in the long run. That alone is ample reason to electrify most of the Connecticut rail network on top of the emission reduction.

2. The plan should consider moving rail maintenance facilities farther inland. In particular the New Haven shop complex should move inland to the site of the former Cedar Hill yard. Cedar Hill lies slightly higher above sea level than does the existing New Haven shop. There is enough room there to combine many functions taking place in East Bridgeport and New Haven. With the maintenance facility upstream of the main New Haven Line operation, placing trains into and removing them from service would involve fewer reverse moves. Moreover, this move would free up the New Haven shop area for development.

3. It should be a goal to reduce freight emissions by transferring tonnage from trucks to rail. To that end, Connecticut should partner with New York State to repair or replace the Poughkeepsie Bridge, which currently carries a trail, and refurbish the Maybrook Line. It is also probably worthwhile to pursue a small container terminal off the New Haven Line. It is critical that freight operations not conflict with passenger operations, and it is probably doable.

4. In terms of passenger emissions, making rail transit more attractive is critical to diverting automobile trips. To that end, the 30-30-30 plan should be explicitly stated in this plan. In order to realize it, and many other goals, DOT has to switch infrastructure maintenance to nighttime and obtain far greater yields out of its capital dollars. The latter goal involves better pay for internal engineers so that DOT has a competent staff in-house that bypasses consultants. It also depends on opening up both formal and informal collaboration with foreign engineers and planners.

5. There should be explicit service goals for rail transit (goal of 2 trains per hour on every branch line, more on the New Haven Line trunk) and bus service (10 minute or better frequency on most urban routes). There should be a comprehensive redo of bus routes at each CT Transit district to eliminate duplication, as is currently partially underway.

Sincerely,

Robert Hale

Submission by:
Chris Donnelly
Urban Forester
Former DEEP Urban Forestry Coordinator
retired August 1, 2020

To the members of the Governor's Council on Climate Change:

Thank you for allowing me the opportunity to offer comments regarding the report of the Sub-Group on Forests. Let me start by saying, if the aim of the report is to offer important ideas for consideration regarding the forests of Connecticut and how they relate to climate change, this is a good report. The report's authors deserve credit for the time, effort and thought they contributed to putting together a report that contains a wide range of perspectives that are well-worth discussing. It is not easy to write so comprehensively on a subject that draws into it such a range of viewpoints. For that they should be thanked.

I understand that the report is still very much of a draft, with its content and recommendations still open for discussion and review. I will say that such recommendations in the report as the 'no forest loss' policy are strong ideas and deserve support. However, I will leave for others the discussion of forests as a 'land cover type', as the report references traditional rural woodlands. I will largely confine my comments to urban forestry and then to a review of what I would term factual and internal discrepancies in the report. As my comments tend to get lengthy, I would like to sum up my comments on each here, in a few sentences.

On urban forestry, it is my conclusion that this topic deserves a much more detailed discussion, either in a separate section of the final report or in a separate report. There is much more to urban forestry as relates to climate change than is covered in this report. The many ways by which urban forests can contribute to dealing with climate change should be considered more thoroughly, if the state as a whole is to receive the full benefits that can be gained from its urban forests and urban forestry practices.

As to factual and other internal discrepancies, perhaps it is the proof-reader in me, but I believe that, in a report that will be seen as authoritative, as this one will, the authors should make every effort to verify the factual basis of the information contained. This is especially true with regards to background information. Also, internal discrepancies that are not caught and corrected can lead to confusion, especially among readers who may not be as familiar with the background and the issues under discussion.

## Urban Forestry

Too often, in this report, urban forestry comes across as the extension of the practices of traditional forestry into urban areas. Also, too often, urban forestry is used to show how forestry is meeting the equity and environmental justice mandates of the Governor's Council. It is my belief that, in adopting this approach, the report sells both urban forestry and traditional forestry short. Urban forestry is complex, varied and far-reaching. It is not just traditional forestry that has been adapted to fit the built areas of our cities and towns. Similarly, traditional forestry has much more to offer, in an equity and environmental justice context, than what is contained in this report. For instance, the report talks about urban trees as being of benefit to people in the cities because those trees are where the people who live

in cities are. Given the extensive value that the report places on rural forests, shouldn't there be more discussion as to how to also bring people from cities and rural areas out to where rural trees are, so those people from throughout the state can directly benefit from the experience of these rural trees and forests? This report should be an opportunity to explore these types of questions.

In the discussion of the future of urban forestry and of the state's urban forest program, the Connecticut Urban Forest Council offered 8 objectives for inclusion in DEEP Forestry's soon to be finalized Forest Action Plan. These objectives, as included in the current version of the FAP, are:

1. Publicize, Clearly and Explicitly, the Benefits of Urban Forests
2. Establish a Statewide Urban Forest Data Bank
3. Describe and Promote the Elements of a Successful Municipal Urban Forestry Program
4. Help to Build Communication and Dialogue Among Municipalities, especially Among Adjacent Communities That May Share Common Regional Concerns
5. Embrace Diversity and Encourage Cooperation and Inclusion Throughout Urban Forestry
6. Work to Secure Urban Forestry's Place as a Major Contributor to the Management of the Modern Urban Environment
7. Prepare for the Effects of Climate Change while Helping to Mitigate its Causes
8. Encourage Innovation

Of these eight objectives, Objective #6 deserves specific mention in the context of climate change. Urban areas are complex systems that will require a 'all-hands' approach if they are to be managed well in the face of climate change. The Forests Sub-Group Report does mention some examples of how urban forestry can contribute, most notably in terms of dealing with the urban heat island effect. The list should be extended beyond that, however. A full discussion of urban trees and forests would include a consideration of their role in the:

- biophysical environment (such as the urban heat island effect, stormwater run-off management, air and water quality, the sequestration and storage of carbon and the avoidance of the release of carbon from fossil fuels through reductions in energy demand)
- social environment (such as the public health effects, the fostering of an active and interactive sense of community out-of-doors, the sense of identity and of place one gets from 'getting to know' trees in urban areas, the many opportunities trees provide for people to meet as a community)
- economic environment (such as the influence of urban trees on property values, quality of life, and the desirability of neighborhoods; the role urban trees can have on job creation, both in terms of the planting and maintaining urban trees and other types of green infrastructure and in finding opportunities to re-use the wood from trees that have been removed).

One of the main reasons I reached the conclusion that urban forestry should be treated separately, either in a separate section of this report or in a report of its own, is that integrating urban forestry into a more general report does not allow for a discussion of the history, variety and specific challenges faced by those who practice urban forestry.

For example, while the report does reference the excellent work currently going on in Hartford, it does not mention in enough detail the equally important and high quality work that is ongoing in New Haven, primarily through cooperative efforts of the Urban Resources Initiative and the City of New Haven. Together, New Haven and URI have a long history of identifying and creating neighborhood green spaces, of working with high school students on inventory and green space development programs, of working with individual residents on tree planting programs and of working with EMERGE, a city-based non-profit, in assisting adults returning from incarceration as they participate in the implementation of tree planting and green infrastructure projects in the City. Nor does the report give adequate attention, in my view, to the excellent and admirable work Groundwork Bridgeport is doing with its after-school educational programs for high schools students, introducing them to the world of trees and urban forestry, or the City of Bridgeport, which also has a highly successful program of partnering with individual property owners on tree planting projects. Bridgeport has also been very effective at bringing the tree planting decision-making process out into the neighborhoods, so that local individuals and groups have a direct voice in what trees get planted where.

The report should mention the pioneering work that has occurred within both Milford and Norwalk in the recruiting of citizen volunteers to inventory the street trees in their respective cities. These volunteers then came to provide an important policy voice for the maintenance and management of those trees. Fairfield, Orange and Hamden have shown how volunteers can play a significant role in developing a broad-scale management plan for their community. For more than 20 years DEEP has provided grant support to cities and towns throughout Connecticut, using funding provided by the US Forest Service and by RGGI. These grants have allowed communities state-wide to think creatively about their trees and urban forests and to engage in projects that are of local community importance.

The urban forestry efforts in Connecticut have never lacked for ideas, or for the means to accomplish good work, once funding has been made available. Funding has always been the core issue. I am pleased that the report takes finding funding so seriously. A good foundation for local urban forestry programs in Connecticut has been laid over the past 20-plus years that is more than ready to be built upon. I would also agree that the urban forestry program, from the state level, could help by providing more direction in terms of establishing priorities for urban forestry efforts. However, state leadership should be careful that, in providing guidance, this guidance does not overwhelm the already vibrant local efforts to nurture and maintain local urban forestry programs. In addition, greater effort is needed to reach out those who own trees on private property such that a sense of stewardship develops among those who own this majority portion of the urban forest.

The tree wardens throughout Connecticut have been a huge part of this growth in urban forestry over the past several decades. As Jim Govoni, recently retired Tree Warden in Windsor and former President of the Tree Wardens Association of Connecticut, often expressed it, “Tree wardens have two goals, public safety and the health of the canopy of the urban forest. Both are important, although public safety must always take priority. At the same time, as tree wardens, we cannot forget that we are working for the people in our towns and that we have a responsibility to them to take care of their trees for them.”

This leads to a couple of points where I have some direct disagreements with how the report expresses its recommendations. On both pages 25 and 31, the report discusses the importance of large trees in urban areas. In its recommendations, the report seeks to prohibit aggressive pruning or removals and to

target pruning and removals only to "trees in hazardous poor condition that are imminent threat to people or electric infrastructure." (page 31). The goal of having a well-maintained urban forest in our cities and towns that contains a significant number of large, tall shade trees is a good one. The ongoing presence of a large number of tall, large and healthy trees is necessary if urban forests are to succeed in making the contributions everyone who lives in Connecticut needs from urban trees. However, I do not agree that the approach offered in the report is best direction to take towards achieving this goal. Public managers must be proactive and not simply reactive in their approach to managing public problems. The tree wardens as a group have worked hard to professionalize themselves. The cities and towns they work for have also invested significant resources into bringing the skills of both tree wardens and arborists into their tree management decisions. This is where the decision-making should sit, reliant upon the discretion of trained and knowledgeable professionals working with equally professional public managers who understand both the nature of public risk and the long-term life cycle of trees.

Another area where I have at least partial disagreement with the report is in its emphasis on establishing a program for tree planting. Before establishing a new program such as the Youth Conservation Corps, the state, or whichever entity is envisioned as developing this program, should first look at the already existing programs in places such as Hartford, New Haven and Bridgeport. That entity should look at how communities currently undertake tree planting efforts, as it may prove to be more effective to build off of existing programs than to go with the wholesale creation of a new one. This might include either expanding these existing efforts into other communities or modeling new efforts on those that already exist.

Urban forestry does have its challenges in Connecticut. The electrical distribution companies tend to view the environmental health of cities and towns through the lens of reliable electrical distribution, a view that often puts them at odds with those who would rather see more existing healthy trees retained, especially tall trees, and more trees planted. Trees, generally speaking, do not react well to extensive changes in their environment and cities and towns are dynamic places in which to live. The same environmental stressors that affect rural forests affect urban forests, including those that are a result of climate change and the introduction of non-native insects and diseases. And the list could go on.

Returning to the subject of how urban forests differ from traditional, rural forests, here is a more complete list of the differences:

- Unlike traditional rural forests, the urban forest is usually not considered either a land use or a form of land cover type. There are certain exceptions, such as urban natural forests, as they are now being called, typified by Svihra Park and Remington Woods, both in Bridgeport. Most often, urban forests occur on land that is primarily intended for other uses, such as for residential use, use by industry or in commercial districts. As such, urban forest management must be secondary to these broader purposes. Typically, urban forests only succeed when they are well-integrated into these other, primary purposes.

- Urban forests involve a complex intermix of public and private ownerships. This means that the decision-making regarding the management of those trees that make up the urban forest often varies, owner to owner, at a very local level. Many of these owners differ in their reasons and approaches for retaining and maintaining the trees that they own.

- In urban forestry, focus should not be only on publicly owned trees. The majority of the urban forest in most cities and towns and under most circumstances will be found on private property. Again, this means decision making will often vary greatly within a relatively small geographic area, although one tree owner, the municipal government, will often be asked to play a significant role in leadership and in setting policies that will influence private tree owners, either through mandate or by example.

- The photo at the right shows the streets of New Haven as seen from East Rock Park. A close look at this picture reveals how important privately-owned, backyard trees are to the urban forest in this part of New Haven. On careful examination, one can pick out the backyard trees fairly readily. They tend to be both larger and more numerous than the adjacent street trees.

- Although this is the case in New Haven, that does not mean that the same pattern prevails everywhere. For instance, in a 2007 study of the full (public and private) urban forest of Hartford[1], a significant portion of that urban forest was found to be 'fence-line trees' – that is, trees that had grown up between neighboring properties along, and often into, the fences installed to denote property lines. Mostly, these were volunteer trees that would not be considered of high value except for their role as accidental screening. At the same time, because these trees are present in significant numbers, they do have a role in the functioning of that city's ecosystem.

- It can be argued that social policy has always had a leading role in determining the state of our forests, whether urban or rural. However, present and past social policy decisions have had a much more direct impact on how urban forests have developed. The history of redlining is one example of the sorts of social policies that have had a major influence, but modern zoning,

[1] "Hartford's Urban Forest – the Challenge", https://portal.ct.gov/-/media/DEEP/forestry/urban_forestry/UForeFlyerLetterpdf.pdf

wealth distinctions and age of the surrounding development also tend to be important factors in the condition of the urban forest, as one looks at around at the trees to be found in almost any city or town in Connecticut.

- Urban forests should be considered as one component within the complex set of interactions that govern how urban areas function as an ecosystem. In traditional forestry, managing the trees is often the primary means by which to manage other aspects of the rural forest ecosystem, such as the water flow or wildlife. This is less often the case in urban ecosystems. In most cities and towns, the major functions of the urban system are handled by means of built infrastructure, such as storm drains and channelized rivers to handle stormwater runoff. It is only recently that trees and green infrastructure have seen increased prominence (or, perhaps it could be said, have been resurrected) as tools for improving the livability of our cities and towns.

- In rural forests, older trees that have become structurally insecure can still be considered as valuable components within the surrounding forest. Likewise, stands of younger trees are also often valued for their distinctive contributions to the forest ecosystem. Within the urban forest, most often, neither are valued in the same way. Old, infirm trees are considered to be unsafe when near people or property and so should be removed. Younger trees are often perceived as a necessary stage in growth, but not significant contributors either in terms of aesthetics or ecosystem services until they are older and larger.

- While both rural and urban trees and forests contribute in terms of ecosystem services, the set of services offered tend to be different. Both types of forests create clean air and clean water. However, urban trees do much more than that. Urban trees, for example, provide shade that provides local relief from the urban heat island effect. They can also have a role in local reduction of ground level ozone. The presence of urban trees often encourages outdoor activities that are in and of themselves valuable for personal and social health reasons. At the same time these trees provide such local environmental benefits as filtering out air-borne particulate matter from automobile traffic. In this way, urban trees contribute to people's health even as these people are simply going about their normal daily activities.

- Of particular significance in terms of climate change and energy policy, urban trees sequester carbon as they grow. They can also, if properly placed, through the production of shade, reduce the emission of carbon from fossil fuel-fired electrical power plants. The extent to which urban trees can do so was outlined in a recent University of Massachusetts study[2] on the before and after changes in energy consumption by households in a neighborhood in Worcester that lost most of its tree canopy due to the Asian longhorned beetle.

- The relationship between urban trees and energy consumption is highlighted in a listing of the benefits provided by Hartford's street trees, as compiled by Davey Tree Care after a 2019 inventory of those trees[3]. Davey reports that these trees sequester 1,830 tons of carbon dioxide on an annual basis. The company also reports that these same trees reduce the consumption of

[2] "The Energy Benefits of Trees: Investigating Shading, Microclimate and Wind Shielding Effects in Worcester and Springfield Massachusetts", a thesis presented by Emma L. Morzuch towards her MS degree, May 2013
[3] Made available to me by the City of Hartford.

electricity by 1,876,000 kWh hours annually. Assuming that the production of each kWh of electricity produces 2 pounds of $CO_2$ (based on a coal-fired power plant), this works out to the production 1,876 tons less of $CO_2$. The Davey report indicates that a total of 2,200 tons of carbon dioxide is avoided by Hartford's street trees, suggesting that there are additional reductions in $CO_2$ release due to Hartford's trees.

- While there are many good reasons for focusing attention on Connecticut's largest and most densely populated cities, it is important not to overlook the statewide nature of the urban forestry program. Urban forestry occurs within all cities and towns in Connecticut, with the majority of those municipalities having a population of less than 15,000 people. This is a break down Connecticut's population by municipality, based on the 2010 census:
    - # of cities with population greater than 100,000 5
    - # of cities or towns, between 50,000 and 100,000 14
    - # of cities or towns, between 30,000 and 50,000 12
    - # of cities or towns, between 10,000 and 30,000 65
    - # of cities or towns, between 600 and 10,000 73
    - Average municipal population size 21,146
    - Median municipal population size 12,683 (Oxford)
- As an example of the importance of a statewide urban forestry program, in 2008 America-the-Beautiful grants for tree planting were given to the City of Bridgeport and the Town of Sprague. Sprague's grant was for the planting of trees within the Village of Baltic. While Baltic and Bridgeport are different in many ways, in one demographic feature they compare similarly. The percentage of people below the poverty line in Bridgeport is 21.4%. The percentage of people below the poverty line is Baltic is 24.3%. On the ground, in terms of the impacts on individual properties, the similarities between the two

projects are very easy for a visitor to see. (Note, the included photo shows the fall color of the red maples planted in Baltic. The photo was taken approximately 9 years after planting.)

- A 2019 survey of people engaged in urban forestry conducted by the Connecticut Urban Forest Council suggests that there is a difference between larger cities and smaller towns, regarding how people associated with those municipalities view of the importance of the urban forest's role in climate change. Respondents associated with larger communities were more likely than those from smaller communities to consider the role of urban forests relative to climate change as an important role.

In these comments, I have sought to not make specific recommendations for going forward. I have confidence in the ability of local leaders to take appropriate action, provided they have three things:

- Good, solid, on-the-ground information
- Reasonable direction from experts, provided in the form of leadership at either the state or federal level, or both
- Sufficient funding

It is my sense that, with all 3, a great deal of accomplishment is possible.

Just a note with regards to good, solid information – in 2024, the US Forest Service plans to begin releasing data from their Urban Forest Inventory and Assessment (UFIA) for Connecticut[4]. This program, analogous to the long-time Forest Inventory and Analysis program that has been so important for providing baseline information on the rural forest, will undoubtedly yield useful information regarding trends and patterns in the urban forest. For example, if Connecticut's urban forests are undergoing species change on a broad scale, whether due to climate change, changes in planting choices or ongoing insect and disease problems, the ongoing UFIA reporting will be able to show the changes as they are occurring.

Also of potential importance is the role that the regional Council of Governments can play as a resource capable of informing local urban forestry decision making. These organizations often have the technological capacity and analytical skills needed to assist local governments with developing and then using data of the sort that are becoming increasingly important in urban forestry, such as GIS mapping and aerial imagery. These COGS have already indicated a willingness to assist in urban forest information sharing.

Finally, Sustainable CT deserves mention, as a potential model for how the synergy of interacting programs can be used to advance fundamentally more efficient and effective environmental programs at the municipal level. "Managing Woodlands and Forests" is currently one of the actions by which communities can earn points towards their sustainability rating.

[4] For more information, see https://portal.ct.gov/DEEP/Forestry/Urban-Forestry/Urban-Forest-Inventory-and-Analysis

Concerns Relating to Factual References and to Internal Consistencies

Some of the factual considerations that I am about to raise are likely to be seen as not that important in terms of the overall message of this report. I bring these and others up, however, due this report's high-level profile. For many readers, this report will be seen as a key informational resource. Factual rigor is therefore important. Similarly, I am concerned that internal inconsistencies might lead to the message becoming confused or being unclear.

In this section, I am not attempting to get into a discussion of the value of various recommendations or ideas. I am mostly focused on the clarity and the accuracy of the presentation of these ideas.

- On page 4, there is a chart illustrating the "% CT Forest Cover". On the following page it references 1860 as the low point of the extent of Connecticut's forest cover, at 30%. While the presentation of this chart and these numbers suggests historical accuracy, the historical data on which they are based are largely conjecture. Good numbers on the extent of Connecticut's forests did not come about until the second half of the 1800's. For the years prior, no actual data exist. The two authors[5] that have looked at the years between 1790 and 1860 do not agree with each other, even though they hypothesized a similar numerical relationship between early population data from the US census and the amount of forestland that likely existed.
- It is not important that the numbers in the chart are correct, only that they are portrayed properly. These numbers are part of telling a story that the forests of Connecticut were heavily disrupted and largely removed during the centuries between 1600 and 1900, that many of our forestlands are only recently returning to forest after being converted to other often indeterminate land uses, and that, due to these disruptions and discontinuities, the forests of today are likely significantly different in several key ways from the forests prior to European colonization. In my opinion, those are the aspects of Connecticut forest history to be underscored.
- On page 7, reference is made to an 'aging forest'. It is not clear what this means. Is it to intended to imply that a forest has successive periods of maturity, as people do as they age? And, how can our forests, almost all of which are less than 400 years old, and most less than that, be considered aging in the context of the forest that went before, when the age of that forest could be measured in millennia?
- Presumably, the authors mean that the current forest consists largely of trees that are even-aged and so, individually and in aggregate, are aging together. That, though, that begs the question as to, what is the right age for a tree? This point becomes important in the later discussion regarding proforestation and active management.
- Also on page 7, the report discusses forestland ownership and reports that 71% of the forest is in private ownership. The report then goes on to discuss the findings from a 2015 Connecticut Woodlands Owners Survey report. It is useful to note that this survey was not of all private landowners. Instead, it reached out to the "17,000 families and individuals (who) own close to

[5] The two authors are Henry I. Baldwin, Forestry in New England, an unpublished preliminary report submitted to the National Resources Planning Board, Boston, MA in December 1942 and Roland M. Harper, Changes in the Forest Area of New England in Three Centuries, published in the Journal of Forestry in April, 1918.

600,000 acres of forest across the state, in parcels of 10 or more acres, which is about 34% of Connecticut's forest estate". Based on that quote from the report[6], some 37% of the state's forestland is owned by corporate landowners and land trusts. Their views may be different those of the individual and family woodland owners referenced in the CWO Survey.

- On page 10, the report lists that the total acreage of Connecticut's State Forests as 168,960 acres, in 32 State Forests. However, the Connecticut State Register and Manual, published by the Secretary of the State, lists 33 State Forests, covering 184,443 acres. Presumably, the difference in the numbers is due to Centennial Watershed State Forest, the state's most recent State Forest. Centennial Watershed State Forest is administered and managed through a cooperative arrangement that distinguishes it from the other 32 State Forests. Focusing on the 32 State Forests that are administered in a similar manner likely makes sense. However, the actual total of 33 State Forests, if Centennial Watershed State Forest is included, should be noted.

- On page 12, the report includes a chart that estimates "Connecticut's forest products and forest recreation industries" as producing an annual gross output of $3.38 billion and being responsible for almost 13,000 jobs. Assuming these numbers are accurate, while this chart is technically correct, its inclusion is misleading in the context of this report. Almost half of the dollar value ($1.57 billion) and over a quarter of the jobs listed are in paper manufacturing. While Connecticut's forests do produce some timber that goes into making pulp, with reference to Connecticut's forests, paper manufacturing is not a large industry. It is certainly nowhere near the scale mentioned in the chart. The reason that the paper manufacturing industry is included in this chart, and the reason that this chart is misleading, is that the chart is a summary of the Department of Commerce economic statistics, of Connecticut-based industries working in the forest products sector. That includes all companies that list their headquarters as being in Connecticut, even national and international corporations whose revenue is based on forests located elsewhere on the planet. Given that knowledge, it is difficult to get a good assessment from this chart of the economic contribution that is actually from products of Connecticut's forests.

- On page 17, the reports states that "There are multiple factors and stressors that have combined to threaten the resilience of our forests" and, further down on page, the report lists as the second factor "Most Forests are Mature and Getting Older". However, in the description under this heading, the report states, "Old growth forests have enormous ecological and social value, are rare in the modern landscape, and can have substantial resilience to disturbance." In other words, in this case, the report seems to be undercutting its own argument.

- Also on page 17, under the fourth factor, regarding "edge", the report includes under the factors causing permanent edge "chronic imbalance of predator-prey in wildlife populations (e.g. deer)." This assertion requires explanation. While deer are notorious for interfering with understory regeneration, it is not clear how that relates to the development of a forest edge.

[6] Mary L. Tyrell, Understanding Connecticut Woodland Owners, Yale School of Forestry and Environmental Studies, March 2105. Available on the DEEP Forestry web site.

- On pages 22 and 23, the report references the need to strengthen markets for forest products, including non-timber forest products. However, the discussion comes across as vague, particularly in reference to what timber forest products and what parts of the forest products industry need strengthening. I would suggest that we need to know a lot more about the status of the various sectors of our forest products industries, of all sorts, before specific recommendations can be made about strengthening individual parts of the whole.
- On page 28, the report states that "Proforestation … is the most effective solution to preserve accumulated carbon storage and enable it to continue to increase". This is a fairly dramatic statement to make, particularly in connection with a term that many people, include many forest practitioners in the state, were not familiar with as recently as two years ago. A statement of this magnitude should not be stated with this degree of certainty without a full vetting of its meaning and accuracy, and not until there is a robust consensus as to its truth. I am not suggesting the basis for this claim is untrue – I don't know that, either way. I am questioning the use of terminology when it is not yet widely accepted as to what, exactly, the term means. I am also questioning the inclusion of a statement of this sort of sweeping nature when the statement has yet to gain wider acceptance, particularly among forest professionals.
- Along those same lines, on page 3, in the final paragraph, the report states that any comprehensive policy solution for forests should address 4 challenges, stated as:
    - Longevity of the approach
    - Additionality (that the approach would not have taken place anyways)
    - Leakage (that the approach is not pushing the avoided activity elsewhere, where it might cause more damage)
    - Substitution (the carbon implications of using one material over the other)

  It is reasonable to ask, within this report, for a summary as to how these challenges apply to proforestation.
- On page 30, the report states that "edge forests and residential and urban treescapes typically contain larger trees, on average, and therefore store more carbon per tree or area of forest than do interior forests and tree." I am not sure what this statement means or how it could be tested. For instance, a study of all the trees within the city limits of Hartford[7] above 1" in diameter found there to be approximately 568,000 trees, 80% of which were less than 12" in diameter. Is that the sort of comparison that this report is suggesting?
- On page 33, the report indicates that the tree canopy cover is urban areas is estimated at nearly 50%. In a March 2018 article in the Journal of Forestry, David Nowak and Eric Greenfield of the US Forest Service report Connecticut's urban tree cover at 61.6%.[8]
- The surface temperature map on page 35 shows the potential for the surface temperature to read in one part of New Haven as 33°F and in another part of the city, at the same time, as 76°F. This is a rather remarkable range of temperature variation.

[7] "Hartford's Urban Forest – the Challenge", https://portal.ct.gov/-/media/DEEP/forestry/urban_forestry/UForeFlyerLetterpdf.pdf

[8] David Nowak and Eric Greenfield, US Urban Forest Statistics, Values, and Projections, J.For. 116(2):164–177

- On page 38, the section of Local Wood Re-use starts out discussing the re-use of wood from the urban forest. By the third paragraph in this section, the report is discussing, for construction in densely developed neighborhoods, the substitution of locally-grown, long-lived wood products for more carbon-dense materials such as steel aluminum or concrete. Very few people see re-purposed urban trees as having a major role in such construction uses as structural framing[9]. It seems more likely that, at this point, the report is referencing the use of forest grown trees, as opposed to reclaimed urban trees. These forest products could then be used to produce materials such as cross-laminated timbers. The economics of urban wood re-use make it unattractive for most uses outside of those in which the costs of small scale manufacture can be borne by the ultimate purchaser, such as in custom furniture manufacture, or in which the demand for the product is relatively narrow and so is appropriate to a limited extent of manufacture, such as utility lumber used locally for lining truck beds.

Thank you. I greatly appreciate this opportunity to be able to provide comments. I am grateful for your taking the time to read and consider what I have to say.

With regards,

Chris Donnelly
Northford, CT
October 5, 2020

[99] There are exceptions. See the USDA Forest Products Lab notes https://www.fpl.fs.fed.us/labnotes/?p=5488 and also https://wholetrees.com.

Hello Brian,

I hope you are doing well. I am not sure who to direct this thought to, so please let me know if not you. We reviewed the Draft Report of the Progress on Mitigation Strategies Working Group, and would offer Sustainable CT be included as an implementing partner to the strategy found on page 13, "Engage municipalities as allies." If it makes sense to discuss further, let me know.

Kind regards,

Jess

Joseph Orefice, PhD
18 Old Barrows Rd
Union, Connecticut 06076

# Response to Science and Technology Draft Report

October 6, 2020

Governor's Council on Climate Change,

Thank you for providing the draft report from the GC3 Science and Technology Working Group. I have a few comments I hope will be considered as the final report comes together. I included a brief bio at the end of this letter for reference.

I was glad to see a strong focus on the need for science in this report. However, **the inclusion of proforestation in this draft is incredibly concerning for a number of reasons and it should be removed from the report.** Proforestation is a highly disputed concept which draws conclusions based on partial science and very limited studies form forests outside of Connecticut's region. While the concept of studying the effects of active vs passive management on Connecticut's forests is incredibly valid and needed, **the science is anything but conclusive when it comes to forest carbon dynamics of managed vs unmanaged forests**. Long-lived forest products and fossil fuel substitutions are also an important part of this equation[1], of which proforestation inappropriately groups in with woody biomass or ignores altogether.

**Most importantly, the scope of this working group is not forests, there is a separate working group to address that topic**. Consider, hypothetically speaking, if the Forests GC3 working group were recommending windmills in Long Island Sound. That recommendation would be far beyond the Forests working group's scope and expertise. It would be even more inappropriate if the only documented support for windmills in the Sound was a single, highly controversial, opinion paper in a journal wrought with controversy[2,3], co-authored by the chair of that very working group.

The Science and Technology draft report also contains an inappropriate grouping of wood energy components. **Biogenic carbon must be considered separately from fossil carbon sources**[1]. Residential wood energy (firewood) is incredibly important to rural people in Connecticut, and it has a vastly more climate friendly footprint than woody biomass. Additionally, it is a direct biogenic carbon substitution for home heating oil or propane, both of which are sources of fossilized carbon. Risks of particulate matter to human health are not the same in rural areas as they are urban areas (where there currently are fewer wood stoves yet greater particulate pollution). While wood energy for heat may not be appropriate in a crowded city, it is very appropriate and poses little health risk in a rural area when combined with efficient furnaces/boilers.

Technologies such as solar panels are very important to develop, especially on rural homes. However, solar has limited potential to heat homes. Locally sourced firewood from public and private lands currently serves as an important component of rural home heating budgets. It would serve this group this well to **recommend support for indoor solid-wood gasification furnaces/boilers** as a way for rural

homeowners to decrease their fossilized carbon footprint while engaging them in sustainable natural resource use and the climate crisis.

Wood gasification technology has significantly advanced in recent years and it has the potential to continue to make these technologies far more efficient than traditional wood stoves. You will see in my bio that I own and operate a sustainable farm. On that farm is a 1700sqft house I built with wood, and which is 100% heated with firewood from sustainable forestry operations, there are no fossil fuel burning appliances in the home whatsoever. Heat for the home comes from an indoor wood gasification furnace, and the hot water is a heat pump that concentrates ambient heat in the home for the hot water supply. Modern HVAC ductwork and digital controls keep the system safe and cozy. Outdoor wood boilers have seen wide adoption in rural areas but modern indoor wood furnaces/boilers reduce firewood consumption by about 3x compared to these, and heat pumps for hot water add to the home's energy savings and efficient use of wood heat. Masonry heaters are a traditional technology from other areas of the world which also hold significant promise for rural residential heat.

My greatest challenge when designing and building this home was the lack of resources and knowledge in the building products industry related to sustainable home systems and options. I was fortunate to grow up working in construction, however most homeowners must rely on builders and repair contractors to do the work and educate them about their options. **An educational campaign to train contractors in sustainable home construction/technologies would serve to disseminate consumer awareness of what is possible and snowball into greater adoption of climate friendly living.**

Residential living is just one piece of the puzzle but there are ways we can make it very climate friendly. We need the support of working groups like yours to help make the right policies happen. **Directly connecting residential buildings and rural populations with sustainable home technology will help bridge the political mess that climate change has become and better connect people to natural resources.** Wood gasification furnaces/boilers, masonry heaters, solar panels, heat pumps for hot water and as a backup home heat source, and development of biogenic construction materials are all low hanging fruit when it comes to technologies that will contribute to decreasing our State's carbon footprint and I hope to see them reflected in your report.

Sincerely,

Joseph Orefice, PhD

Brief Biography:

Joseph Orefice, Ph.D. is a native of Connecticut and serves as a Lecturer and Director of Forest & Agricultural Operations at The Forest School at The Yale School of the Environment. He teaches courses in agroforestry and forest management and he also oversees forestry operations and applied educational opportunities on the 10,880 acre Yale Forests system. His research focus is in temperate agroforestry and applied forest management. Prior to joining Yale in 2018, Joe served as Cornell's Northern New York Maple Specialist, Director of Cornell's Uihlein Research Forest, and as an Associate Professor of Forestry at Paul Smith's College. Joe's current work is in maple extension and temperate silvopasture regeneration and carbon dynamics. His passion outside of academia is farming, where he integrates agroforestry and forest management into Hidden Blossom Farm, which he owns and operates in Union, CT.

Work Cited:


1. https://www.fpl.fs.fed.us/documnts/pdf2014/fpl_2014_bergman007.pdf
2. http://retractionwatch.com/2015/06/02/mutant-plant-paper-uprooted-after-authors-correct-their-own-findings/
3. https://en.wikipedia.org/wiki/Frontiers_Media

Hello,

I participated in the virtual public forum last month and was asked to submit my comment here.

I'm currently trying to build affordable housing in Derby, CT. My architect tells me that the easiest and most affordable way to meet Connecticut's R-50 roof insulation is with spray foam insulation.

This is troubling to me because my potential tenants that need afford housing are likely to have experienced all sorts of environmental racism that results in compromised health. I've read reports that state that spray foam becomes toxic of the house gets too hot. What of my tenants prefer to keep windows open in the summer because they can't afford the cost of air conditioning? What if we have another hundred year storm and electricity is unavailable for weeks in the summer. This overheated spray foam has caused documented breathing issues for residents in Canada and Florida.

I commend Connecticut for demanding that homes are well insulated. However, I urge you to find and recommend a healthier and more affordable solution for low income houses.

Best regards,

Tanya Dwyer

347-829-5295

Dear Governor's Council on Climate Change,

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
- Stop the 650 megawatt Killingly gas plant from being built and halt future fossil fuel power plants from our state.
- Set a goal of 100% clean and renewable zero-emission electricity, transportation and buildings that centers equity and creates good jobs.

Thank you for the opportunity to comment.

Sincerely,

Kara Guerin
36 Jamestown Ct
Glastonbury, CT 06033
kara.lessard@gmail.com
(860) 614-2035

Dear Governor's Council on Climate Change,

I live in Killingly and only 1 mile from the other large fossil fuel electric plant. We also have Frito Lay (who makes it own energy with gas and has a stack) in that loop. We need to promote solar and wind energy to help save our planet for our children. I am not someone who just wants people to do the right thing. I have invested in my solar panels and built my home to be net zero and energy efficient. We all need to look at our footprint from this point on. We know the science. We need to be examples of our beliefs.

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
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- Set a goal of 100% clean and renewable zero-emission electricity, transportation and buildings that centers equity and creates good jobs.

Thank you for the opportunity to comment.

Sincerely,

Lisa Suchy
65 Island Rd
Dayville , CT 06241
lsuchy47@gmail.com
(860) 429-6822

Dear Governor's Council on Climate Change,

Natural gas is not cleaner, and is not a bridge fuel. We need renewable energy now!

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
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- Set a goal of 100% clean and renewable zero-emission electricity, transportation and buildings that centers equity and creates good jobs.

Thank you for the opportunity to comment.

Sincerely,

Mary Donegan
243 North Quaker Lane
West hartford, CT 06119
mkdonegan@gmail.com
(919) 360-5288

Dear Governor's Council on Climate Change,

Stop trying to get rich at the expense of Americans and this planet?s health. Enough is enough. We want ethical leadership. The world is moving away from gas and fossil fuels, so why is a state like CT trying to keep dirty fuels alive? Lack of morals and greed is the only reasonable explanation.

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
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- Set a goal of 100% clean and renewable zero-emission electricity, transportation and buildings that centers equity and creates good jobs.

Thank you for the opportunity to comment.

Sincerely,

Adam Paul
27 Burlwood Drive
Burlington , CT 06013
adam_r_paul@hotmail.com
(413) 531-2632

Adelheid Koepfer
35 Whiffle Tree Road
Wallingford, CT 06492
Koepfer@gmx.net

Oct 7, 2020

**Re: Draft Report - recommendations on insurance industry**

Dear Chair and members of the G3C Financing and Funding Resilience and Adaptation working group:

Thank you for your work on the draft report and the countless hours you put in for our stat's future.
However, I am concerned that the recommendation part of your report lacks mentioning the role of the insurance industry, which is quite a factor in CT. How can you incentivize the insurance industry to make even more profit from the coming disasters, while they at the same time *make money financing these disasters*?

I ask that the Financing & Funding Resilience and Adaptation working group include the following recommendations in their final report:

1. Require that insurance companies:
    - Immediately cease insuring new coal projects and coal companies, unless they are engaged in a rapid transition process away from coal to clean energy of no more than two years.
    - Immediately cease insuring new oil or gas expansion projects, like the planned Killingly gas plant.
    - Commit to phasing out insurance for oil and gas companies in line with a 1.5ºC pathway.
    - Divest all assets from coal companies and oil and gas companies that are not in line with a 1.5ºC pathway, including assets managed for third parties.
    - Bring stewardship activities, membership of trade associations and public positions as a shareholder and corporate citizen more broadly in line with a 1.5ºC pathway in a transparent way. This must include forceful advocacy for a green and just recovery from COVID-19.
2. Reintroduce and enact SB 345 introduced in the Connecticut legislature in 2020 to require the Insurance Commissioner to (1) annually conduct a study on issues related to climate change and report the results of such study to the joint standing committee of the General Assembly having cognizance of matters relating to insurance, and (2) assess the feasibility of collecting and reporting additional data concerning climate change.

Insurance companies should invest in insuring our future (e.g. renewable energy, and electric vehicles, trucks and school buses), not destroying it (funding fossil fuels)!

Respectfully,

Adelheid Koepfer

Dear Governor's Council on Climate Change,

We need to stop putting profit over the protection of our plant.

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
- Stop the 650 megawatt Killingly gas plant from being built and halt future fossil fuel power plants from our state.
- Set a goal of 100% clean and renewable zero-emission electricity, transportation and buildings that centers equity and creates good jobs.

Thank you for the opportunity to comment.

Sincerely,

Alison Zyla
1 Shore Gove Road
Clinton, CT 06413
barral11@att.net
(860) 552-4022

Dear Governor's Council on Climate Change,

I strongly support investment in clean energy in CT for the sake of the environment and future generations.

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
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- Set a goal of 100% clean and renewable zero-emission electricity, transportation and buildings that centers equity and creates good jobs.

Thank you for the opportunity to comment.

Sincerely,

Andrea Simmons
30 Walnut Ave
East Hampton, CT 06424
andreasimmonz@yahoo.com
(860) 267-6961

Dear Governor's Council on Climate Change,

I am writing to ask you all to please stop for a few minutes and deeply consider the ever expanding and lasting effects on our environment, on all the living beings, including humans and on all future generations, of Eversource's?hopes to build a pipeline to fuel the Killingly fracked gas power plant and of building a fracked gas power plant to begin with. It will only create more and more destruction to our beloved planet on so many different levels. I beseech you to compassionately look deeply into this matter asking what would be the best thing to do for the sake of our Earth and all beings who are part of the body of this Earth.
Please let go of the habitual ways of thinking and doing things. Please open your hearts to look with the eyes of wisdom and be the leaders of exploring and developing creative, wholesome, and sustainable ways of creating and harnessing energy. I know you, you are capable of doing this, with your great creativity, talent and genius. Please help.

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
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- Set a goal of 100% clean and renewable zero-emission electricity, transportation and buildings that centers equity and creates good jobs.

Thank you for the opportunity to comment.

Sincerely,

Anne Speiser
92 Whispering Pines Rd
Avon, CT 06001
hannahla3@gmail.com
(203) 361-2085

Dear Governor's Council on Climate Change,

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
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Thank you for the opportunity to comment.

Sincerely,

Beverly Dunn
229 Bacon Pond Rd
Woodbury, CT 06798
duste2@juno.com
(203) 241-8403

Dear Governor's Council on Climate Change,

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

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Thank you for the opportunity to comment.

Sincerely,

Christine Oliphant
83 Morgan St Apt 6K
Stamford, CT 06905
olirick2@msn.com
(917) 655-8266

Dear Governor's Council on Climate Change,

Please move forward with green renewable energy and forget the fossil fuels!

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
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Thank you for the opportunity to comment.

Sincerely,

Cyd Gorman
Box 617
New Hartford , CT 06057
cgorman@thedataedge.com
(203) 918-5061

Dear Governor's Council on Climate Change,

Hasn't the planet endured enough damage already from pig scum Bourgoise garbage that only sees dollar signs where human compassion is much more needed?

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
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Thank you for the opportunity to comment.

Sincerely,

David Dougherty
282 Pershing Ave
New Britain, CT 06053
wyrmfire3@gmail.com
(860) 224-0893

Dear Governor's Council on Climate Change,

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
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- Set a goal of 100% clean and renewable zero-emission electricity, transportation and buildings that centers equity and creates good jobs.

Thank you for the opportunity to comment.

Sincerely,

Diana Heymann
98 Caya Ave.
West Hartford, CT 06110
heydiana42@gmail.com
(860) 200-8525

**Subject:** science and technology group on the right track

Practiced on humans, it is termed, Genocide.

Practiced on trees, it is termed,  Management.

Our forests are under siege, at the same time as we look for solutions to the rapidly changing climate and carbon emissions control.

Humans decide that some tree species are better than other, so destroy existing tree types and replant more desirable ones, using their criteria, for 'more desirable'.

Humans also know that trees felled can be replanted and grow, so they pretend that trees are a renewable source of energy.

We harvest our trees and burn them, for energy, emitting the same amount of carbon into the air as coal does.

When we cut trees, for energy use, we not only put carbon into the air but **double** the impact due to loss of the carbon sequestration.

Today, carbon sequestration is primary.

Trees, older trees, do the best job.

Even fallen trees continue to sequester carbon.

A natural forest is our first best step in controlling carbon..

**Is this a concept too easy to understand?**

Proforestration is a critical first step solution to climate change.

Protecting a connected network of natural forests, is imperative.

Our public forests are our forests, the people's forests, and should not have selected harvesting unless absolutely necessary.

Do not allow those who harvest our trees for profit, claim they are managing for the health of the forest.

Allow our forests to live and grow to their natural maximum age.

They will reward us well.

Respectfully submitted,

Diane Nash

5 Merrywood

Simsbury CT. 06070

Dear Governor's Council on Climate Change,

Considering Governor Lamont?s Executive Order 3 (EO3) calling for 100% carbon-free electricity by 2040 and despite state climate law mandating greenhouse gas reductions of 45% below 2001 levels by 2030 and 80% by 2050, the fracked gas power plant at Killingly is a step in the wrong direction!

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
- Stop the 650 megawatt Killingly gas plant from being built and halt future fossil fuel power plants from our state.
- Set a goal of 100% clean and renewable zero-emission electricity, transportation and buildings that centers equity and creates good jobs.

Thank you for the opportunity to comment.

Sincerely,

Elizabeth Langhorne
16 Morris Street
Hamden, CT 06517
langhornee@ccsu.edu
(203) 214-4081

## French, Rebecca

**From:** Helen Keegan (hellionk@yahoo.com) Sent You a Personal Message <automail@knowwho.com>
**Sent:** Wednesday, October 7, 2020 4:55 PM
**To:** DEEP ClimateChange
**Subject:** Governor?s Council on Climate Change: No new fracked gas plant; We want 100% clean energy



Dear Governor's Council on Climate Change,

do the right thing

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
- Stop the 650 megawatt Killingly gas plant from being built and halt future fossil fuel power plants from our state.
- Set a goal of 100% clean and renewable zero-emission electricity, transportation and buildings that centers equity and creates good jobs.

Thank you for the opportunity to comment.

Sincerely,

Helen Keegan
79 Colonial Dr.
North Branford, CT 06471
hellionk@yahoo.com
(203) 828-7362

Dear Governor's Council on Climate Change,

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

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- Set a goal of 100% clean and renewable zero-emission electricity, transportation and buildings that centers equity and creates good jobs.

Thank you for the opportunity to comment.

Sincerely,

Kathleen Fullerton
345 Belden Hill Rd
Wilton, CT 06897
kathyfullerton@ssndwilton.org
(203) 762-3318

Dear Governor's Council on Climate Change,

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
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- Set a goal of 100% clean and renewable zero-emission electricity, transportation and buildings that centers equity and creates good jobs.

Thank you for the opportunity to comment.

Sincerely,

Kathleen Repole
106 Sport Hill Rd
Redding, CT 06896
repland@optonline.net
(203) 938-0509

Dear Governor's Council on Climate Change,

Dear Members of the Governor's Council on Climate Change,

I am an RN and a very concerned citizen of Connecticut.  I add my voice to say NO to any new fracked gas plants in Ct, or anywhere else for that matter !

The signs of Climate Disaster are well evident  in the United States, and in the world.  The denial of science is woefully evident, especially in the United States.  Here we fit to a T that old saying: "NERO FIDDLES WHILE ROME BURNS".  The Northwest is burning; US deaths from corona lead the world; US areas with fracking operations have great increases in earthquakes (e.g. Oklahoma), water pollution, such that (e.g. New York). Ct is already experiencing draught , fracking operations require huge amounts of water - LIFE cannot endure without water, pollutants from fracking are well known, -the US is declining in health-(see WHO lists).

Why is fracking being considered when it benefits corporate interests only; it does not benefit life. Sincerely, K Tolliver

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

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- Set a goal of 100% clean and renewable zero-emission electricity, transportation and buildings that centers equity and creates good jobs.

Thank you for the opportunity to comment.

Sincerely,

kathleen tolliver
339 eastern st APT B306
new haven, CT 06513
tolliverkathleen@gmail.com
(203) 468-1581

Dear Governor's Council on Climate Change,

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
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Thank you for the opportunity to comment.

Sincerely,

Keith Roberts
8 David ST
Enfield, CT 06082
roberts12477@gmail.com
(860) 698-2498

Dear Governor's Council on Climate Change,

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
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- Set a goal of 100% clean and renewable zero-emission electricity, transportation and buildings that centers equity and creates good jobs.

Thank you for the opportunity to comment.

Sincerely,

Kevin McKernan
1 Linden Place
Hartford, CT 06106
kevin.mckernan@gmail.com
(860) 214-8730

Dear Governor's Council on Climate Change,

It is a blatant contradiction and simply illogical to increase fossil gas capacity while at the same time trying to transition off fossil fuels. It is a pretty significant omission not to mention the proposed gas plant in the GC3 reports. The so-called need for a bridge is a fabrication by the gas companies: the only need to is to ramp up efficiencies and renewables, which will lower demand and allow us to get off fossil fuels and meet our GWSA goals. The state has facilitated the false narrative about needing more gas to help us get to a renewable future, and DEEP has been the stumbling block itself to growing the renewable energy economy, by putting caps on solar and OFW, while encouraging and permitting every fracked gas project that comes before it. DEEP showed its preferential treatment to the gas industry by approving a permit for KEC before it had ever received a certificate of convenience and necessity. Please direct DEEP to stop the proposed new fracked gas plant in Killingly

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
- Stop the 650 megawatt Killingly gas plant from being built and halt future fossil fuel power plants from our state.
- Set a goal of 100% clean and renewable zero-emission electricity, transportation and buildings that centers equity and creates good jobs.

Thank you for the opportunity to comment.

Sincerely,

Martha Klein
PO Box 542
Norfolk, CT 06058
martha.klein@sierraclub.org
(860) 542-5225

Dear Governor's Council on Climate Change,

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
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- Set a goal of 100% clean and renewable zero-emission electricity, transportation and buildings that centers equity and creates good jobs.

Thank you for the opportunity to comment.

Sincerely,

Myra Aronow
1 Haddam Dock Rd
Haddam, CT 06438
myraaronow@aol.com
(860) 463-7141

Dear Governor's Council on Climate Change,

Invest in renewal energy only.  We are in crisis now.

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
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- Set a goal of 100% clean and renewable zero-emission electricity, transportation and buildings that centers equity and creates good jobs.

Thank you for the opportunity to comment.

Sincerely,

Robert Dickinson
400 Seabury Dr. Apt. 4160
South Windsor, CT 06002
RLDickinson@snet.net
(860) 644-1986

Dear Governor's Council on Climate Change,

I want to provide  a healthy environment in our state for the sake of our grand children.

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
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- Set a goal of 100% clean and renewable zero-emission electricity, transportation and buildings that centers equity and creates good jobs.

Thank you for the opportunity to comment.

Sincerely,

Robert Marchetti
12 Maple Ave
Old Saybrook, CT 06475
rmarchetti01@snet.net
(860) 388-0434

1. Prioritize equity in all recommendations of this workgroup. At least 40% of all new programs should benefit low-income communities and communities of color that have suffered from decades of intentional structural racism, disinvestment, red lining, discrimination, segregation, and many other injustices.

2. Ensure funding for low-income equitable access to Flood Insurance and Resilience Bonds (as recommended on page 30 and 42) by requiring that 1) insurance companies pay a tax for each fossil fuel company or project that they underwrite, 2) insurance companies pay a tax on the profits from investments in fossil fuel companies, and 3) a portion of any proceeds received as a result of the state's lawsuits against fossil fuel companies. Taxes should be set at a level that ensures the adequacy of funding.

3. Require that insurance companies:

1. Immediately cease insuring new coal projects and coal companies, unless they are engaged in a rapid transition process away from coal to clean energy of no more than two years.

2. Immediately cease insuring new oil or gas expansion projects.

3. Commit to phasing out insurance for oil and gas companies in line with a 1.5ºC pathway.

4. Divest all assets from coal companies and oil and gas companies that are not in line with a 1.5ºC pathway, including assets managed for third parties.

5. Bring stewardship activities, membership of trade associations and public positions as a shareholder and corporate citizen more broadly in line with a 1.5ºC pathway in a transparent way. This must include forceful advocacy for a green and just recovery from COVID-19.

4. Reintroduce and enact SB 345 introduced in the Connecticut legislature in 2020 to require the Insurance Commissioner to (1) annually conduct a study on issues related to climate change and report the results of such study to the joint standing committee of the General Assembly having cognizance of matters relating to insurance, and (2) assess the feasibility of collecting and reporting additional data concerning climate change.

Sharon Huttner

Branford, CT

sharonhuttner48@gmail.com

Dear Governor's Council on Climate Change,

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

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Thank you for the opportunity to comment.

Sincerely,

sian nimkoff
7 Hundred Acres Rd
Newtown, CT 06477
spnimkoff@gmail.com
(203) 208-3698

wDear Governor's Council on Climate Change,

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

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Thank you for the opportunity to comment.

Sincerely,

Susan Civitelli
3 Loving Lane
Wallingford, CT 06492
susan121206@gmail.com
(203) 626-9239

Dear Governor's Council on Climate Change,

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

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- Set a goal of 100% clean and renewable zero-emission electricity, transportation and buildings that centers equity and creates good jobs.

Thank you for the opportunity to comment.

Sincerely,

Sylvain Beloin
5 Powder Mill Ln
North Granby, CT 06060
slyy67@yahoo.com
(860) 602-4159

Dear Governor's Council on Climate Change,

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
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- Set a goal of 100% clean and renewable zero-emission electricity, transportation and buildings that centers equity and creates good jobs.

Thank you for the opportunity to comment.

Sincerely,

Terri Roper
210 Pequot Ave
Mystic, CT 06355
ptroper@gmail.com
(860) 536-1407

I understand meetings will be held today that will include review of the role of insurance companies in promoting and profiting from climate change, specifically fossil-fuel projects. Companies should not be allowed to profit from the destruction they're helping to finance. Please require them to end all support for new fossil-fuel projects (coal, gas, oil) and tax them on profits from any projects they currently support. Businesses must lead the way to end fossil-fuel dependency. As long as there's profit in it, the destruction will continue. -- Yours, Yann van Heurck, Madison CT 06443

Sent from:
Janina Wolfin

janinawoelfin@gmail.com

Dear Governor's Council on Climate Change,

Natural gas is not clean energy, and while it may result in some decrease in carbon emissions, the increase in methane emissions is far more dangerous to our survival on this planet. I can not more strongly urge you (beg you) to stop the planned Killingly gas plant. It is absurd to build something that will lock us into this harmful dependency on fossil fuels.

Please think BIG. Think of all the positive change that could be accomplished if the right people (You!) stood up for the right thing - by saying no to fossil fuels and saying yes to a safe future that is driven by incredible and exciting innovation. Connecticut needs an industrial revolution to be proud of... something to turn our economy around and to excite our citizens, not make us all more fearful of the destruction of all our hopes and dreams. We have seen the awful destruction that is already hitting so many parts of our country. We must seize every opportunity just like this one to go in the right direction.

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
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Thank you for the opportunity to comment.

Sincerely,

Sandy Henschel
23 Richard Rd
Gales Ferry, CT 06335
climb.ak@gmail.com
(907) 723-5709

Dear Governor's Council on Climate Change,

The GC3 draft reports include hundreds of pages of actions that Connecticut can take to address climate, but they are silent on stopping the Killingly power plant. This is a disaster as it continues to allow and promulgate fossil fuel use even when it is not needed.

The reports fail to set a goal for 100% clean and renewable energy.

Connecticut needs a clear and decisive path to transition away from climate destroying fossil fuels. We need to start now, not tomorrow.

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
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- Set a goal of 100% clean and renewable zero-emission electricity, transportation and buildings that centers equity and creates good jobs.

Thank you for the opportunity to comment.

Sincerely,

Michael Harris
PO Box 916
Deep River, CT 06417
michael@ecoshaman.org
(888) 888-8888

Dear Governor's Council on Climate Change,

Stop Global Warming NOW, or nothing else we do will matter.

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
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Thank you for the opportunity to comment.

Sincerely,

Philip Dooley
192 Goose Lane
TOLLAND, CT 06084
philip.dooley@snet.net
(860) 875-4455

Dear Governor's Council on Climate Change,

I  am against allowing  the Killingly Energy Center fracked gas power plant to go forward.  It will emit 2 million tons of carbon dioxide yearly and be in conflict with the long-term climate and clean energy goals mandated in CT.  The Killingly plant makes no sense as there is no current or predicted future need for this power in CT.  CT is an energy exporter!  Why would we want to risk the health of CT's land and people?

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

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Thank you for the opportunity to comment.

Sincerely,

Stephanie Dubinsky
50 Mansfield Rd.
Ashford, CT 06278
sjdubinsky@gmail.com
(713) 899-8795

As temperatures rise I see less Birds in my back yard and all around CT. With the rising temperatures Trees and Native Plants are suffering. Invasive Species and Diseases do well in this climate. No Enemies and no Cures. Drought every summer. Spring and Fall are shorter every year. Fall foliage is not as beautiful due to Drought in the Summer. Yet perfectly good Trees are cut down because they are not welcomed by their Homeowners. Meadows are destroyed by New Development. Empty Buildings everywhere but we need a New Strip Mall or Housing Development. Historical Buildings that could be saved to prevent debris becoming more waste in Landfills. Why do we treat the Earth like it is another Commodity? Or we have a Plan B? Where do we go when everything is Destroyed? How will we describe Animals, that went extinct, to our Grandchildren? When they ask us why we didn't do something? What do we tell them? God made us Stewards of the Earth yet we we raped and pillaged her. We have down more to destroy her in 200 years. Than we did since the dawn of Man. There is a Native American saying "We do not own the Earth but are borrowing it from our Grandchildren". We are coming to the turning point. Do we save the Earth and ourselves or do we keep up with this destruction? I have no power yet to plead with you to stop this! God Bless Mother Earth and her inhabitants.

Theresa Fair <theresajoefair@aol.com>

Here in Woodbury CT, I'm accustomed to seeing Cedar Waxwings every year. This year, I haven't seen or heard a single one!

Tom Greto

tomgreto@gmail.com

Dear Governor's Council on Climate Change,

I understand the new Killingly fracked gas project is going ahead? How is this consistent with our need to end fossil fuels in CT? If our own state is selling us out to commercial interests, what chance have we for 100% clean energy NOW? This stuff is poison, it's killing us and every living thing, and nobody seems willing to do anything about it! COVID is nothing compared to what's happening to the natural world we all depend on!-- Yann van Heurck, Madison CT 06443

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
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- Set a goal of 100% clean and renewable zero-emission electricity, transportation and buildings that centers equity and creates good jobs.

Thank you for the opportunity to comment.

Sincerely,

Yann van Heurck
PO Box 1215
Madison, CT 06443
janinawoelfin@gmail.com
(203) 245-9720

The Working Group reports will be posted on the GC3 website https://portal.ct.gov/DEEP/Climate-Change/GC3/GC3-Working-group-reports and feedback will be accepted until 11:59 pm on October 21, 2020. Written feedback on Working Group reports can be emailed to deep.climatechange@ct.gov.

# Equity and Environmental Justice

## Overview

The EEJ working group needs more time to review the other working groups' reports to analyze for environmental justice impact. As this working group's report indicates, it is essential to prioritize climate change mitigation and adaptation in a way that prioritizes vulnerable communities by addressing and not exacerbating existing inequities. Without sufficient attention to environmental justice, which should be at the core of Connecticut's climate change strategy, these working group plans will be insufficient and potentially damaging to underserved communities. I appreciate the EEJ equity lens, especially prioritizing transparency and accessibility of the GC3 process and attention to both racial and economic justice. This same attention to equity extends into the implementation of GC3 plans to ensure equitable benefits and costs of this transition.

## Public Participation

### Accessible and Inclusive Decision-Making

I am pleased to see that transportation access, online/phone access, food, and childcare are included within this section. In addition, compensation for low-income individuals should be considered, as some individuals may have to take unpaid time off to attend (selecting time frames that "do not conflict with work schedules" is only really possible if it is assumed that people work 9-5 jobs, which is not a safe assumption).

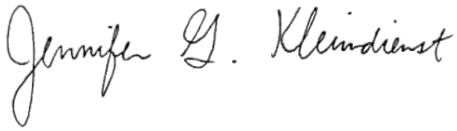
### Equal partnerships

I would like to see clarity on the "multiple options and opportunities" bullet – attendees should have both written/spoken and anonymous/identified opportunities to participate.

## Mapping Tool

In the Tool Development and Implementation Plan stepwise breakdown #2, several partners are identified. It would be good to see entities in smaller environmental justice communities (Middletown, Meriden, etc.) identified.

Sincerely,



Jennifer G. Kleindienst
241 West St.
Middletown, CT 06457

**The following are my recommendations to improve Connecticut's Environment:**

**WETLANDS**

There are approximately 220,000 acres of wetlands in Connecticut, representing 7% of the land within the State. Wetlands play important roles in climate mitigation and adaptation, offering carbon sequestration and storage. In fact, salt marsh ecosystems can remove over 10X the amount of CO2 from the atmosphere per hectare than forests.

My recommendations, consistent with Connecticut Audubon's, for how healthy wetlands can help mitigate climate impacts include:

- Encourage land and ocean management behaviors that support ecosystem services
- Advance regional research and modeling to guide conservation efforts
- Educate and assist private landowners and developers in the management of their lands to minimize impacts to wetlands and reduce risk from climate change.
- Implement new or modified policies that would encourage appropriate land use and reduce repetitive losses

**FINANCE AND ADAPTATION**

I agree with Audubon's strategies for adapting to climate change and providing financing opportunities include:

Building the governance structure to allow for effective and efficient financing and funding. Some examples include:

- Increasing Connecticut’s capacity and competitiveness for securing federal funds for resilience
- Creating a central governance authority for the funding, financing and operations of resilience infrastructure projects
- Requiring the disclosure of physical and transitional climate risks at the state and municipal level

Generating revenue sources to pay for resilience projects and programs. Some examples include:

- Establishing ‘resilience fees’ to provide revenue sources for resilience and adaptation funds and matching funds for grants. Resilience fee options include:
    - Transaction Fee -Municipal Conveyance Fee
    - Increase funding for Community Investment Act (CIA)
    - Create guidance to use Tax Increment Financing (TIF) Districts for resilience

- Promote the bundling of climate resilience and adaptation measures into Energy Savings Performance Contracts (ESPCs)

Supplying grants, matching funds for federal grants and loans to fund resilience projects and programs. Some examples include:

- Creating an Environmental Infrastructure Bank.
- Providing State general obligation bond funding as green bonds for financing resilience and adaptation programs and projects and providing matching funds for federal grants.
- Implementing 10% of the State Revolving Loan Funds that can be used to finance green infrastructure projects
- Expanding eligibility to flood control and microgrid projects.

Investigating the use of tax credit programs to incent the private sector to invest in community resilience. Some examples include:

- Investigating Opportunity Zones for clean energy projects and job creation.
- Promoting the CT State Neighborhood Investment Act Tax Credits for use of climate resilience

Engaging the foundation and philanthropic community as a funding and financing partner. Some examples include:

- Convening Connecticut's Community Foundation leaders to address investing in community capacity building, and annual climate adaptation training of environmental justice organizations
- Assessing Connecticut's capacity for implementation and advancement of climate change initiatives at the community level and with environmental justice communities
- Launching a statewide campaign for Just Climate Change Engagement. Undertaking a strategic initiative to increase available funding for Just Climate Change engagement
- Increasing individual, crowd sourcing and corporate giving for climate resilience
- Facilitating relationship building and partnerships among the state government, foundations in state and national foundation

**RIVERS**

Our rivers, streams, lakes, and ponds provide us with drinking water, food, irrigation, navigation, waste assimilation and energy generation. A river system in a more natural state regulates flooding. Its watershed land keeps our surface waters and groundwater clean, and promotes soil formation and nutrient cycling. River systems act as wildlife and corridors and pollinator pathways. Our inland waters also provide recreation destinations, spiritual inspiration, and a sense of place.

Changing precipitation patterns are projected to result in more frequent drought and an increase in short-duration, heavy precipitation events. These, combined with warmer temperatures, put our inland waters at significant risk of flooding, water shortages and declines in water quality.

Recommendations of the Rivers Sub-group are aimed at:

1. Maintaining ecosystem services provided by rivers
2. Balancing the in-stream vs. out-of-stream demand for water
3. Promoting policies, public education, research and funding that supports protection of inland waters.

Specific recommended actions include:

- Using nature-based solutions at scale
- Re-establishing free-flowing character and connectivity of inland waters
- Creating safe, equitable opportunities for people of diverse backgrounds to access and enjoy water resources
- Promoting demand-side water conservation and water reuse
- Exploring water rights options that protect fish and wildlife
- Funding and enhancing stormwater management programs
- Funding and enhancing education, outreach and research
- Addressing barriers to wastewater solutions and funding deficiencies for wastewater infrastructure

Thank you for your consideration of the above,

Richard J. Koda

Ridgefield, CT 06877

rjkoda@earthlink.net

# Subject: GC3 Comments

**Sarah Hasted** <hastedj@everyactioncustom.com>
to DEEP ClimateChange

Mon, Oct 19, 8:58 AM (12 days ago)





Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Mrs. Sarah Hasted
5 Deforest Rd  Wilton, CT 06897-1908
hastedj@optonline.org

Dear Governor's Council on Climate Change,

This is very important to me because I care about the world I leave for my children, grand children and great grandchildren.

We are in a climate crisis and CT is investing thousands of hours and tens of thousands of dollars to address this crisis.

CT does not need this power plant.  This plant will make reaching our greenhouse gas goals impossible to attain, making all of this above desperately needed investment a wasted effort. Please do not work against our critical work to make CT a livable place for future generations.

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
- Stop the 650 megawatt Killingly gas plant from being built and halt future fossil fuel power plants from our state.
- Set a goal of 100% clean and renewable zero-emission electricity, transportation and buildings that centers equity and creates good jobs.

Thank you for the opportunity to comment.

Sincerely,

Diane HOffman
190 Wilmot rd
Hamden, CT 06514
hoffmandiane30@gmail.com
(203) 415-9510

Dear Governor's Council on Climate Change,

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
- Stop the 650 megawatt Killingly gas plant from being built and halt future fossil fuel power plants from our state.
- Set a goal of 100% clean and renewable zero-emission electricity, transportation and buildings that centers equity and creates good jobs.

Thank you for the opportunity to comment.

Sincerely,

Jocelyn Pudim
89 SKY HILL DRIVE
WOLCOTT, CT 06716
oukanami@gmail.com
(203) 578-6761

Dear Governor's Council on Climate Change,

As a health care professional, I am concerned that this plant will increase the rate of asthma in this relatively poor community. This plant is not necessary for the energy needs of our state. It has been shown that the production and transmission of natural gas releases so much methane that it cannot be called a "clean" fuel source. Putting this plant into production will make it harder to meet our clean energy goals for no benefit to the rate payers.

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
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- Set a goal of 100% clean and renewable zero-emission electricity, transportation and buildings that centers equity and creates good jobs.

Thank you for the opportunity to comment.

Sincerely,

Janet Bellamy
11 Sunset Dr
Ashford, CT 06278
jbellamy23@yahoo.com
(860) 377-2746

Please help me establish a first in the nation Pilot Program.

That encourages CT Landowners to correct their soil pH to pre-acid rain levels; fixing carbon on a level no one believes is possible.

pH controls everything in the soil (think nutrient use efficiency, aluminum toxicity, etc.) Low pH decreases plant growth of almost all CT crops, forests, and lawns. Correcting soil pH will increase plant growth, increasing carbon sequestration. We'll show it can be done on large scale at extremely low cost. It will be replicated. This idea will garner National media attention which we will play to advance our State/Country and other environmental initiatives.

Think of carbon stored in bigger trees. Think more carbon stored in root mass. Think more carbon stored in soil organic matter. Think less need for fertilizer: less volitalization and leaching with associated greenhouse gas emissions.

Farm and forestland owners will be motivated by the economic incentive of increased yields. We'll connect with the environmental conscience of homeowners to get them to lime their lawn and home property. Taking action will give them hope, drive further action and innovation

Sincerely,

Kevin Blacker

P.S.- If Governor Lamont wants to black ball me on this idea; I'll put it on a silver platter and take it to another State like NH, call on some contacts at my old Alma Mater, University of New Hampshire. Let them have the New York Times, LA Times coverage this pilot program will generate.

kjblacker@sbcglobal.net

Dear Governor's Council on Climate Change,

Please come true to CT's GHG Emissions Reduction goal! A new gas power plant is non-compliant with this goal. The Quinnebaug river can't deal with the waste water from a second plant with all the toxins, and our air, forest and climate can't deal with the added emissions. We can generate our power with better, healthier, renewable and fossil free means!
For our kids, for ourselves, for our state, for the planet: we can only do so much in our homes and our community - we need the state to come true!

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
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- Set a goal of 100% clean and renewable zero-emission electricity, transportation and buildings that centers equity and creates good jobs.

Thank you for the opportunity to comment.

Sincerely,

Adelheid Koepfer
35 Whiffle Tree Road
Wallingford, CT 06492
koepfer@gmx.net
(203) 265-1522

Dear Governor's Council on Climate Change,

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
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Thank you for the opportunity to comment.

Sincerely,

Anna Brewster
111 Oliver Rd
Lebanon, CT 06249
abrewster.eco@gmail.com
(860) 455-5451

As a certified forester with 40 years of experience managing Connecticut forests, I see **severe long term unnoticed unintended consequences** on placing up to 104,000 acres of state forests in Core Natural Area Preserves and severely curtailing salvage logging.

Most of our forests coevolved with fire throughout the millennia. Now that we have almost eliminated significant fires in our state, many native plants and ecosystems that were mainly sustained by fire, such as oaks and pitch pine, **are not sustaining themselves under current natural conditions.**

Fires are primarily understory disturbances that a create different environment than overstory disturbances such as blowdowns from severe storms. Sustainable forest management can create understory and overstory disturbances and can act at least as a partial proxy for fire.

The unintended consequence of placing large areas off limits to management without an adequate natural disturbance regime that historically sustained different ecosystems include:

- Probable loss of forest to invasive shrublands due severe seedling deficiency that without management interventions will likely lead to long term declines in forest cover according to National Park Service Ecologist K. Miller.
- Loss of Keystone Oak Ecosystems and decline of bird and insect associated with oaks as they are displaced by depauperate birch, beech and maple.
- Increase in red maple which has been identified by researchers at Yale Forest as the local species that emits the most methane, a green house gas more potent than carbon and is equivalent to 18% of the carbon stored in forest trees.
- Likely decline of quality of interior bird habitat as researchers have found that interior forest birds benefit from young forest habitat that management often creates.
- Likely decline of pollinators as management disturbances promotes flowering plants.
- Likely decline of young forest habitat and over 50 "Species of Special Concern" that utilize these habitats such as chestnut sided warbler and prairie warbler.
- Loss of species – Big tooth aspen, white birch, grey birch, butternut, and red cedar were extirpated from the Natural Area Preserves that the CT Agricultural Experiment Station has monitored since originally established 1927.

**Properly conducted forest management, that include some preserves, is the most efficient way to maintain biological diversity in upland ecosystems.**

The unintended unnoticed consequence of severely curtailing salvage harvests include:

- Recent increases in forest tree mortality should increase the abundance coarse woody detritus (CWD)and ultimately lead to increased atmospheric carbon dioxide
- Sustainable forest management that includes harvesting reduces the volume of dead wood that will release carbon due to decay to the atmosphere.

Forest Carbon Management Approach 6.3 from the "Practioner's Menu of Adaptation Strategies and Approaches for Forest Carbon Management" states to increase harvest frequency or intensity due to greater risk of tree mortality

(many  harvest are planned as pre-salvaging unhealthy trees which often die before they are harvested). This is akin to selling off your poor preforming risky investments and retaining your high performing investments.

If not accompanied by a commensurate reduction of  demand for wood products, a major consequence would be increasing wood production elsewhere with a larger environmental impact. This would include increased energy consumption from transporting longer distances.

Especially since providing raw wood products for its citizens was a main reason for the start of Connecticut State Forests, we should take responsibility for satiating some of our citizens demand for wood products instead of off-shoring our environmental impacts so they are out of sight out of mind.

Sinccerely

Emery Gluck

Certified Forester F000036

emerygluck@yahoo.com

Dear DEEP;

I am totally, unswervingly and without reservation AGAINST the touching of one more single branch, leaf, limb, tree, animal, bird or microbe within Massacoe woodlands in Simsbury, CT and the wider area into which Massacoe is mapped.

These essential areas must be left completely alone and not touched, at all, ever. These areas *as they are,* are essential to nature, people, wildlife and ecology of the region. Please do NOT, in any part, parcel, slice or piece permit ANY further disturbance by ANYone, other than footfall of walkers where permitted by law, precedent, easement or established right.

Leave the whole area alone. It was here a LONG time before the country was settled. Do the honorable thing, the legal thing and leave it so that it remains in it's entirety exactly as it is now, so that it will be recognizable, natural and complete by and for the generations to come after us.

Thank you, sincerely

Jonathan Gooch

10 Glen Hollow Lane,

W. Simsbury, CT 06092

velvetpiano@hotmail.com

We want you to know how strongly we believe CT forest management is too invasive. Do not cut old growth; they are critical carbon collectors. Massacoe is a place we need to protect - rapidly growing, healthy, a main east-west wildlife corridor, on the Eastern Wildway, an educational resource and a refuge for many. No matter what climate, energy and social justice issues you include in your comments, **we need to protect SOME places for nature.**

**We urgently need a strategic landscape plan for a balance among research, responsible resource production, and sufficient and connected *nature preserves* to make sure we do not destroy or fragment our headwaters, special habitats, core forests, old-growth, corridors. Suggesting that these places "don't need protection" is wrong.**

Thank you,
Karyn and Bill Cordner

Simsbury CT

kcordner28@gmail.com

Dear Governor's Council on Climate Change,

Dear G3C members, The global climate emergency, created by global warming, threatens our human habitat. Global warming is due to an imbalance of carbon. We must sequester carbon to reduce the rate of warming and stop extracting fossil fuel. They exist outside of our biosphere for a reason, leave them in the ground.

One action CT should take is to say NO to new fossil fuel power plants. Also, The one thing our State needs in this report is a goal to attain 100% clean and renewable energy.

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
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Thank you for the opportunity to comment.

Sincerely,

Mary Rydingsward
176 Marcia Drive
Bristol, CT 06010
maryrydingsward@gmail.com
(860) 670-4761

**Subject:** A network of nature is an essential backbone for EVERYTHING

Please!

A network of nature is an essential backbone for EVERYTHING in CT

NAT KENNEDY

nat_kennedy07@sbcglobal.net

Dear Governor's Council on Climate Change,

Building this power plant is a mistake. We are polluting our way to an unlivable world. Around 200 species go extinct daily. Do we not realize that we are a species supported by all the other life forms on earth? Do we not see where all of this leads? Whatever reasons why a project like this "should" go forward make zero sense in that context. It doesn't matter if it's inconvenient, unpopular, or expensive to turn this around. The alternative is more inconvenient, more expensive, indeed, deadly. Someone needs to lead the way onto a better path. Here's an opportunity to do so. End this project now.

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
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Thank you for the opportunity to comment.

Sincerely,

Amy Kalisher
!2 Bolduc Lane
Chaplin, CT 06235
amy@amykstudio.com
(860) 455-0087

Mr. Eric Hammerling, Chair
Forests Sub-Group
Governor's Council on Climate Change

October 14, 2020
Mansfield, Connecticut

Dear Mr Hammerling;

Let me begin by commending you and the entire membership of the sub-group task force for compiling an excellent report. The report includes many recommendations for action to confront the challenges presented by climate change. The majority of these address one of two fundamental issues: one, how should we manage our forest resources going forward, and two, how can we protect our forests from being fragmented by development and converted to other land covers. It is to this second issue that I offer the comments below.

It is important to recognize that not all forests receive equal levels of protection. At the top of the pyramid are the State lands, which are provided the highest level of protection by a recent amendment to the State's Constitution. Below that are lands protected by municipalities and large accredited land trusts. Next, the lands owned and managed by non-accredited land trusts face slightly higher levels of risk. At the bottom of the pyramid are the lands currently enrolled in Connecticut's 419 Program. The only protection these forest lands receive are those associated with the goodwill and intent of the current landowner. The 419 Program is extremely valuable in Connecticut's land protection effort because it encourages current landowners to continue to own and manage that land as forest by lowering the property tax rate to reflect its current use value. However, if the land is transferred to a new owner through sale or inheritance it loses its 419 status. Enrollment in the 419 Program does nothing to prevent a current owner from developing or fragmenting the forest through subdivision except to extract a minimal tax penalty.

Lack of resources is often cited as the principal impediment to achieving a significant increase in the acreage of protected forestland in Connecticut. Adding to the State owned

inventory of protected lands is expensive both in terms of acquisition and future maintenance. It is unlikely that we will see significant increases in funding to support increasing the acreage of State land given the many competing needs presented by the pandemic and the impacts of climate change on society. Municipal budgets can also be expected to be tightened.

The potential for land trusts to fill this gap is severely constrained. Land trusts are limited in their ability to acquire and manage additional properties in part by the need to maintain large cash reserves to fight potential enforcement cases. Land trusts are also limited by their dependence on volunteers for forest management activities and donor funding for acquisitions. As a result, only the most highly valuable and unique properties qualify for consideration for protection and most transactions take several years to execute. It is difficult to imagine how the acreage of protected forestland in Connecticut can be dramatically increased by reliance on existing State programs and the best efforts of land trusts under these constraints.

What I propose as a remedy is the creation of a new category of protected land at the bottom of the pyramid yet above the 419 Program threshold. For convenience, "Conservation Land". I have referred to this concept as "419 Forever" in prior correspondence because the intended outcome would be to establish an enforceable easement that would make the existing requirements for participation in the 419 Program permanent. In order to be effectively implemented, I believe the program must be simple, easily understood by landowners and efficient to implement. The principal elements of such a program might include:

Limited to properties currently enrolled in 419 Program

> Insures that the land is actually forest land (inspected and certified by a licensed forester), and exceeds 25 acres in size (has sufficient value as forest land to support reduced taxation by municipality).

Designation as Conservation Land must be consistent with the Plan of C&D

Avoids conflict with developers who might otherwise find designation “obstructionist”.

Enforcement backstop provided by the State.

Allows land trusts to assume greater liability without significantly increasing their cash reserves for enforcement. Insures that legal costs for any enforcement of easement conditions is limited. This action alone would free up additional land trust cash reserve assets for acquisition and/or forest management.

Utilize a simple, “no edit” easement document for all transactions.

Reduce time and expense of negotiating individual documents for each property. NRCS has an excellent example that they apply nationally (Healthy Forest Reserve Program). This easy to understand 10-page document covers all the necessary elements required to insure that the forest will continue to provide climate mitigating effects in addition to the corollary values of wildlife habitat, clean water and air and other quality of life values supported by forested landscapes.

Develop low cost alternative enforcement monitoring methods

Engage CLEAR and others to develop remote sensing methods to detect violations of easement provisions. Utilize Town assistance (e.g. issuance of building permits or approving property subdivisions) to identify potential violations. Currently most Towns are very adept at identifying when a property is no longer enrolled in the 419 Program because of the tax liability.

Some of these suggestions could be implemented independently. However, if our collective goal is to dramatically increase the acreage of protected forest land in the State, success requires that we add many more properties into the bottom of the protection pyramid. Using our limited dollars to acquire a few, “special” acres and providing them with the ultimate level of protection will not yield the increase in total acreage necessary to mitigate climate impacts. Of course, one approach does not preclude the other. Some high quality lands are no doubt worth the public investment for reasons unrelated to climate change. But addressing climate change requires volume. We need to increase the area of protected forests dramatically

and within a short time frame. Creating a Conservation Land program could achieve that goal. Many current landowners would be receptive to this approach and would require minimal financial incentive, if any, to participate. A strong desire to protect their forest land from development is common among forest landowners, many of whom are aging quickly and are anxious about the future of their lands. The opportunity is there but the time frame is short.

Thank you for your time and attention. If there is anything I can do to further your efforts, please let me know.

Sincerely

Lee E. Dunbar
498 Wormwood Hill Road
Mansfield Center, CT 06250

Dear Governor's Council on Climate Change,

Methane gas is 28 times more effective in trapping heat in the atmosphere than CO2 (National Oceanic and Atmospheric Administration). CT needs to be increasing energy production through means such as off shore wind and decreasing our use of gas. We need to make sure that ALL possible clean generation is counted when calculating future supply. We need to take into account CT's climate goals in CT's permitting process. We need to realize that even companies that are traditionally fossil fuel providers are investing in clean generation. We need the jobs created through clean energy production.

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
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Thank you for the opportunity to comment.

Sincerely,

Maryellen Donnelly
114 Old Town Pound Rd
Hampton, CT 06247
maryellenadonnelly@gmail.com
(860) 455-9638

Dear Governor's Council on Climate Change,

The state plan to reduce GHG needs to be integrated with the actions taking place in and around the state. A plan does not achieve results if it is not implemented. Connecticut needs to transition off fossil fuel now. It does not need another fracked generating plant. Please provide the cohesive leadership needed to stem the immediate climate chaos threat.

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
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Thank you for the opportunity to comment.

Sincerely,

Michael Harris
PO Box 916
Deep River, CT 06417
mharris@harris-mgmt.com
(860) 873-8989

# COMMENTS concerning the Connecticut Governor's Council on Climate Change draft Science and Technology Report

Ralph Jones
Hamden, Connecticut
12 October 2020

As I understand it, the overall intent of the Connecticut Governor's Council on Climate Change (GC3)[1] effort is to provide citizens, decision makers, and political leaders with the information needed to address the many climate related issues we are facing. The hope is that it will help inform those of us who are not specialists as we seek to come to terms with the science and the realities. I am one of many who are grateful for these efforts.

The Science and Technology Working Group (of the GC3) put in long hours and has created a truly valuable report. Unfortunately, as drafted, their report lacks clarity, particularly about one of their major findings.

Temperature is perhaps the most widely recognized indicator of what is happening with the climate crisis. The draft Science and Technology Report explains that that working group has a high degree of confidence in their expectations at mid-century. Concerning projected temperature, it reads in full:

> 5. Average temperatures in Connecticut could increase by 5º F (2.7º C) by 2050. Connecticut's temperature has already risen more than the global average.

As this omits the baseline for this finding, the reader is left to wonder if any portion of that increase has already occurred. Grammatically, absent a phrase explaining when the increase began, the assumption is that the 5º F will be added to the current average Connecticut temperature. This would put us way beyond (perhaps double) the 2º C maximum described by the Paris Accord.

Most discussions of climate change reference the beginning of the industrial revolution. Using the beginning of that period, the finding would put us "only" 0.7º C over the Paris Accord disaster line.

Footnote 16[2] in the report may suggest yet a different, non-obvious base time of 1970-99. Such a base would mean that some small portion of the expected increase has already occurred, but one that nevertheless would have us deeply in jeopardy.

Faced with these uncertainties, it is all too easy, and too unfortunate, to imagine a legislative body bogged down in wrangling over whether it is necessary to face the costs of this crisis. Indeed, if we are looking at an increase of 5º F (2.7º C) over a mere 30 years, perhaps we

1 The working group reports are available at:: https://portal.ct.gov/DEEP/Climate-Change/GC3/GC3-Working-group-reports

2 16 Seth, A., G. Wang, C. Kirchhoff, K. Lombardo, S. Stephenson, R. Anyahand J. Wu (2019). Connecticut Physical Climate Science Assessment Report (PCSAR): Observed trends and projections of temperature and precipitation. CIRCA Report. https://circa.uconn.edu/wp-content/uploads/sites/1618/2019/11/CTPCSAR-Aug2019.pdf

should just eat, drink and be merry for the grandchildren will surely die.

Finding 5 says that Connecticut's temperatures have already risen more than the global average. This needs explanation. It is often reported that the polar regions are expected to warm faster than the tropics due to loss of ice. If Connecticut's warming is also due to geographic location, that's something over which we have no control. If our experience is due to proximity to human warming activities (releases of greenhouse gases or other factors) then we may be encouraged to act. Do our local activities play a significant role in our existing situation? What do we know about the balance between them and those brought here from other areas? Does Long Island Sound play a role in our increased temperature rise? If so what is that role, and what is causing it? Do we have a local problem with methane and the other fast acting greenhouse gasses? These questions are among those left unanswered.

Beyond that, knowing if Connecticut's excess warming above the global average is a recent development, an accelerating development, or a recent, accelerating development could help planners and those seeking mitigation. The answers here may well be the same as the explanations for our being warmer than average, but there may be other considerations.

What is the basis for the "high level of confidence" in the 5º F (2.7º C) by 2050 finding? Emotionally and anecdotally, I'm inclined to agree, but uncertainty is the basis for much of what the climate deniers proclaim. The article cited in footnote 16 appears to adopt the most aggressive model as the most likely scenario. Those who read and use this Report's finding deserve explanation of that choice.

The rhetorical shock value of 5º by 2050 may be the take away that really matters. Still, the implications of that finding are also shocking and need to be clarified in ways that lead to prompt and aggressive actions at many levels.

*Further concerns*

The draft Report identifies two other principal findings; namely that by 2050 there will be about a 20 inch increase in sea level from a 1983-2001 base and that the risk of summer droughts will increase along with increases in precipitation in other seasons. This draft Report may not be the place to discuss the background of these findings, but identifying the causes and responses that can be localized in Connecticut would be most helpful.

Finding 6 reads:[3]

> 6. All indices of hot weather are expected to shift toward more frequent and higher temperature events. For example, by mid-century the number of days per year with temperatures above 90º F (32º C) could increase. Statewide, from 1970 to 1999 the average number of days was 5, and this is projected to increase to an average of 25 days between 2040-2069. *(Note that specific locations and specific years will show more days with extreme temperatures than statewide and long-term averages).* The number of days with frost could decrease from 124 to 85.

This insight needs to be elaborated. What are the environmental consequences of these

3 The authors may intend the base period of 1970-99 mentioned here to apply to the 5º finding. If so, that is not made clear.

changes? What is the urgency of response? Many of us will welcome milder winters. Nevertheless, we are likely to be greatly troubled if our Connecticut forests begin to die, as an October 7 New York Times article concerning New England forests suggests is already beginning to happen.[4] Vast amounts of presently stored carbon will be released if our sylvan heritage transitions rather rapidly to that of a more southern climate. Such a die-off and regrowth would have a major impact on carbon retention, on air quality, on water flow and purity, on animal and insect populations and on viable crops. Perhaps these matters belong in a different draft report, but they are urgent.

The draft Science and Technology Report identifies numerous desirable actions as responses to anticipated climate changes. These are not clearly prioritized or placed in an accountability context. Who is responsible for initiating and following through and who is responsible for seeing that the essentials are being accomplished on a realistic schedule?

What are the most effective responses to the climate crisis? Some of the answers to that question no doubt belong in the reports of the other working groups. But there are many intrinsically worthwhile efforts that will have negligible actual impact on the crisis. What is it that is most urgent that we accomplish and who must do it? What portion of our response is likely to be effective, and what part will only matter when it is part of a national or global effort?

In particular, I note no mention of the cost of greenhouse gasses. Greenhouse gasses cost more than we are currently paying at the pump, through our utility bills, and in other ways. That difference, sometimes referred to as the social cost of carbon, is in effect charged to the accounts of future generations. Those deferred costs will be paid, both in cash and in shortened lives and in expensive efforts to repair a more extensively damaged environment. Some of this is covered in the Remediation working group draft Report, but the costs of carbon are not fundamentally a matter for remediation. Before we can begin remediation, we must stop making the crisis worse. There is considerable evidence that realistically pricing carbon is essential if we are to manage the climate crisis. Necessary as it may be, this is a burden that must not land unfairly on those who can least afford it.

Since the draft Science and Technology Report was released, both the Pope and Sir David Attenborough have published statements calling into question the ability of the capitalist economy to protect the viability of life on earth. It is beyond reason to expect this draft to address all the immediately urgent complexities. It provides a good starting point. As the Governor's Council on Climate Change moves into its next stages, however, it must develop plans that allow Connecticut to bring its considerable resources to bear on the problems over which we have some control and also identify those efforts that require us to work cooperatively with our global neighbors.

The work before us all is a very heavy lift – politically, educationally, financially. We are near the point of no return, if we haven't already past it. All our best efforts are required. The accomplishments of the GC3 process must not lead us to a return to our steady habits.

4 "New England's Forests Are Sick. They Need More Tree Doctors." Marguerite Holloway, *New York Times,* 7 Oct. 2020. https://www.nytimes.com/2020/10/07/climate/new-england-trees-forests.html

Dear Governor's Council on Climate Change,

It is time to reduce our reliance on fossil fuels and switch to renewable energy sources such as solar and wind.  Please demonstrate leadership by Not building a gas power  plant (in Killingly). Gas power plants release nitrogen oxides, known to cause respiratory problems in humans. If our state government instead provides more incentives for solar panels on homes, the jobs (installing the panels) will go to Connecticut workers.  There is a climate crisis (consider the fires, for example), and we need to do our part to reduce the rate of increase of warming.

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
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- Set a goal of 100% clean and renewable zero-emission electricity, transportation and buildings that centers equity and creates good jobs.

Thank you for the opportunity to comment.

Sincerely,

Thomas Mione
26 LEONA LN
New Britain, CT 06053
thomasmione@gmail.com
(860) 424-6474

To Whom it may Concern,

I have been informed that on October 21st the Governor's Council on Climate Change will stop accepting feedback from the public, after which the GC3 will decide the next 10 years of Connecticut's climate change strategy. I wish to add my voice to those who fervently hope to secure the protection of clean water and intact, connected ecosystems in CT, and to keep our forests out of European power plants. I believe that accomplishing these goals is paramount to securing the healthy future of our state.

It is a point of great pride to me that New England is the only place in the United States identified as part of the “Global Safety Net”, the map of regions important to stabilizing the climate and saving human life on Earth. We must keep 21% of our beautiful state protected from development. I exhort the GC3 to create a strategic landscape strategy that incorporates a balance among research, responsible resource production and sufficient and connected nature preserves to protect our headwaters, special habitats, core forests, old-growth, and wildlife corridors.
Thank you for your important work and your careful consideration on this essential matter.

Anita Scopino
Simsbury

scogirl51@gmail.com

Dear Friends,

Open space is critical for all of us. During this pandemic, people have turned to the forests for recreation, nurturing, as a place of refuge and peace. All have done this because there were few places left in our cities and towns that could provide the same connection with a more natural world. In addition to and because of this, we need 21% of the state of Connecticut protected from development. We need a strategic landscape plan for a balanced agenda to promote research, responsible resource production, and sufficient and connected nature preserves. Connectivity between protected spaces is crucial to adequately protect our headwaters, our special habitats, our core forests and increasingly endangered species.

Please give this your closest attention.

Bettina Hall
West Hartland, CT

nhall@high5adventure.org

Dear Governor's Council on Climate Change,

There needs to be a change to innovative, nature based solutions, the are sustainable!

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
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Thank you for the opportunity to comment.

Sincerely,

Christine Masztal
230 Christian Hill Road
Brooklyn, CT 06234
cg.masztal@gmail.com
(860) 774-2369

Subject: Proforestation

My name is Dan Mudgett and I live in West Simsbury now,having grown up in town and this area of the state. I am now 74 years old. Over the rest I have in other parts of the country, but have always returned here and consider myself a New Englander. I find myself greatly concerned with the rapidly increasing deforestation of both public and private lands using now outdated science in regard to the state of undeniable climate change and global warming. Newer scientific thought such as that spoken to in the recent book The Hidden Life of Trees puts forth the idea that the entire forest biome, from the largest trees to the soil and the smallest life forms therein are far more critical to the health and wellbeing of our finite planet itself. I hope these facts will be strongly taken into account when making plans for forest use in this area. Short sighted deforestation for dubious or less than well thought out commercial interest will have wide and permenant consequences. Thank you for allowing me to voice my concerns, Dan Mudgett, West Simsbury, Ct. danmudgett1@icloud.com

We need 21% of the state protected from development. We need a strategic landscape plan for a balance among research, responsible resource production, and sufficient and connected nature preserves to protect our headwaters, special habitats, core forests, old-growth, and corridors!

Greg Long

galong05@gmail.com

I write as a follow up to the recent webinar in which the draft report developed by the Financing Resilience and Adaptation Group shared their draft report. My limited understanding is that pursuant to an Executive Order the group was charged with recommending proposals for funding sources and financing mechanisms to advance investment in climate resilience and adaptation.

In response to the invitation for comment I provide the following proposal:

**Background:**

In 2019 Public Act No. 19-77: "An Act Authorizing Municipal Climate Change and Coastal Resiliency Reserve Funds" was signed into law. This law was created based on a belief that future exposures and costs associated with climate change represent a long term liability, and the prudent approach, therefore, is to begin the process of funding and investing assets today to address this liability. Municipalities could make annual appropriations into the fund and invest the assets using a long term investment strategy. This approach seeks to match the assets to the liabilities while providing an added funding source to supplement more conventional methods such as bonding and grants. As an example the legislation permits a 50% equity allocation. Historically a portfolio consisting of 50% in equities and 50% in bonds resulted in an annual return of 8.4% (based on results of a 1926-2017 Vanguard Group Study). While past history does not guarantee future returns, it is worth noting that an 8.4% return could grow $1 million invested today to $11.2 million over a thirty year time period.

**Challenges to Communities:**

Communities looking to create and invest funds for the purpose of funding adaptive infrastructure face significant challenges as many municipalities find their resources constrained by rising labor costs, pension and debt service costs and a declining property tax base. Alternatively communities with stronger balance sheets may be inclined to create Coastal Resilient Reserve Funds however the administrative tasks of establishing the fund, hiring investment managers and managing the act of rebalancing the portfolio to comply with the statute when assets are bought and redeemed presents additional challenges.

**Proposal and Thoughts for a Solution:**

In 1972 the State Treasurer created the Short Term Investment Fund (STIF) as an investment vehicle for the state and political subdivisions to invest their cash reserves. The fund provided daily access to participant's balances while managing the underlying investments and reporting needs.

My recommendation is for the State Treasurer to replicate the overwhelming success of the STIF fund by using this model to create an investment pool for Coastal Resiliency Funds. The portfolio could be managed by the Treasurer in accordance with the investment parameters outlined in PA 19-77. In doing so the State could potentially absorb the costs of managing the fund and provide a vehicle for all municipalities and political subdivisions to participate. While this may be initially deemed to benefit wealthier communities, (Similar to STIF) less wealthy towns and cities would be encouraged to participate with smaller balances. This approach could be adopted by other states which in turn could provide favorable consideration when determining the ESG ratings (Environmental, Social and Governance) ratings of the State and the political subdivisions.

Thank you for considering this recommendation and perhaps finding a space for it in the final report. As always free to contact me with any questions, comments or clarifications.

JFinch@branford-ct.gov

## Yankee Division – Society of American Foresters
## Comments on Forests Sub-Group Draft Report - Governor's Council on Climate Change

We appreciate the time, energy, and diligence that the members of the Forests Sub-Group - Governor's Council on Climate Change (F-GC3) invested in developing their draft report of 9.10.20. The draft report provides a strong background on many elements of forest management and provides some solid Priority Action recommendations. However, we believe there is an overly strong emphasis on a passive "hand's off" approach that is a step back from the principles of multiple use management that have successfully guided natural resource management for over sixty years. After summarizing several research-based examples of the potential negative impacts of passive management, we provide several proactive suggestions for the F-GC3 members to consider integrating into the final draft report.

The concept of multiple-use has been the guiding principle of foresters on state and many private lands for at least the past sixty years. It is the opinion of the leadership of the Yankee Division of the New England Society of American Foresters (NESAF) and other signatories below that a focus on a single product – carbon – is a regression away from the principles of multiple use/benefits. We believe strongly that this will have a negative impact on the myriad benefits that flow from our woods and forests, and that active, sustainable management can help to maintain or enhance those benefits.

In 1960, Congress passed the Multiple-Use Sustained Yield Act that mandated national forests be managed for timber, range, water, recreation and wildlife **with no one use given priority** (Godrey 2005). Professional foresters practice these principles on a daily basis. Though carbon was not called out specifically in this Act, recent best-available scientific findings support that multiple-use forest management (which includes no management implementations where appropriate) can maintain and enhance carbon sequestration and long-term carbon storage (Yankee 2020).

It is interesting that since the late 1950s, foresters and forestry continue to be characterized by some members of the conservation community and some members of the general public as being single-minded timber beasts. While timber production is a valuable part of what foresters do and helps pay the cost of land stewardship, the reality is that many additional benefits are generated from well-managed forests. Is forest management decimating our forests? NO! Connecticut's standing forest contains 4.3 billion cubic feet of wood. According to a draft 2020 report by CT DEEP, the forests of Connecticut continue to add volume as net growth significantly exceeds annual harvest and natural mortality. In 2017, Connecticut's forests grew 92 million cubic feet while approximately 14.7 million cubic feet of timber was harvested.

Rather than write a long white-paper that few would read, the following is a highlight of some, but by no means all, studies specific to Connecticut and southern New England highlighting the importance of pro-active management to achieve and enhance multiple forest benefits.

**Young forests – a critical habitat**
Over 40 species including wood turtle, golden-winged warbler, and New England cottontail depend on young forests that develop after a harvest or major natural disturbance. To provide adequate habitat diversity to maintain healthy, diverse wildlife populations (mammals, birds, amphibians, and reptiles), the forest at the landscape level should have approximately 5-10% young forests, 25-30% sapling/pole stands, 55-65% mature stands, and 10% old-growth (DeGraff et al. 2006). Because of the lack of habitat diversity to maintain viable populations of bird species, Audubon Connecticut, Massachusetts Audubon, and Rhode Island Woodland Partnership include proactive forest management, including silvicultural clearcutting to create young forest habitat, as a tool to enhance habitat diversity (Mass Audubon 2016, Burr and Sayles 2019, Audubon Connecticut 2020).

The F-GC3 draft report notes the extremely low proportion of young and sapling/pole forests in Figure 4, but curiously does NOT include any mention of the amount of young forest that should be part of the Connecticut landscape. Relying on sporadic, increasingly unreliable and unpredictable severe weather to create diverse habitats while ignoring the positive historic and future role of forest management will imperil those species that depend on young forests.

**Oaks – a fading species**
Oaks are keystone species in the eastern deciduous forest that supports dozens of wildlife species by producing a nutritious acorn. Oaks also support hundreds of caterpillars and other insect species (Tallamy 2019) that serve as vital sources of protein for birds during nesting, fledging, and migratory seasons. Perhaps surprising, oak forests host a greater diversity of wildflowers and other herbaceous species than stands dominated by maples and beech because the less dense canopies of oak forests allow more sunlight to filter through (Fralish 2004).

Oaks are the predominant species in over 35% of Connecticut stands that are 60-years-old and older (Smith and others 2004). However, only 15% of stands younger than 20-years-old are dominated by oak, and in Connecticut, oak species now account for only 6% of all stems in the sapling size class (1-5" diameter trees) (Alerich 2000). The future composition of the oak forests is of concern among natural resource managers because of the inability to consistently regenerate oak. We have already lost chestnut, elm, butternut, and are now losing another species (ash) because of introduced insects and diseases. Will we lose others – oak, aspen, pine – because of the benign neglect of unmanaged forests? If this comes to pass, there will likely be profound impacts on our wildlife, ecosystem services, local and regional economy, and quality of life.

**Unmanaged forests**
Connecticut is fortunate to have what is perhaps the oldest study of forest stand dynamics in the world – the Old-Series study. This study has followed the germination, growth, and mortality of over 50,000 stems on four unmanaged forests in central Connecticut since 1926-1927. Unmanaged does not mean undisturbed; one forest was partially burned by a wildfire in the 1930s and all had varying degrees of documented defoliation since the 1960s. Five species dependent on conditions that can be created by scientific forest management have been lost: paper birch, gray birch, bigtooth aspen, butternut, and eastern red cedar (Ward et al. 1999).

We are now witnessing the decline and eventual loss of an entire genera – the oaks. No oaks in the study that originated after 1957 have been able to move in the upper canopy where they receive sufficient sunlight to produce the acorns so many species depend on for food. Indeed, less than one new oak per acre has been observed in the past 20 years and only 23 per acre over the last 50 years. In contrast, nearly 650 new stems of other species have developed over the same time period. Will we be the generation responsible for the loss of oak? Consider of the consequence of losing this long-lived native hardwood to Connecticut's carbon storage potential.

Another study examined regeneration on 11,000 acres of private property throughout Connecticut using 1200 sample points. What did we find? While there were numerous oaks less than 2-feet-tall (about 17% of all regeneration) the proportion of oak steadily decreased as we examined taller and larger trees. Only about 1.6% of regeneration 6-feet tall or taller was oak. These are the oaks that have a chance, and only a chance, of growing fast enough and tall enough to become mature trees after severe weather or a harvest. Again, will we be the generation responsible for the loss of oak because we forgo proactive forest management?

**Forest management**

The necessary condition to allow oak, aspen, pine (and others) to grow from new seedlings to their majestic maturity does ultimately require complete or nearly complete removal of the largest trees, those in the overstory. For oak and pine, there has to be a period of partial removal before complete removal to allow small seedlings to develop adequate root systems (Brose et al. 2008). We could bring back repeated wildfires for the partial removals and wait for a hurricane for complete removal; or we could continue to practice professional forest management based on science.

A just published paper found that oak can be regenerated in Connecticut using the scientifically developed shelterwood system that does include a final overstory removal (Ward and Williams 2020). We examined 108 stands that had had a regeneration harvest implemented by a professional forester. The study included 2,210 points covering 4,500 acres. In a nutshell, harvesting increased plant diversity, increased regeneration density, and especially important – increased the density of oak regeneration. We found an average of over 380 oak and hickory stems per acre where a shelterwood system had been used. It should be noted that this only included those oaks with their tops in full sunlight; and only those oaks in full sunlight have the potential to become mature trees. Professional forest management works and can allow us to maintain the charismatic oaks as a keystone species in our vibrant forest ecosystems.

Setting aside some land as purposefully unmanaged is important and in the right locations, and for good reasons is advisable. However, making excessive amounts of land off-limits to responsible active management will have negative impacts on Connecticut's forest products industry. According to a draft 2020 report, Connecticut's forest products industry provides employment of 16,141 individuals and accounts for $3.96 billion in economic output not including retail sales. Reducing the viability of our logging/mill infrastructure will convert forest management from a slightly profitable enterprise (for the landowner), to an activity reserved for the wealthy and for government. Creating the young forest habitat necessary to conserve some critically threatened wildlife species will cost more money with reduced options for timber markets. Reduced income from the sale of forest products also means there will be no incentive

to control invasives without a government grant and may hasten the conversion of forests to other uses. Lastly, a significant reduction in local logging equipment and reputable contractors will both delay and increase the cost of cleanup after the next hurricane, super-storm, or round of tornadoes.

**What do we suggest?**

- To maintain a diversity of habitats required to sustain all wildlife, the Forests Sub-Group - Governor's Council on Climate Change should recommend minimum statewide goals of the proportion forested lands in a range of age classes. The F-GC3 should consider the following when setting those goals:
  - Fully one-third of state-managed forests (73,300 acres) is currently under explicit passive forest management (i.e., forest preserves).
  - At current management levels and using traditional forest prescriptions of a single thinning, 1st step shelterwood, and then overstory removal; roughly 24,000 acres (11% of state-managed forests) would be harvested over the next 100 years – leaving ~124,000 acres unmanaged. This implicit passive management would add an additional 56% to unmanaged state lands for a total 89% in explicit/implicit passive management.
  - Doubling current harvest levels and using traditional forest prescriptions would still result in 78% of state lands in explicit/implicit passive management.
  - Lastly, we close with noting that the 1938 hurricane destroyed one-fifth of the largest trees statewide and 40% in eastern Connecticut (Hawes 1939). The same report stated that 61% of stands in Connecticut were under 40 years old in 1938 and that those young stands were only lightly damaged. There have been six Category 3 hurricanes in Connecticut over the past 420 years for a mean return interval of 70 years (Boose et al. 2001). **Therefore, much stored carbon from a policy of no management will be lost in a day when the next major hurricane inevitably arrives.**
- Carbon storage and sequestration should be considered as an additional element of multiple-use forest management in Connecticut, coequal with water, recreation, wildlife, and timber.
- Support professional forest management and allied professionals who provide the expertise, experience, and infrastructure necessary for sustainable multiple-use natural resource stewardship.
- Promote invasive species and herbivory browse control. The damage done by invasive insects and diseases to forests with subsequent loss of stored carbon is obvious. Less well-known to non-foresters is how the combination of invasive plants and excessive deer browse results in forests with minimal subcanopy carbon storage, decreases in soil carbon with loss of litter and organic horizons, and replacement by slow growing species after loss of canopy from severe weather or harvesting. In extreme cases, new stands are vine tangles with a few, widely scattered trees.

## Signatories:

### Yankee Division and Connecticut Chapter Officers

Jeffrey S. Ward, PhD – Chair-Yankee Division, New England Society of American Foresters
Research scientist (forest dynamics) and certified forester with 41 years' experience

Lawrence Rousseau – Vice Chair-Yankee Division NESAF
CT DEEP Service Forester (retired) with 42 years' experience

Thomas E. Worthley, MS – Secretary/Treasurer-Yankee Division NESAF
UConn Associate Extension Professor with 45 years' experience

Joseph Orefice, PhD – Connecticut representative to New England Society of American Foresters (NESAF), CT certified forester with 13 years' experience

Alexander J. Amendola – Vice Chair-Connecticut Chapter, Yankee Division NESAF
Private and watershed forester with 5 years' experience

Daniel Lawrence – Secretary/Treasurer-Connecticut Chapter, Yankee Division, NESAF
Private and watershed forester with 6 years' experience

### Alphabetical order

Joseph P. Barsky – Yankee Division NESAF
CT certified Forester with 20 years' experience

Michael J. Bartlett – Yankee Division NESAF
CT certified Forester with 40 years' experience

Frank Cervo, MF – Yankee Division NESAF
CT certified Forester with 7 years' experience

Daniel Evans– Yankee Division NESAF
CT certified Forester with 12 years' experience

Michael Ferrucci, MS – Consulting forester with 41 years' experience, including work on forestry issues in 37 states

Emery Gluck– Yankee Division NESAF
CT certified Forester with 30+ years' experience

Eric Hansen – Managing Partner, Ferrucci & Walicki, LLC.
CT certified Forester with 15 years' private and state experience

Tim Hawley, CF – Yankee Division NESAF, past Chair
Natural Resources Manager for South Central CT Regional Water Authority (retired), former CT DEEP forester, and board member Connwood Foresters, Inc.

Jill Humphreys – Yankee Division NESAF
CT certified Forester with 3 years' experience

David Irvin – Yankee Division NESAF
CT certified Forester with 25 years' experience

Dwight Jensen – Yankee Division NESAF
Columbia Forest Products

Jerry Milne – Yankee Division NESAF, past Chair
CT certified Forester with 40 years' state experience

Ralph Scarpino – Yankee Division NESAF
CT certified Forester with 45 years' experience

Marc Tremblay, CF – Chair, Rhode Island Chapter, Yankee Division NESAF

Andrea Urbano, MS (forest carbon) – Yankee Division NESAF
CT certified forester with 8 years' experience

Jessica Wikle, MS - Yankee Division NESAF, UVM PhD candidate
CT certified Forester

**References**


Alerich, C.L. 2000. Forest statistics for Connecticut: 1985 and 1998. USDA Forest Service Res. Bull. NE-147, Northeastern Research Station, Newtown Square, PA. 104p.

Audubon Connecticut. 2020. Forestry with birds in mind. [in press]

Boose, E.P., K.E. Chamberlin, and D.R. Foster. 2001. Landscape and regional impacts of hurricanes in New England. Ecological Monographs 71(1): 27-48.

Brose, P.H., K.W. Gottschalk, S.B. Horsley, P.D. Knopp, J.N. Kochenderfer, B.J. McGuinness, G.W. Miller, T.E. Ristau, S.H. Stoleson, S.L. Stout. 2008. Prescribing regeneration treatments for mixed-oak forests in the Mid-Atlantic region. USDA Forest Service, Northern Research Station, General Technical Report NRS-33. 100p.

Burr, J., and K. Sayles. 2019. Forestry for Rhode Island Birds: a guide for foresters and landowners to manage woodlots "With Birds in Mind". 50p. [https://rhodeislandwoods.uri.edu/files/FFRIB_ForesterLandownerGuide_b.pdf].

DeGraff, R.M., M. Yamasaki, W.B. Leak, and A.M. Lester. 2006. Technical guide to forest wildlife habitat management in New England. University of Vermont Press, Burlington, VT. 305p.

Fralish, J.S. 2004. The keystone role of oak and hickory in the central hardwood forest. pp. 78-87 *In*: Upland oak ecology symposium: history, current conditions, and sustainability. USDA General Technical Report SRS–73. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 311 p.

Godfrey, A. 2005. The ever-changing view: a history of the national forests in California. USDA Forest Service R5-FR-004. 657p. ISBN 1-59351-428-X

Hawes. A.F. 1939. Hurricane damaged forests – still an important State Asset. 24p.

Massachusetts Audubon. 2016. Managing forests for trees and birds in Massachusetts. [https://www.massaudubon.org/content/download/20455/290511/file/Managing-Forests-for-Trees-and-Birds-MA.pdf].

Smith, W.B., P.D. Miles, J.S. Vissage, and S.A. Pugh 2004. Forest resources of the United States, 2002. USDA For. Serv. Gen. Tech. Rep. NC-241. 137 p.

Tallamy, D. 2009. Bringing nature home. Timber Press. Portland, OR. 288 p. ISBN-13: 978-0-8819208

Ward, J.S., S.L. Anagnostakis, and F.J. Ferrandino. 1999. Seventy years of stand dynamics in Connecticut hardwood forests - the Old-Series plots (1927-1997). The Connecticut Experiment Station Bulletin 959 68p.

Ward, J.S., and S.C. Williams. 2020. Influence of white-tailed deer hunting and residual stand structure on tree regeneration in temperate deciduous forests. Wildlife Society Bulletin. DOI: 10.1002/wsb.1120.

Yankee. 2020. Southern New England Forest Management in an Era of Climate Change. Position paper of the Yankee Division of the Society of American Foresters. 11p [https://nesaf.org/wp-content/uploads/2020/09/2020_Yankee_SAF_Position_Mgt_and_Climate_Change.pdf].

Greetings,

Please find attached the comments by the Yankee Division – Society of American Foresters on the Governor's Council on Climate Change (F-GC3) Forests Sub-Group draft report. While we appreciate the time, energy, and diligence that the members of the Forests Sub-Group invested in the draft report, we believe the draft report has some serious deficiencies that must be addressed. These deficiencies are included in the attached document.

Thank you for your time and attention. Take care and be well.

Regards, Jeffrey S. Ward, PhD

Chair, Yankee Division - Society of American Foresters

Prospect, CT

(203) 671-48487

jwcaes@gmail.com

Subject: Prevent the Destruction of America's Final Hope for Conservation

We need 21% of the state protected from development. We need a strategic landscape plan for a balance among research, responsible resource production, and sufficient and connected nature preserves to protect our headwaters, special habitats, core forests, old-growth, and corridors!

Thank you,
Jennifer Fletcher
11 Fox Den Rd
West Simsbury, CT 06092

fletcher_jennifer@att.net

We need 21% of the state protected from development. We need a strategic landscape plan for a balance among research, responsible resource production, and sufficient and connected nature preserves to protect our headwaters, special habitats, core forests, old-growth, and corridors!

Sincerely,

Jennifer and Tom Kim

j.s.kim@comcast.net

We are SO much more aware of the problems with invasive species than we were years ago, when plans included thinning out intact forests in CT.  As a Master Gardener, I constantly receive pleas to volunteer and help remove invasives.  It often seems like a losing battle. Logging will expose forests to more invasive species and increase the negative effect on plants and wildlife.

We need 21% of the state protected from development. We need a strategic landscape plan for a balance among research, responsible resource production, and sufficient and connected nature preserves to protect our headwaters, special habitats, core forests, old-growth, and corridors!

Joanne Pomerantz, Simsbury CT

jspomerantz@aol.com

We need 21% of the state protected from development. We need a strategic landscape plan for a balance among research, responsible resource production, and sufficient and connected nature preserves to protect our headwaters, special habitats, core forests, old-growth, and corridors!

jjkulak@gmail.com

Dear Governor's Council on Climate Change,

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
- Stop the 650 megawatt Killingly gas plant from being built and halt future fossil fuel power plants from our state.
- Set a goal of 100% clean and renewable zero-emission electricity, transportation and buildings that centers equity and creates good jobs.

Thank you for the opportunity to comment.

Sincerely,

Kathleen Magner
55 Sanford Drive
Easton, CT 06612
elewc55@sbcglobal.net
(203) 452-9190

We need 21% of the state protected from development. We need a strategic landscape plan for a balance among research, responsible resource production, and sufficient and connected nature preserves to protect our headwaters, special habitats, core forests, old-growth, and corridors!

Kevin P Keating
14 Chestnut Hill Rd
W. Simsbury

sicudoc@gmail.com

Eric, Jeff:

Tim Hawley and I are leading an effort to provide the F-GC3 - Forests Sub-Group with the specific edits you mention in this email and which we discussed today during our wonderful woods-stroll.

**All others:**

Tim Hawley is breaking the draft F-GC3 - Forests Sub-Group report into five sections for comments that are directed to **specific page-and-sentence-linked edits**. I'll send that out tonight.

Tim Hawley, Carol Youell, and I will each lead the effort on one such section. I seek two other volunteers to lead the other two sections.

Tom Worthley will provide the five section leads with integration and a "landscape" perspective, in two dimensions. Tom will provide the five section leads his short explanation of an option for landscape-scale reserve planning that could include some reserves and the concept of core forests. We hope to have common reference to this comment available for all five sets of comments.

The idea is that the F-GC3 committee will receive five separate letters, one per section of the draft report. The letters will be from five individuals; there isn't time to a group consensus.

**Regarding the GC3 Science and Technology Draft Report's Forestry Recommendations**

**Intended for All Recipients:**

Separately I'm working with a smaller group on the SAF letter to the Science and Technology group. That letter will be provided to the Yankee SAF Leadership for approval.

The draft makes the following points that each of you might consider making separately to the Science and Technology group:

1. The Science and Technology group's draft report's recommendations regarding forestry are not based on forest carbon science.

2. The GC3 forestry recommendations should come from the Working Lands- Forest Group, which does include expertise on forest carbon science, including forest ecology and forest carbon dynamics.

3. The proforestation-related citations in the Science and Technology report are very narrow and do not represent the depth and breadth of scientific understanding on the topic.

4. The SAF Position Paper on Forest Management and Carbon provides a thoroughly documented treatment of the issues.

5. Comparing the substantial body of scientific knowledge provided by the SAF report to the limited forest science on offer in the draft GC3 Science report shows that the Science and Technology group did not fully or fairly consult the relevant science.

Mike Ferrucci

R.S. Berg & Associates, Inc.

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Connecticut is a gem and our progressive thinking over the last few decades has served us well. I have a masters in Environmental Engineering and am now a lawyer. I do understand the balance among competing interests, but conservation has a huge long term payback for all the stakeholder. There is no longer a debate about the destructive impact of climate change and the need for the entire globe to take action. Thus, we need to make the commitment of protecting at least 21% of the state from development. We need a strategic landscape plan for a balance among research, responsible resource production, and sufficient and connected nature preserves to protect our headwaters, special habitats, core forests, old-growth, and corridors! Brownfield redevelopment makes so much more sense. Much progress has been made on that front with some of our cities becoming revitalized and allowing for the appropriate balance of economic and environmental interests.

Peter Sexton

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Comments on the Governor's Council on Climate Change, Forests Sub-Group, Draft Report

October 12, 2020

From: Ralph Scarpino- Retired DEEP Forestry (39+ years), Certified Forester, 45 years' experience, President of the Friends of American Legion and Peoples State Forests.

Generally speaking, within the Forestry community, there is a consensus that there are some basic forest management principles that have inconsistencies within this report. I share that concern. It does not appear that the report takes into account basic scientific knowledge in how forests grow and respond to normally acceptable forest management techniques or disruptive natural occurrences.

Within this report there is an overreliance on encouraging passive management of the forests that will in effect have a long term negative affect on carbon storage and degrade the health and resiliency of the forests

The report regularly calls for more resilient forests. Two quotes from the report: "With greater biodiversity comes forest resilience", "our forests are mature and getting older" It is generally accepted that greater biodiversity means healthy forests. Older forests are less diverse. Older forests are less healthy. They are less resilient. The conflict with the two quotes is obvious. Older forests will get older consequently less healthy consequently less resilient. The concept of proforestation is not a benefit to healthy forests.

I have a concern about the present oak forests that dominate CT's landscape now and have dominated for the past 70 years. These oak stands are old. Graphs within the report indicate over 50 % of the forests are over 80 years old, another 32% are between 60-80 years. So over 80 % are older forests. Personally I think the forests are older. Diversity means diversity of sizes and ages. The report mentions this unbalance of ages/size classes but doesn't address it. Our forests are not diverse. Our oak forests which are so well documented to be the cornerstone for supporting all kinds of life- caterpillars, birds, mammals that depend on acorns are going to be disappearing. Relatively recently Red maple has surpassed Red oak as the most frequently occurring tree. Oak forests are being

replaced by red maple, black birch and beech. This will result in a fundamental shift in forest composition and over time will result in less productive forests for all forest uses especially many species of wildlife that will be adversely affected. This needs to be addressed in this report.

Within the past few years Eastern CT had significant oak loss from a combination of drought and defoliation. Thousands of acres- the understory is heavy to red maple and black birch. The next forest will not be oak.

My point is the report needs to look into forest health which means age and size class distribution and forest composition and that relationship to carbon sequestration and storage.

There is a short term goal under *Forest Management Approaches* that says "*Greatly reduce clear-cutting of mature forests as a habitat management practice benefiting young forest species"* This is a feel good statement. There is *very little* clearcutting in this state. Clearcutting is a used to create young forests of sun loving tree species (oak, aspen, and hickory). It is also a valid tool to create young, biodiverse, healthy forests which is a benefit to many species of wildlife. If anything there should be more clearcutting, in appropriate stands.

Multiple uses of the forests have been the cornerstone of management for 60 plus years. The use of forests as a carbon sink should be another 'use' of the forests and not the primary driving force. Keeping our forests healthy will achieve the objectives.

I think more of the report could focus on the urban trees and not co-mingling the resources (urban vs. rural forests). They have different needs and benefits are measured differently. Our urban forests and trees need attention and need funding and professional expertise.

A final, few comments. The following are specific to 'Actions *to Increase adaption and resilience* '

*-Increase the reserve (passive management) acreage to promote local and landscape/regional resilience-* Comment: contradiction- Cannot promote resilience with passive management.

*-Implement active forest management approaches that can increase structure, age class and species diversity in low diversity second growth forests.* Comment- All of our forests are second growth, low diversity so….seems like a conflict with proforestation.

*-Respond to elevated tree mortality across the urban …with tree removals, limited salvage harvesting where appropriate…not in reserves and very limited on public lands except where safety is concerned*. – Comment. This makes no sense to me. Dead trees fall down and release carbon- what is wrong with the salvage?

> *Revitalize the state nursery?* Comment- Really? Natural forests have an abundance of seedling sources. Planting in forested situations is not practical and not needed. Anyone who has had experience with tree planting in a forested environment knows this is not a practical suggestion. Consider increase plantings and care in the urban forest.

*-Promote regeneration of native and future adapted tree species (especially oaks and hickories) …implement forest management approaches and planting initiatives to promote regeneration of mid-tolerant and intolerant species, such as oak and hickories where needed and appropriate.* –Comment. Can't do this with passive management. Planting will not work.

It is obvious the group did a lot of research into the development of this report. There are some good recommendations. However, in my opinion it lacks practical solutions/recommendations. We need to recognize the need for healthy forests (not old, stagnant, unhealthy forests) and work hard not to lose additional forest land. Our urban forests need attention. Our traditional forests need professional foresters to manage them. Private landowners need good, free services from the State Service Foresters and private consulting foresters to follow up with sound, multiple use forest management. Locking productive forests up with 'passive management' under the guise of proforestation being a viable management solution to climate change is not responsible.

Thank you for the opportunity to comment.

Ralph Scarpino

We need 21% of the state protected from development. We need a strategic landscape plan for a balance among research, responsible resource production, and sufficient and connected nature preserves to protect our headwaters, special habitats, core forests, old-growth, and corridors!

roybpomerantz@aol.com

We need 21% of the state protected from development. We need a strategic landscape plan for a balance among research, responsible resource production, and sufficient and connected nature preserves to protect our headwaters, special habitats, core forests, old-growth, and corridors!

uchock@hotmail.com

To Whom It May Concern:

We need (at least) 21% of the state protected from development. We need a strategic landscape plan for a balance among research, responsible resource production, and sufficient and connected nature preserves to protect our headwaters, special habitats, core forests, old-growth, and corridors.

Thank you.

--
Amy R. Kirschbaum
Attorney

Kirschbaum Law Group, LLC
433 South Main Street, Suite 101
West Hartford, CT 06110

(860) 955-9601 direct

(860) 522-7000 x111
(860) 522-7001 fax

amy@kirschbaumlaw.com
https://www.kirschbaumlaw.com/

We need 21% of the state protected from development. We need a strategic landscape plan for a balance among research, responsible resource production, and sufficient and connected nature preserves to protect our headwaters, special habitats, core forests, old-growth, and corridors!

coppersmith@comcast.net

Subject: Protect

Hi
I just want to emphasize my support and ask you to preserve and protect our forests including Massacoe!
We are at a critical juncture and or actions to protect the land are so important !

Danielle D'Ermo
https://gcc02.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.danielledermo.com%2F&data=04%7C01%7CDEEP.ClimateChange%40ct.gov%7C2584b5cabd674ed656f808d8710307a1%7C118b7cfaa3dd48b9b02631ff69bb738b%7C0%7C0%7C637383605112389297%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=oGOKJxdMQrc8ZCoWutlXHvGNqHSKhOaV%2Bz0CVCgsbQ0%3D&reserved=0
Photography

ddermo1@aol.com

"Forest plays a major role in carbon sequestration, which is crucial for achieving the global warming targets set by the Paris Climate Agreement. The Global Safety Net finds that 1/4 of Earth's land area is forested (32.8 M km2), only 28% of which is protected. Protecting the remainder of these forests, which contain more than 1.3 trillion tonnes of carbon, are vital to maintaining the balance of our global climate system." – Anup Joshi, University of Minnesota https://www.globalsafetynet.app/

I have been reading with great interest the GC3 reports, and I am heartened at the breadth of stakeholders who were involved in putting them together. We are truly fortunate to live in a state where its inhabitants care deeply about the fate of our planet.

I write today to support the recommendations put forward in the Science and Technology report. What the report suggests is that climate impacts are inevitable and that we must act quickly to come up with common sense solutions to a multitude of issues – including protecting our water and our intact, connected ecosystems. What concerns me greatly is the care of our intact and old-growth forests. According to the Global Safety Net cited above, New England Acadian forests are identified as 1 of the top 5 ecoregions in the world that must be protected for climate stabilization.

I urge the Governor to create strong protection for those intact forests, such as Massacoe State Forest, to maintain their natural state. Not only does the area serve as a significant carbon-storing source, major east-west wildlife corridor, and educational resource, but it also provides a mental health benefit for those who enjoy the beauty of nature as well as its life-sustaining benefits. Nature is a need: as Pulitzer-prize-winning poet Gary Snyder said, "Nature is not a place to visit. It is home." It certainly is for me, and I hope it will be for future generations to come.

Sincerely,

*Jan Beatty*

Janet M. Beatty

30 Woodhaven Drive

Simsbury, CT 06070

October 15, 2020

emmajbeatty@comcast.net

We need 21% of the state protected from development. We need a strategic landscape plan for a balance among research, responsible resource production, and sufficient and connected nature preserves to protect our headwaters, special habitats, core forests, old-growth, and corridors!

Michelle Sexton

Resident of West Simsbury CT

lauderdale327@gmail.com

Dear Members and Staff of the Working Group,

Thank you for the opportunity to comment on the GC3's **Draft Report of the Progress on Mitigation Strategies Working Group** and the inclusion of **Community Choice Aggregation (CCA)** as a tool for Connecticut to reach its climate goals. As the draft report indicates, CCA can do far more than just lower the commodity cost of electricity and increase the renewable energy credits purchased when a particular CCA replaces an incumbent utility as the default supplier. CCA can play a significant role in accelerating the adoption of building thermal energy conservation improvements, transitioning building fossil fuel thermal loads to efficient renewable thermal technologies, and optimizing grid management strategies to reduce carbon emissions.

The Public Utility Regulatory Authority's opening of a docket to study CCA is just one indication that the GC3 is justified in taking a close look at this policy tool that nine states currently enable, including some of the most progressive in addressing climate change such as Massachusetts, New York, and California. Our fellow New Englanders Rhode Island and New Hampshire are also among the states enabling CCA.

Another indication that CCA should be part of the GC3's report is the growing coalition of Connecticut municipalities (New Haven, Middletown, Mansfield, Simsbury, and Windham), legislators (about 15), and organizations (the CT League of Conservation Voters, Acadia Center, Operation Fuel, Peoples Actions for Clean Energy, Clean Water Action, CT Roundtable for Climate and Jobs, Efficiency for All, and many others) who support CCA.

Again, thank you for your work.

Peter Millman

--

**Peter Millman**
**Cell (860) 933-2944**

Eastern CT Green Action

People's Actions for Clean Energy

Hi, I am Rick Huffman and I am 67 years young. I have been aware of and speaking to climate change since 1976 when Jimmy Carter raised the issue. I have enough background in ecological sciences and botany to see and understand the effects of climate change. I also have been teaching sustainability and resilience in our built environment to promote a ‘C” change in designing sustainably.

We are facing a moral imperative to act and act profoundly to combat climate change. In 2000, we had a choice which direction we would go regarding climate change, we went the wrong direction. In 2016, we had a choice which direction we would go, we went the wrong direction. We must change course, speed, and direction. I was on a TEDx talk Monday with Furman University, called Countdown to Climate Change. We all must act; we all must be part of the solution.

Regards, Rick Huffman

Rick Huffman, ASLA

Earth Design, Inc.

1309 Grove Road

Greenville, South Carolina

o: 864.603.1231

m: 864.901.7583

f: 864.603.1323

www.earthdesignsc.com

From my perspective, our top priorities for using the power of our CT forests should be to mitigate the threat of climate change and to provide effective habitat for threatened wildlife. Regarding the issue of active versus passive forest management, I'm troubled by the fact that "experts" on both sides of the issue cite scientific evidence for their point of view and seem unwilling or unable to reach consensus or agree on effective compromise.

As noted in the Catanzaro and D'Amato report from 2019, **Forest Carbon: An Essential Natural Solution for Climate Change** (available through a link on the CFPA website), a combination of both active and passive management approaches should be considered, because both bring us benefits if implemented correctly. Although I'm sensitive to the fact that the forestry industry depends on active forest management for its livelihood, I believe that we need to move the needle toward more passive forest management (like we've done with our national parks) if we want to take bold, urgent action to respond to the increasing threat of climate change as stated in the Summary of Report on page 1.

As noted by Mark Anderson, Eastern Conservation Scientist for the Nature Conservancy, in a recent webinar on "Why Wilderness?", it turns out that the rate of carbon sequestration is based on the number of leaves that a tree has and not how fast a tree is growing. So older forests with larger trees will help maximize both carbon storage and sequestration as well as help protect forest dwelling birds which are in sharp decline. As the negative impact of climate change increases, I think it's crucial that we increase our commitment to cost-effective passive forest management approaches.

I fully support all the passive management/reserve-related recommendations in the report, especially those that pertain to permanently protecting core forests. I do. however, think that some of the recommended actions need to be more aggressive and more measurable. For example, one of the short-term (1 - 5 year) actions on page 26 is: "Adopt statewide core forest permanent protection goal of 50% by 2040". How can we have a 1 - 5 year goal but set the goal 20 years from now? We should have interim goals established for 5-year increments, and we should consider more urgent goals for core forests owned by CT, since the state has control over those properties.

I might have missed it in the report, but I think we should have a measurable goal for ensuring that any wood products generated through active forest management be used locally in order to support local jobs and the local economy.

Please note that while I'm on the Board of Directors at CFPA, I'm making my comments solely as an individual.

All the best,

Bill Cordner

West Simsbury

willcord@comcast.net

October 15, 2020

To the Science and Technology Working Group of the Governor's Council on Climate Change (GC3),

I appreciate your efforts to take part in the ever- important and timely recommendation process. I am a Connecticut resident who has devoted my personal and professional life to environmental conservation and sustainable natural resource management.

As someone with a B.S. in environmental conservation and M.S. in carbon forestry, I would be remised to not respond to your draft report. I have gone through the scientific research and publication process (Urbano and Keeton 2017), and am well versed in what science is, and how it can be used to better our society and natural environment. With all due respect, I expect much more from the Science and Technology Working Group.

First, the GC3 consists of nine working groups (https://portal.ct.gov/DEEP/Climate-Change/GC3/Subcommittee-and--working-groups), each with a clear focus area and purpose to provide specialized recommendations. The Working and Natural Lands Forests Subgroup was bestowed with the responsibility of providing recommendations in the context of forestry. So, why does the Science and Technology Working Group put such significant emphasis on forests and provide recommendations regarding forests and their management? This is not your job or responsibility. In fact, it's inappropriate, unprofessional, and discredits your efforts. I request you remove all the currently-included forestry-related content and recommendations and focus on the task assigned to you. Of course, forestry is a science, and as such, may be addressed appropriately within the confines of your duties, however not as the primary focus. If you deem it important that the readers of your report learn about forests, consider pointing them towards the Forests Subgroup's report, or the soon-to-be published 2020 Forest Action Plan. Any forestry-related content within the Science and Technology Group's (and the Forest Subgroup's) recommendations must also be based exclusively in forest science. That should go without saying, but this brings me to my second point.

The current forest related information and associated recommendations contained within the Science and Technology Group's Draft Report are purely opinion based and lack accurate and legitimate scientific support. Several of these suggestions are not only counterproductive to the goals of the GC3, but too many statements lack scientific baking. Even where there are citations to support a forest-related statement or recommendation, too often the citation does not actually provide support. If this were a graduate student's literature review or research paper, it would have been torn apart and dismissed by their advisor before ever making it to the peer reviewed process. It is impossible to read

this draft report and not feel like Group members are promoting their personal agendas, biases, and perspectives. Is this really how you're taking the responsibility of submitting recommendations to the Governor on behalf of the State of Connecticut?

Let it be said that "proforestation", a term defined by a Science and Technology co-chair, has no scientific backing. It is simply a perspective in its infancy. Its inclusion in the Science and Technology Group's and/or the Forests Subgroup's report should either be avoided or properly identified as an opinion and not falsely labeled as science or fact.

You have the responsibility to share and promote the best available science covering an array of topics. You have not done that. Your draft report would be improved and legitimized if you removed forestry related content from it and if you used legitimate science (not only in being scientific, but also in actually addressing the cited point) to support your recommendations.

I appreciate your consideration, and am happy to discuss these matters, or even provide some viable scientific references at your request.

Sincerely,

Andrea Urbano, M.S.

Woodbridge, CT
Connecticut Certified Forest Practitioner #001262
Aurbano89@gmail.com

UCONN
UNIVERSITY OF CONNECTICUT

**Alec Shub <alec.shub@uconn.edu>**

# FW: Governor?s Council on Climate Change: No new fracked gas plant; We want 100% clean energy

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Mon, Oct 19, 2020 at 6:15 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: Bruce Dasinger (bdasinger44@gmail.com) Sent You a Personal Message <automail@knowwho.com>
Sent: Friday, October 16, 2020 6:13 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: Governor?s Council on Climate Change: No new fracked gas plant; We want 100% clean energy

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Governor's Council on Climate Change,

We owe our progeny, who will inherit the world we leave them, a place where they can survive and enjoy their lives. We are well on our way to leaving them an uninhabitable planet, and and the clock is counting down to the point of no return.

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
- Stop the 650 megawatt Killingly gas plant from being built and halt future fossil fuel power plants from our state.
- Set a goal of 100% clean and renewable zero-emission electricity, transportation and buildings that centers equity and creates good jobs.

Thank you for the opportunity to comment.

Sincerely,

Bruce Dasinger
12 Stone Cliff Drive
Niantic, CT 06357
bdasinger44@gmail.com

(860) 739-2693

This message was sent by KnowWho, as a service provider, on behalf of an individual associated with Sierra Club. If you need more information, please contact Lillian Miller at Sierra Club at core.help@sierraclub.org or (415) 977-5500.

CONNECTICUT LEAGUE OF CONSERVATION VOTERS

Connecticut Department of Energy & Environmental Protection
Office of Climate Planning
79 Elm Street
Hartford, CT 06106-5127
Via email: deep.climatechange@ct.gov

Thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) Working Group Draft Reports.

In September 2019, Governor Lamont issued Executive Order #3 to bring Connecticut to a 100% zero-carbon electric grid by 2040 and reinstate the GC3. At that time, CTLCV strongly recommended that the GC3 be composed of a diverse group of stakeholders, including, but not limited to: local and statewide lawmakers, community leaders, climate scientists, economists, labor representatives, and business leaders. In particular, the GC3 should include representatives from marginalized and disenfranchised communities. We are happy to see that the GC3 was able to incorporate voices from various backgrounds.

Please consider CTLCV's specific comments and recommendations below for the report as a whole and the various working groups.

1. Connecticut needs to set a goal of **100% zero-emission** electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW **Killingly fossil fuel** power plant. Connecticut does not need the energy that this plant would produce. Investing in sustainable and carbon-neutral energy resources will yield both profit and lasting energy resources for far more decades than fracking can provide, and will aid Connecticut in the fight against climate change, inequity, and pollution.
3. Connecticut needs to reform or replace the **ISO-New England** market system. At this time, the grid is not taking into account the clean energy goals that we have worked so hard as a State to progress. If we are going to have a 100% zero-carbon electric grid by 2040, our outdated grid operator needs to share in that goal.
4. **Prioritize equity** in all aspects of the GC3 working groups reports.

5. Action on climate change can start now. We should not wait on final reports to act if the **science is already sound.**

We have reviewed and considered all of the reports and strongly support many of the recommendations. Based on our review, we would like to highlight specific recommendations that are particularly important.

## Working and Natural Lands

While we were thrilled to see the focus on working and natural lands in mitigating climate change, we realize there is some overlap between the subcommittees and some confusion as to what each subcommittee was responsible for. Going forward, we would like to see a crossover group for the entire ecosystem to create comprehensive legislation that takes into account recommendations from each subcommittee. Additionally, clarification for which subcommittee Long Island Sound falls under would be beneficial.

### Forests

CTLCV supports the emphasis on trees and forests in mitigating climate change impacts and in sequestering carbon. In order to protect and encourage forest growth, we are recommending major policy initiatives are pushed forward.

1. Establish a "No Net Loss of Forests" policy as in Maryland to increase forest cover and canopy where needed, avoid losses or conversion of forest, protect and steward resilient forests, mitigate "permitted" loss of forests/trees, and monitor for forests/tree resiliency.
2. It is critical to invest in planting and stewarding trees (as well as open spaces/parks, and community gardens) in our major cities to reduce "heat islands", improve air quality, create job opportunities for BIPOC youth, and benefit the health of our most vulnerable communities who are already being disproportionately impacted by climate change and COVID-19.
3. It will take funding to make a difference on climate change and we must be willing to invest in natural climate solutions that work and are generally less expensive than most other infrastructure concepts.
4. Biomass must not be considered a Class 1 renewable energy.

### Wetlands

Wetlands are an integral part of Connecticut's climate change mitigation strategy. As natural carbon sinks, wetlands need to be protected and nurtured to provide adequate carbon sequestration measures. Additionally, wetlands provide barriers to increased storm surges and habitat to critical species to preserve biodiversity and act as indicators for healthy waters. In order to protect these critical ecosystems, there are significant policy

recommendations that we would like to see pushed forward in the 2021 legislative session.

1. Protect and enhance the ecosystem services value of wetlands using sound science and adaptive management strategies. Protecting our coastlines and tidal wetlands is a wise and data-based solution if we want to protect ecosystem services. Inland and tidal wetlands provide all the ecosystem services, from food and freshwater to carbon sequestration, to water filtration, habitat, and recreation.
2. Encourage and expand research on conservation efforts. Provide funding to revise the FIRM maps to include updated precipitation data and alterations in the landscape from changing flood zones.
3. Revise the Tidal Wetland Act and the Inland Wetland and Tidal Courses Act to include language stating that wetlands provide flood protection and carbon sequestration. Review the language of the Tidal Wetland Act to include preservation of near-shore soils known as subaqueous soil.
4. Review the impacts on affordable housing in legislation that incentivizes development in flood hazard areas, essentially bringing low income families to the hazard. We need to ensure that our policies moving forward are equitable as to not further burden already overburdened communities.
5. Reevaluate CT's Green Plan and open space grant programs to prioritize broader acquisition of land and conservation easements for ecosystem services most at risk from climate change.
6. Ensure that the GC3 wetlands policy recommendations are aligned with the State Water Plan goals.

## Agriculture and Soils

While agriculture is a major player in soil health, we need to understand that soils are all around us. Soil health is not just a factor in the agriculture industry, but also relates to infrastructure of impervious surfaces, sewers, wetland soil, and more. Future policies should reflect the big picture of soil health and not only focus on soils relating to agricultural land. There is limited information listed in Connecticut statutes specifically about soil health. Healthy soils resolve a multitude of wrongdoings including water quality and carbon sequestration. Below are policy recommendations referring specifically to soils.

1. Connecticut needs specific legislation to change the definition of "Soil Health".
2. Change the Soil and Water Conservation Act legislation to include Soil Health, not just erosion.

3. A statewide fund needs to be developed to encourage farmers to do Best Management Practices when it comes to soil health and local foods.
4. Encourage programs to invest in composting and anaerobic digestion to synthesize methane and invest in local economies selling organic fertilizers.

### Rivers

Rivers are a key factor in combating climate change, and Connecticut's rivers have the potential to provide strong climate change mitigation. Healthy waters lead to healthy communities and a healthy economy. However, the changing precipitation patterns, combined with warmer temperatures put our waters at a significant risk to adverse climate change impacts. Although some progress has been made, we must continue to take action to ensure the quality and quantity of our rivers and streams to meet our future resource needs. Below are some specific policy recommendations going forward:

1. Strong water conservation policies are critical to mitigate the impacts of drought due to climate change.
2. Employ and mainstream nature-based climate solutions that are inexpensive and based on science-driven processes.
3. Protect high-quality upland tributaries to keep healthy temperatures in our rivers and streams.
4. Invest in stormwater management programs to decrease pollution from runoff.
5. Re-establish connectivity of rivers. Invest in culverts based on increased precipitation to allow streams to continue to flow during storm events.
6. There is a need to invest in wastewater infrastructure to maintain the level of investments in the Clean Water Fund and take the burden off of ratepayers.
7. Develop more comprehensive programs for invasive species management.

## Progress on Mitigation Strategies

Connecticut has made substantial progress on employing strategies to mitigate climate change impacts. We support the focus that the Mitigation group put on equity and environmental justice. CTLCV focused specifically on the recommendations of four subcommittees, including Buildings, Electricity, Transportation, and Cross-Sector:

### Cross-Sector

There are overlapping strategies we must use to fully transition from a fossil fuel economy to a green economy.

1. Strengthen the alignment between State decision making and GHG reduction goals.
2. Implement a price on carbon in the transportation and buildings sectors.

## Buildings

The building sector is one of the largest contributors to GHG emissions and rising temperatures due to the creation of "heat islands" in cities. CTLCV would like to emphasize the following recommendations to improve sustainability in the building sector.

1. Allocate funds to remediate unhealthy homes which would then allow for Energy Efficiency upgrades. This is especially important in low-income and environmental justice communities.
2. Develop a strategic plan for transitioning from fossil fuels to renewable thermal technology, including electric heat pumps. Biofuels/Biomass should not be considered renewable thermal technology.
3. Expand consumer education and awareness to increase public demand for zero and low carbon technologies. In order to expand use of renewable energy technology, consumers need to first understand what the technology is.
4. Set clear end-dates for the expansion and new infrastructure of fossil fuels.
5. Create energy saving building codes including stretch codes, carbon codes, and all-electric options. Improving our building codes and standards will ensure that new buildings are sustainable, cost-effective in the long-term, and equitable for both the health and vitality of people and the planet.

## Electricity

Connecticut will continue to become more and more reliant on our electric grid as we transition away from fossil fuels. Therefore, we need to have enough energy, storage and grid technology to support our growing demand. CTLCV recommends:

1. Establish clear targets for offshore wind procurement to foster its significant potential to help meet zero carbon goals and work regionally with our New England neighbors to increase purchasing power.
2. Plan specific and achievable pathways for students in technical high schools, and for people living in areas where new electric infrastructure will be built, that lead to good paying "green" jobs.

3. Commit at least 50 MW of demand reduction per year to the ISO-New England market and ensure that ratepayers do not have to repay that deficit in the next billing cycle.

### Transportation

The transportation sector is the leading cause of GHG emissions in our State, so it is the first place we must look to combat our climate crisis. We support many of the recommendations in the Transportation report, and recommend these additions:

1. Establish Statewide goals for zero-emission medium and heavy-duty trucks and for school transportation.
2. All proceeds from the State's GHG emissions-reduction vehicle registration fee should be allocated to CHEAPR, and additional incentives for the low income market.
3. Sign onto the Transportation and Climate Initiative to reduce carbon emissions in the transportation sector and allow for complementary policies to promote public transportation, active transportation, electric vehicles and more.

## Infrastructure and Land Use Adaptation

Many of the core recommendations for the Infrastructure and Land Use working group have been addressed in other sections of the GC3 reports. Our main recommendation for this report is to improve the ability of efficiency programs to overcome health, safety, and legal barriers (also stated in the Mitigation report and Buildings subcommittee). This will address equity issues while also aligning the State's climate goals:

1. Establish an Energy Efficiency and Healthy Homes (EEHH) equity fund.
2. Siting decision for clean energy infrastructure should Incentivize and prioritize redevelopment of previously used sites within established neighborhoods, i.e. Brownfields, abandoned lots, and not on prime forest or farmland.
3. Require that all utilities consider all projected climate change impacts in their planning and ensure they are consistent with state climate plan goals.

## Public Health and Safety

As climate impacts bear down on Connecticut and are only projected to get worse, unless we seriously start to alter our behavior, we need to plan for the public health and safety of our residents. CTLCV supports all the recommendations in the Public Health and Safety report, and would like to draw particular attention to the below recommendations:

1. Enact policies to protect low-income residents and renters, particularly those in government-supported housing, from indoor heat exposure.

2. Enact policies to protect residents in vulnerable communities located in flood plains.
3. An energy audit program needs to be developed for the water industry to reduce consumption, conserve resources, increase energy efficiency, and reduce greenhouse gas emissions.
4. Include a resiliency and a climate assessment for all new legislation to show how each policy will impact climate change and align with our climate goals.

## Financing Adaptation and Resilience

Many of the goals of the Financing Adaptation and Resilience working group are addressed in other reports. A main goal for this group would be to:

1. Establish a carbon fee to provide a revenue source for resilience and adaptation funding. Funding for climate mitigation and adaptation should be provided by the root cause of climate issues.
2. Approve legislation to allow individual municipalities Statewide to form stormwater utilities to fund resilient infrastructure.

## Science and Technology

In order to adequately and rapidly mitigate climate change, we need to rely on and develop sound science. Connecticut needs to employ the best science and technology practices to preserve our wildlife and ecosystems, clean air and water, and protect public health. The below suggestions are examples of "multi-solving", programs that would help mitigate climate change while providing benefits to public health, recreation, transportation, wildlife health and more. CTLCV supports the recommendations of the Science and Technology working group, with special attention to the following:

1. Remove biomass facilities from the list of Class 1 Renewable Energy Sources in the CT Renewable Portfolio Standards.
2. Prioritize "proforestation" and natural area preserves on public land and ensure that old growth forests are protected in order to protect native species and maximize carbon accumulation, fight climate change, and protect public health.
3. Protect Keystone Species on land and water as an essential part of ecosystem integrity.
4. Ensure that all communities, especially low income and BIPOC, have access to clean and safe nature preserves.
5. Invest in reliable and safe people-powered (walking and biking) and public transportation.
6. Develop local systems for resource and food distribution to reduce fossil fuel usage and create a plan to deal with unknown and unpredictable disruptions.

7. Invest in research and landscape level planning to prioritize climate change mitigation programs in areas that are affected by multiple environmental issues (i.e. flooding, heat island effect).
8. Prioritize depaving of impervious surfaces to protect water quality of lakes, rivers and streams.

## Equity and Environmental Justice

Connecticut has made a lot of progress on equity and environmental justice in recent years. CTLCV supports the recommendations of the Equity and Environmental Justice working group, with particular consideration made to the following policies:

1. Support the recommendations of the Public Participation subcommittee.
2. Development of a statewide environmental justice mapping tool that provides a visual illustration of vulnerable communities across Connecticut.
3. Develop stricter regulations on permits for installation and construction.

As stated, we encourage DEEP and the Governor's Office to take all the recommendations of the GC3 into consideration when planning for climate change mitigation and adaptation. Thank you for the opportunity to submit comments on the draft working group reports.

Sincerely,

**Emily Alexander**
Climate Policy Advocate
Connecticut League of Conservation Voters

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860.236.5442
emily.alexander@ctlcv.org
www.ctlcv.org

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Mon, Oct 19, 2020 at 6:12 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: emilyja426@everyactioncustom.com <emilyja426@everyactioncustom.com>
Sent: Friday, October 16, 2020 3:42 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Emily Alexander
533 Farmington Ave  Hartford, CT 06105-3048 emilyja426@gmail.com

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Paper on Hartford's methane leaks

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Mon, Oct 19, 2020 at 6:12 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Ridge, Gale <Gale.Ridge@ct.gov>
**Sent:** Friday, October 16, 2020 3:14 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Paper on Hartford's methane leaks

To whom it may concern,

Dr. Kimberly Stoner provided me with your email, so that I might alert you a recently published paper I co-authored. Please find attached a scanned copy (it can also be read on open access). It's common knowledge in certain circles that there is a serious problem with leaking natural gas pipes and infrastructure here in New England, because of age and a general lack of maintenance. We wanted to see how serious this was, since there was evidence that PURA was depending on corporate self-reporting resulting in an underestimation of gas leaks. Thus during the winter of 2016 we conducted a survey of over 225 road miles in Hartford and discovered 716 distinct leaks equal to the daily gas use of 214 homes/day.

To compensate for this loss, in 2014 a law was passed that included surreptitious language which permitted gas companies to sequester compensatory charges into customers' bills without them being aware of the hidden fees. (See below yellow highlight). This de-incentivized the need to make repairs if leaks were considered too small. We found numerous small unreported leaks that produced a considerable cumulative loss of gas.

I think the paper speaks for itself. I would be grateful if you might consider it for submission as evidence in your GC3 work and deliberations.

***AN ACT CONCERNING LOST AND UNACCOUNTED FOR GAS.***

Be it enacted by the Senate and House of Representatives in General Assembly convened:

Section 1. (NEW) (*Effective from passage*) (a) Not later than July 1, 2015, and annually thereafter, the Public Utilities Regulatory Authority shall submit a report, in accordance with the provisions of section 11-4a of the general statutes, to the joint standing committee of the General Assembly having cognizance of matters relating to energy. Such report shall include (1) a description of the reasons for each gas company's percentage of lost and unaccounted for gas, (2) recommendations for each gas company's gas leak reduction strategy, (3) a description of each gas company's current gas leak monitoring system program, and (4) the number of leaks and causes of such leaks throughout the entire gas distribution system in the state and any other information the authority determines to be relevant.

(b) The authority shall initiate a docket to investigate the lost and unaccounted for gas of a gas company if the percentage of lost and unaccounted for gas of such gas company in any calendar year exceeds a total of three per cent. In such docket, a gas company shall report (1) leak detection and monitoring procedures, (2) emissions reduction strategies in addition to leak repair, and (3) any additional requirements the authority determines to be relevant. In such docket, the authority shall establish a cost mechanism to comply with long-term emissions reductions required by section 22a-200a of the general statutes and to incentivize a gas company to (A) reduce lost and unaccounted for gas, including the number of leaks throughout the entire gas distribution system in the state, (B) replace aging infrastructure, and (C) comply with any additional requirements the authority determines to be relevant. Such cost mechanism may be incorporated in the purchased gas adjustment clause pursuant to section 16-19b of the general statutes. Approved June 6, 2014

Sincerely yours,

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Research article

# An enhanced procedure for urban mobile methane leak detection

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ABSTRACT

Leaked methane from natural gas distribution pipelines is a significant human and environmental health problem in urban areas. To assess this risk, urban mobile methane leak surveys were conducted, using innovative methodology, on the streets of Hartford, Danbury, and New London, Connecticut, in March 2019. The Hartford survey was done to determine if results from a 2016 survey (Keyes et al., 2019) were persistent, and surveys in additional towns were done to determine if similar findings could be made using an identical approach. Results show that Hartford continues to be problematic, with approximately 3.4 leaks per road mile observed in 2016 and 4.3 leaks per mile estimated in 2019, similar to that previously found in Boston, Massachusetts (Phillips et al., 2013). A preliminary estimate of methane leaks in Hartford is 0.86 metric tonnes per day (or 313 metric tonnes per year), equivalent to 42,840 cubic feet per day of natural gas, and a daily gas consumption of approximately 214 U.S. households. Moreover, the surveys and analyses done for Danbury and New London also reveal problematic leaks, particularly for Danbury with an estimated 3.6 leaks per mile. Although road miles covered in New London were more limited, the survey revealed leak-prone areas, albeit with a range of methane readings lower than those in Hartford and Danbury. Data collection methods for all studies is first reported here and are readily transferable to similar urban settings. This work demonstrates the actionable value that can be gained from data-driven evaluations of urban pipeline performance, and if supplemented with a map of leak-prone pipe geo-location, and information on pipeline operating pressures, will provide a spatial database facilitating proactive repair and replacement of leak-prone urban pipes, a considerable improvement compared to reactive mitigation of human-reported leaks. While this work pertains to the selected urban towns in the Northeast, it exemplifies issues and opportunities nationwide in the United States.

## 1. Introduction

The objective of this paper is to introduce an innovative mobile methane leak detection method and to demonstrate its use in recent urban surveys. These survey results may be used to influence applicable legislation or policy changes to improve the manner in which gas companies in Connecticut and elsewhere manage gas pipelines and how they serve ratepaying customers. Most significantly, this research can be a guide for regulators to directly mitigate the effect of methane on public health and the environment. A related goal is to highlight the relatively efficient, effective, and pro-active manner in which surveys like the ones described in this report can be done by the Public Utilities Regulatory Authority (PURA) or the Local Distribution Companies (LDCs) in Connecticut, and their counterparts in other urban areas.

Natural gas is composed of 97% methane ($CH_4$). Methane is a short-term pollutant with a half-life of seven years and has a much worse greenhouse gas impact than carbon dioxide (Intergovernmental Panel on Climate Change [IPCC], 2014). When measured over the life of the chemical, methane has as much as 100 times the climate impact of carbon dioxide. The Environmental Protection Agency (EPA) and Connecticut's Department of Energy and Environmental Protection (DEEP) both measure methane's climate harmfulness over 100 years which produces an artificially low Global Warming Potential (GWP) of 25 (Howarth, 2014). The high rate of unintentional leaks from hydraulic

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[1] Tim Keyes and Robert Ackley were paid consultants, commissioned by the Sierra Club Connecticut for this work.

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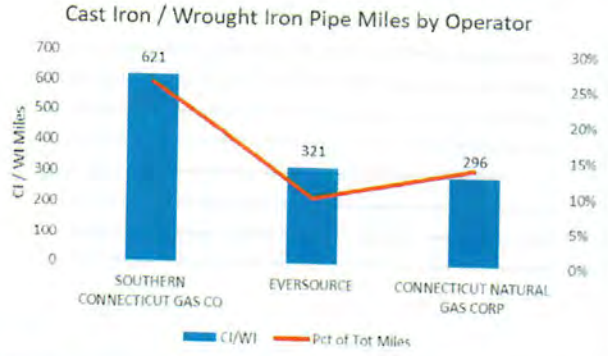


**Figure 1.** Mileage of cast iron pipe managed by Connecticut operators.

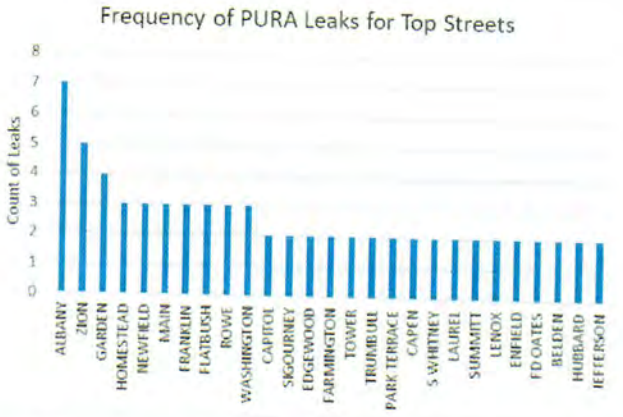


**Figure 2.** Frequency distribution by street name from leak reports recorded by PURA between October 15, 2015 and October 15, 2016, a one year, four season period. A total of 138 gas leaks reported in the city of Hartford.


**Figure 3.** Frequency distribution by street name of Leaks from this study between February 25 through March 31, 2016. A total of 716 gas leaks were recorded in the city of Hartford.

fracturing (fracking), gas pipelines, compressor stations, and other gas infrastructure, as well as the practice of intentional leaking or 'venting', contribute to methane's climate impact (Howarth, 2014). In addition to the severe climate impact, methane also kills trees, harms air quality, is an explosion hazard as has been reported in newspaper articles (Korte, 2018; Santora, 2014), and increases the risk of pediatric asthma in children living in homes that are connected to natural gas for heating and/or cooking as reported by the non-profit Home Energy Efficiency Team of Massachusetts [HEETMA] (Krasner and Jones, 2019).

While the greenhouse gas impact of methane is important, of more immediate concern for most residents is the negative public health impacts that are caused by leaking methane. Natural gas that flows through Connecticut pipelines is fracked from the Marcellus Shale in Pennsylvania and Ohio and includes other components in addition to methane. Some of these are volatile organic compounds which lead to the formation of ground level ozone smog that exacerbate asthma and emphysema,

**Table 1.** A selection of relevant recent studies.

| Year | Study | Definition of leak | Notes |
|---|---|---|---|
| 2013 | Phillips et al. | "...a unique, spatially contiguous group of [$CH_4$] observations, all values of which exceed a concentration threshold of 2.50 ppm...correspond[ing] to the 90th percentile of the distribution of data from all road miles driven, and, relative to global background, is 37% above 2011 mean mixing ratios observed at Mauna Loa..." | |
| 2014 | Jackson et al. | "...a separate, spatially contiguous set of [CH4] observations exceeding a concentration threshold of 2.50 ppm at >5-m spacing." | |
| 2015 | Gallagher et al. | "... a spatially contiguous set of [$CH_4$] observations greater than 2.5 ppm (i.e., >20% above background [$CH_4$] of 1.8–2.0 ppm of $CH_4$) with a distance threshold radius greater than 5 m from any other elevated [$CH_4$] observation." | |
| 2015 | Lamb et al. | "Specific pipeline leaks and facilities were selected randomly from Local Distribution Company leak survey data and facility lists for the targeted areas." | Leaks not defined in study; obtained elsewhere |
| 2016 | Chamberlain et al. | "...temporally discrete $CH_4$ concentration peaks that were above the 98% percentile of all measured concentrations (>1.93 ppm). Survey time series were de-trended prior to peak identification to control for fluctuations in background $CH_4$ concentration throughout the day." | |
| 2016 | Hopkins et al. | "We defined hot spots as road segments where at least one 150 m segment had a CH4 value that exceeded the 95th percentile threshold (132–360 ppb above the local background level). The spatial extent of each hot spot was defined by the number of adjacent 150 m road segments that had CH4 values above the local background level. Local background CH4 levels varied over the course of each transect due to spatial variability and diurnal changes in boundary layer height and were thus determined by visual inspection..." | |
| 2016 | Lamb et al. | "These results were accumulated in 100 × 100 m grids and averaged to produce a map of average methane enhancement for the urban area. These gridded results were filtered to remove levels greater than 500 ppb to eliminate the presence of large, identified sources." | |
| 2017 | Von Fischer et al. | "...as a set of elevated readings <160 m that was found more than once". "...elevated" $CH_4$ concentrations as >10% or >1SD above background, whichever is greater." | |
| 2019 | Weller et al. | "...we define an elevated reading as any reading having $CH_4$ levels greater than or equal to 110% of the baseline value. Because the baseline value will vary in time and space, so will the threshold for elevated $CH_4$ levels, but at a typical background of 2 ppm, the threshold is 2.2 ppm" | Includes much additional algorithm detail not included here. |
| 2020 | This study | Uses modified Thompson's Tau method to identify outlier measurements relative to each local ambient level, dynamically determined. | |

impairing lung function and other pre-existing respiratory problems: benzene, which is linked to cancer, respiratory illnesses, and birth defects; ethylbenzene, linked to neurological and blood disorders; and formaldehyde, which is linked to certain cancers and respiratory illnesses (Pun et al., 2015; Shi et al., 2016). Fracking generates at least two thirds of natural gas distributed across the United States (U.S. Energy Information Administration, 2016a, b).

The volume of natural gas leaked in cities and the concomitant climate and economic impacts can be substantial. A recent study in Boston (McKain et al., 2015) estimated a gas loss rate from greater Boston at 2.7% of the total consumed natural gas, which resulted in an annual value loss of approximately $90 million, partially borne by ratepayers. This represents approximately 10% of Massachusetts' greenhouse gas emissions inventory. Estimates of tree damage from gas leaks in mid-sized municipalities in Massachusetts range from hundreds of thousands to millions of dollars. Urban natural gas pipelines are mostly made up of 'distribution' pipelines operating at low pressures (below 100 pounds per square inch [psi]) compared to the high-pressure interstate transmission pipelines that deliver natural gas into high population areas and the "upstream" pipelines in production areas. In older cities such as those in the eastern U.S., leak-prone cast iron, wrought iron, or bare steel gas pipelines can be up to a century old or more. These pipes often leak at decaying joint connections (typically spaced at 12-foot intervals), or due to corrosion or mechanical disturbance caused by freezing conditions.

While an inventory of leak-prone pipes for Hartford was unavailable for this study, it is known that Connecticut has some of the highest total miles and percentage of leak-prone pipe in the U.S. (Pipeline Hazardous Materials and Safety Administration, 2015–17). In general, independent research using precise measuring devices, such as the Picarro Cavity Ring-Down Spectrometer used in this study, documents more gas leaks than are reported by state regulatory agencies (see Figure 4 below; also, Home Energy Efficiency Team (HEET), n.d., in references). Studies done in Weston, Acton, and Fitchburg, Massachusetts, in 2019, 2017, and 2014, respectively by the authors (Gas Safety, Inc.) illustrate this point. In Weston, 292 leaks were found, compared with 117 reported; in Acton, 234 vs. 115; in Fitchburg, 177 vs. 42. Data reported to regulatory agencies are available via FOIA request, and are tracked at the HEET site (HEET, n.d.). Gas Safety data are available upon request to the authors.

There are three investor-owned natural gas companies (LDCs) in Connecticut serving urban and suburban communities. These are Connecticut Natural Gas (CNG; cngcorp.com), Southern Connecticut Gas (SCG; www.soconngas.com), both owned by UI/Iberdola, and Eversource/Yankee Gas Company (ES; www.eversource.com). Gas service in Hartford is supplied by CNG, the smallest of the three main gas delivery companies in terms of miles of pipeline mains (with 296 miles of leak-prone cast iron and wrought iron mains in 2017 (14% of their total miles), according to the Pipeline Hazardous Materials Safety Administration (PHMSA, 2015–17)). Hartford is the largest city within the CNG

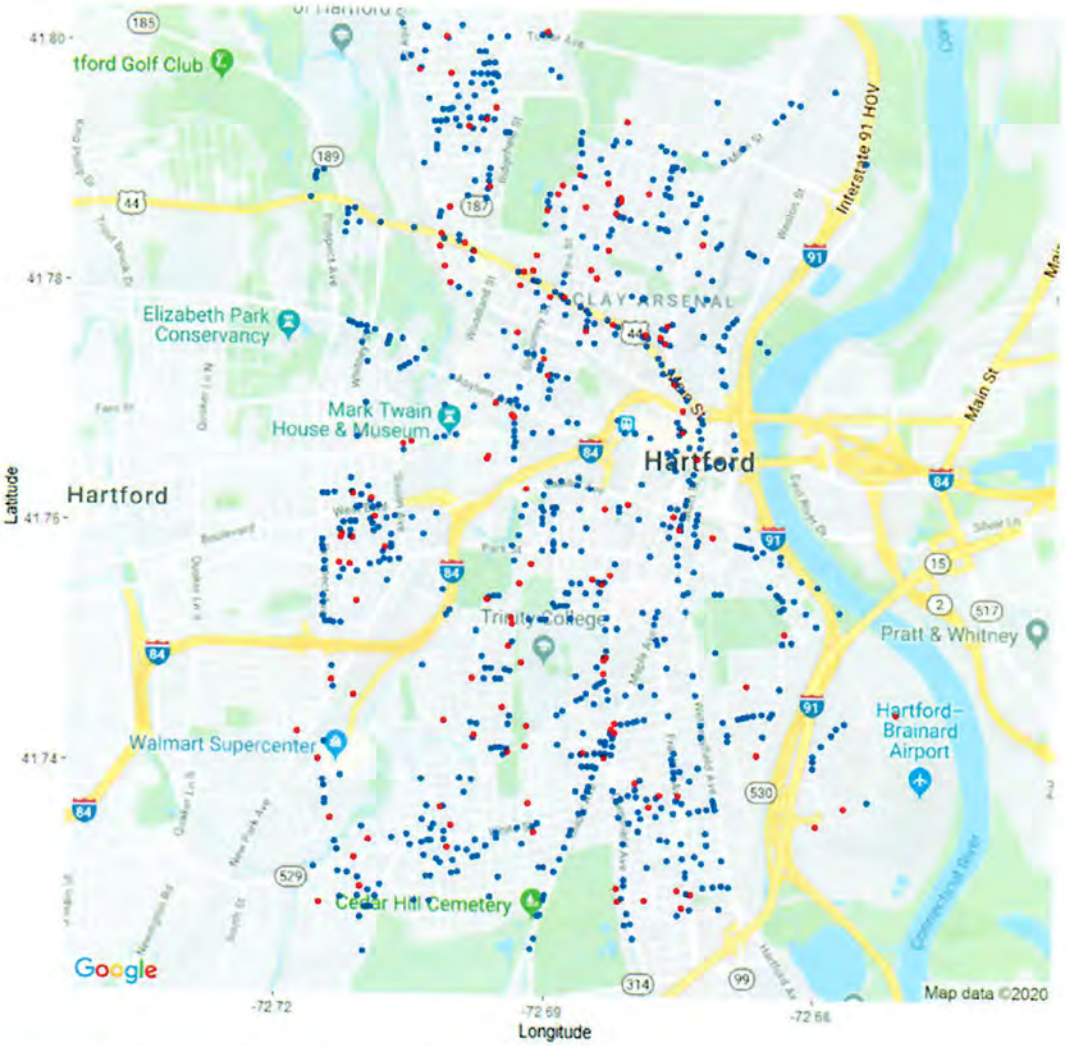


**Figure 4.** Locations of methane leaks found in Hartford; data plotted in blue (716 leaks) gathered in this study February 25 through March 31, 2016, and in red by PURA (138 leaks of Grade 1 and 2) October 15, 2015–October 15, 2016. Details for Grade 3 leaks not available to authors.

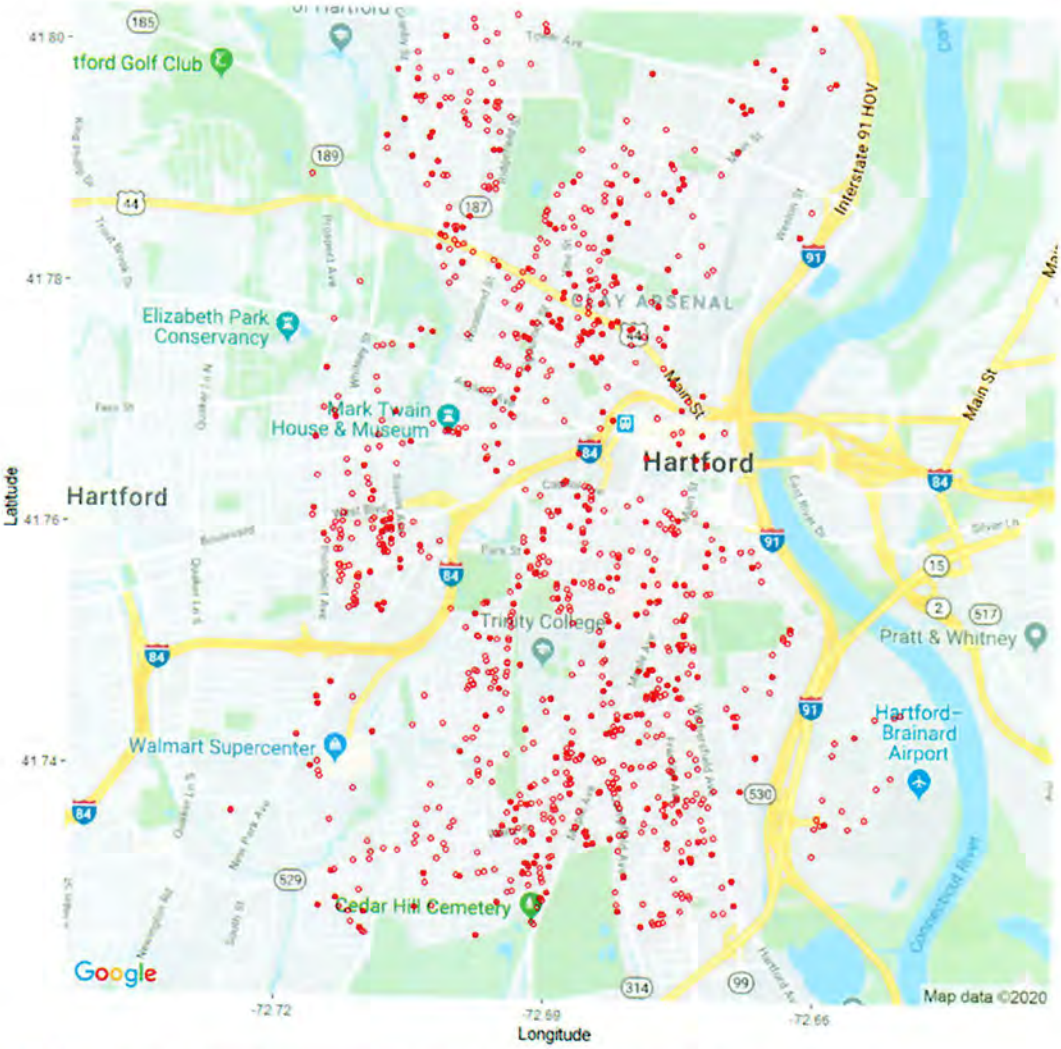


**Figure 5.** Locations of PURA Methane Leaks Found in Hartford, 2011–2016 (1,069 leaks, 321 of Grade 1 and 748 of Grade 2; Grade 1 leaks are red filled circles, Grade 2 are not filled). Details for Grade 3 leaks not available to authors.

service area. Gas service in Danbury and New London is supplied by ES. See Figure 1.

There were 225.45 road miles in Hartford as of December 31, 2014 (Connecticut Department of Transportation, 2014). Strictly speaking, this study detected $CH_4$ leaks as a broader category than natural gas leaks. Methane can originate from sources other than natural gas pipelines, including broken sewer mains, landfills, and wetlands. Prior work in Boston (Phillips et al., 2013) showed that the vast majority of leaks detected from under streets and sidewalks bore a distinct chemical signature of natural gas methane. Moreover, the spatial signature of wetland and landfill leaks is distinctly different from that of pipeline leaks. Pipe leaks are recognizable as abrupt and highly localized spikes in methane concentration, while wetland and landfill methane emissions are more diffuse gradual deviations from a baseline methane concentration. Emissions of $CH_4$ from sewer systems indicate a "non-flowing" or "dead spot" in the system and are typically rare occurrences, but there is no guarantee each leak indication detected in this study was from a methane pipe. While confirming that each leak is from a methane pipe is beyond the scope of this study, the leak indications found were too numerous to have significant representation from sewer pipelines, wetlands or landfills.

Surveys were conducted mid-February through late March 2016 in Hartford, and again in mid-late March in 2019 in Hartford, Danbury, and New London, CT, a timing that suppressed alternative methane emission signals from possible wetland, landfill or other subsurface sources, because of cold temperatures. Danbury and New London were selected for surveys owing to a similar aging infrastructure, and in order to test the hypothesis that similar leak-prone pipeline data would be observed. The 2016 survey in Hartford was nearly a complete census of all 225 road miles in the town (Connecticut Department of Transportation, 2014), whereas the 2019 surveys done in Danbury and New London were samples of road miles in each town, targeting areas in which pipelines are most likely to be present, based on the judgment of the field team. As a result, comparing results from Hartford across time requires recognition that the 2019 survey was a smaller sensor sample (not a census of road miles). Additionally, for comparison, data collected from the survey was

**Table 2.** 2016 Hartford survey results.

| Survey | Measurements | Road Miles | Leaks | Leaks/Mile | Min $CH_4$ (ppm) | Max $CH_4$ (ppm) |
|---|---|---|---|---|---|---|
| Hartford, 2016 | 140,602 | 225 | 766 | 3.4 | 1.93 | 9.67 |

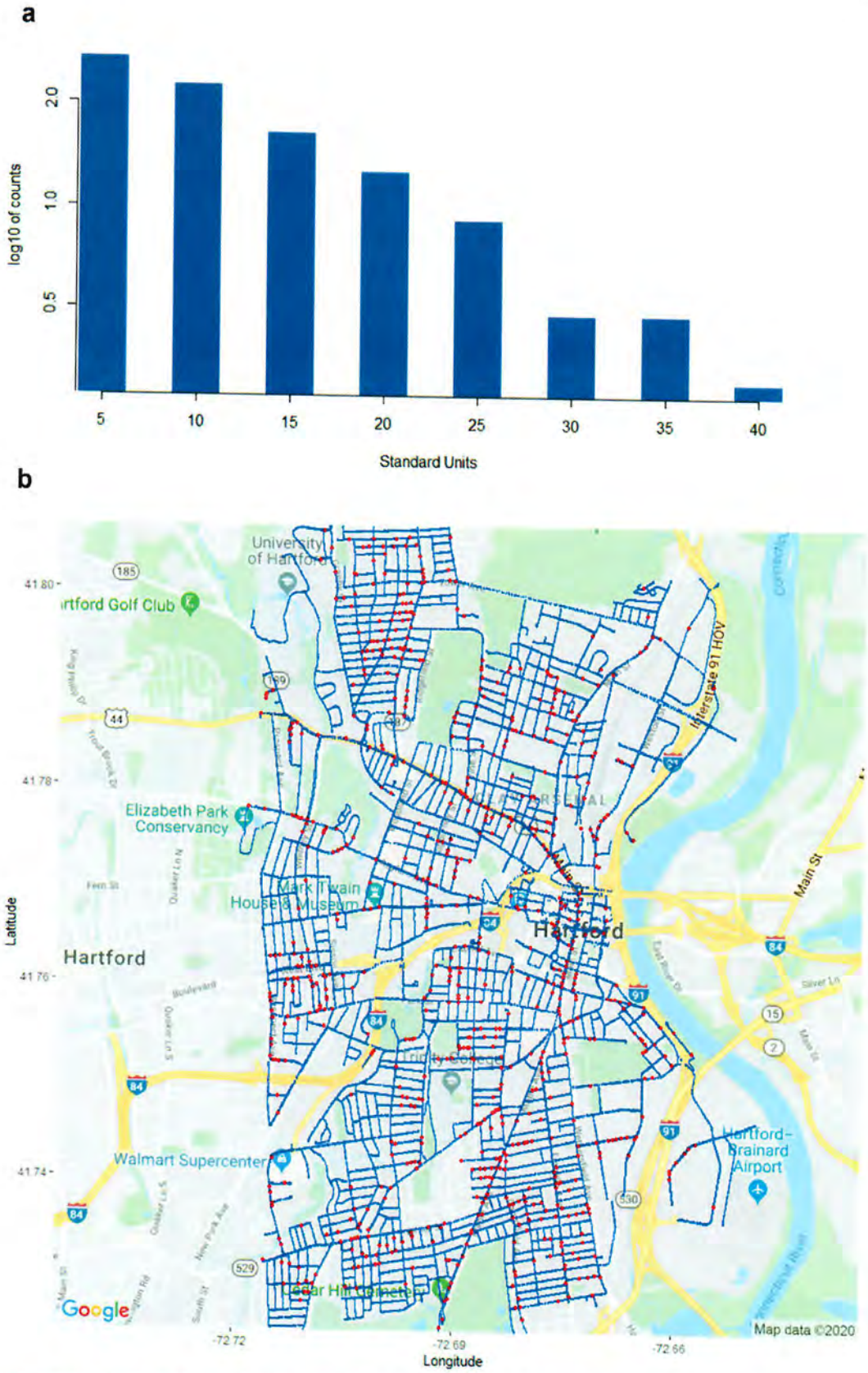


**Figure 6.** a: (log10) Histogram of z-scores for Predicted Leaks in Hartford, 2016. b: Updated 2016 Hartford Survey Results Map (blue = measurement, red = leak).

**Table 3.** 2019 Hartford survey results.

| Survey | Measurements | Road Miles | Leaks | Leaks/Mile | Min $CH_4$ (ppm) | Max $CH_4$ (ppm) |
|---|---|---|---|---|---|---|
| Hartford, 2019 | 62,546 | 100 | 425 | 4.3 | 1.97 | 10.99 |

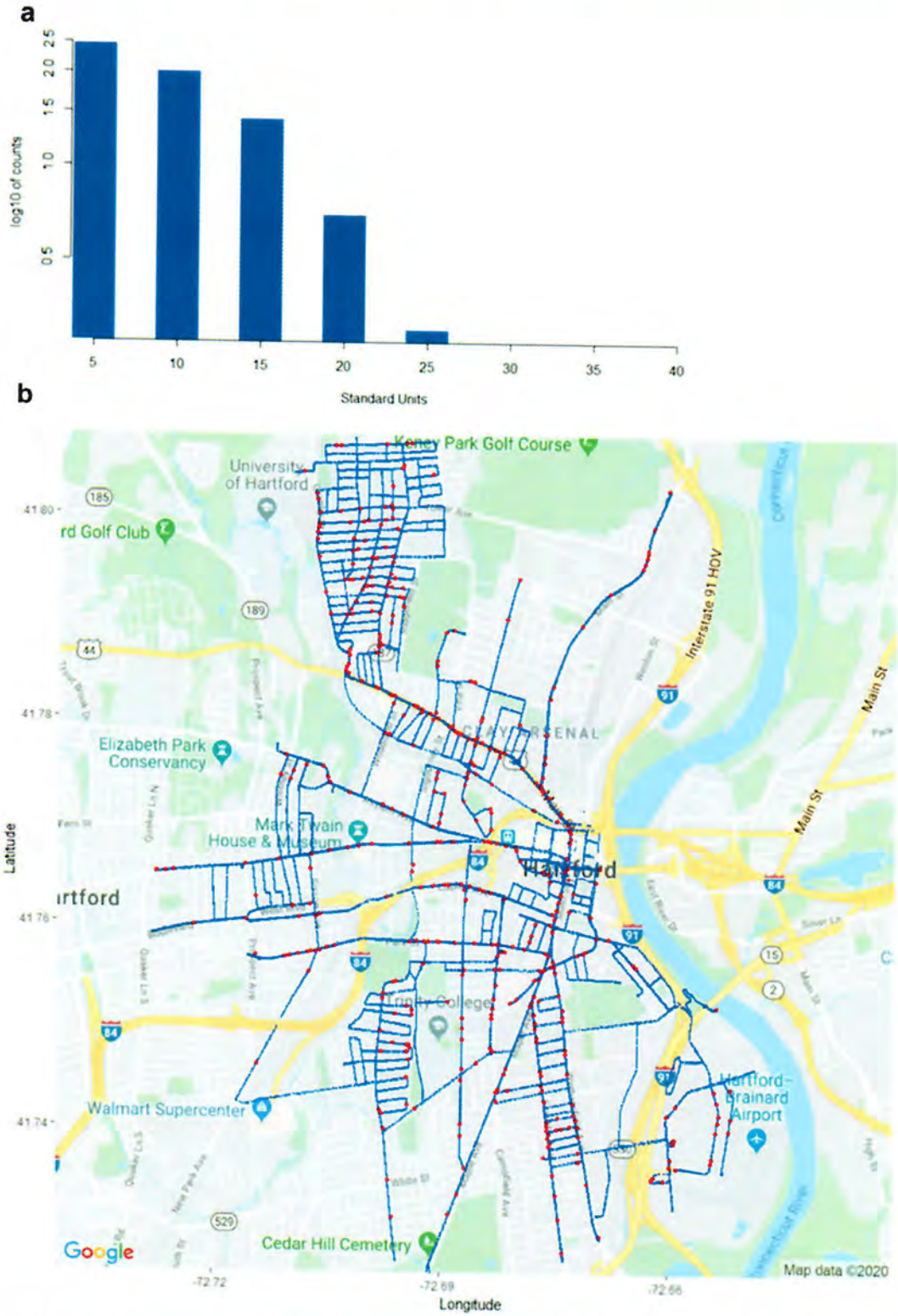


**Figure 7.** a: (log10) Histogram of z-scores for Predicted Leaks in Hartford, 2019. b: 2019 Hartford Survey Results Map (blue = measurement, red = leak).

Table 4. 2019 Danbury survey results.

| Survey | Measurements | Road Miles | Leaks | Leaks/Mile | Min $CH_4$ (ppm) | Max $CH_4$ (ppm) |
|---|---|---|---|---|---|---|
| Danbury, 2019 | 17,120 | 27.4 | 99 | 3.6 | 1.99 | 5.15 |

placed precisely between the first and last dates of a PURA one-year reporting period (October 15, 2015–October 15, 2016).

## 2. Materials and methods

The same mobile Picarro G2301 Cavity Ring-Down Spectrometer (Picarro, Inc., Santa Clara, CA; http://www.picarro.com/) was used in all surveys (2016 and 2019), installed in a vehicle equipped with a geographic positioning system (GPS), and driven on the public roads in each town. Focus on the 2019 Hartford survey was on main roadway arteries and problematic areas based on 2016 conclusions. A filtered inlet tube was placed outside the passenger side of the vehicle. The analyzer was periodically tested with 0 and 5 ppm $CH_4$ test gas (Spec Air Specialty Gases, Auburn, ME; www.mainespecialtygases.com/; reported precision ±10%) throughout the 2016 survey.

As roadways in the town being surveyed are driven, the system records parts per million (ppm) $CH_4$ concentration each second, along with latitude-longitude GPS coordinates. The system operator will typically start and stop the recording of data into individual files representing survey micro-areas likely to have similar ambient conditions, and therefore each town survey results in many individual files of $CH_4$ readings by geo-position. For example, the 2016 survey in Hartford produced 65 data files.

To distinguish discrete leaks from the spatially continuous raw methane concentration data, a modified Tau approach (Olewuezi et al., 2015) was used to perform outlier detection on the raw spatial methane concentration data. This method is a statistical approach to support deciding whether to keep or discard suspected outliers in a population sample, in this case an individual $CH_4$ system file representing a micro-area within the town being surveyed. A threshold methane level that meets the outlier category, indicating a leak, is calculated by the data file's $CH_4$ sample size, sample average, sample standard deviation, and desired confidence level.

To avoid double-counting leaks that were driven past multiple times, a procedure was used to eliminate multiple outliers within a spatial window of 30 m radius from the highest peak methane concentration in the vicinity. A spatial window was used from as small as 5 m up to 30 m. It was found that there was relative insensitivity of the total leak count in this range, while apparent leak count decreased substantially in window sizes above 30 m. Since vehicle lane widths are generally approximately 10 m or less, the 30-meter window is large enough to prevent double-counting but small enough to avoid incorrectly combining separate observed leaks into one.

Once each town's survey was complete, the corresponding data files described above were created (.DAT and.KML) for use in subsequent analysis, the essential steps of which are outlined in the Appendix, which also contains the file control lists, software (R code) for processing the data files, and the resulting outlier files (predicted leaks).

Over the last six years a number of mobile methane leak mapping studies have been conducted (Chamberlain et al., 2016; Gallagher et al., 2015; Hopkins et al., 2016; Jackson et al., 2014; Phillips et al., 2013; etc.) All of these studies contain elements of arbitrary, or geographically idiosyncratic, spatial, temporal, or scalar concentration threshold in which continuous $CH_4$ readings are discretized into leaks as identifiable objects. Table 1 displays a selection of recent studies attempting to define discrete $CH_4$ leaks from mobile $CH_4$ mapping data.

This study also contains a spatial element which is arbitrary, but we believe advances toward a goal of standardized gas leak identification by employing a statistical data grouping method that will have broad general utility.

## 3. Results from 2016 study

In the 2016 study, a total of 716 distinct methane leaks over 225.45 road miles in Hartford were detected, resulting in a leak frequency of 3.2 leaks per road mile. This leak frequency compares to 4.3 leaks per mile previously discovered in Boston, MA (Phillips et al., 2013). Over a one-year period covering the same area (15 October, 2015 to 15 October, 2016), PURA recorded138 leaks (data provided by PURA). When the researchers who performed the 2016 study compared the number of leaks found in a period of weeks to the number reported by gas companies that are recorded and monitored by PURA over an entire year, they objectively measured approximately five times more leaks than were recorded by PURA. The difference between the number of leaks identified by pro-active, objective measurement is significantly larger than those found by incidental finding or report. LDCs are required by PURA to record any leak reported by customers or employees into their data. Any hazardous leaks (e.g., Grade 1) are repaired immediately. Leaks that represent a potential future hazard (e.g., Grade 2) are periodically monitored and scheduled for repair. Grade 3 (the lowest risk category) leaks are monitored annually, but data are not available in detail.

A preliminary estimate of the leakage rate from the leaks found during the survey was made using the leak size distribution data from a prior Boston study (Hendrick et al., 2016). Assuming leaked natural gas volume from the Hartford pipes had the same distribution found in the Boston study, with a log-normal average of 1.2 kg $CH_4$ per day, a preliminary estimate would find 0.86 metric tonnes/42,840 cubic feet of gas was lost to the atmosphere each day, resulting in 313 metric tonnes per year. Although peak methane concentrations observed from the mobile survey offered a rough indication of leak size, it is not a reliable indicator of this, because shifting wind speed and direction influences leaked gas concentrations from moment to moment. To mitigate this risk, we attempted to take measurements as close to the pipeline route as possible. What is important is to detect a deviation from the $CH_4$ baseline that indicates a fugitive emission.

The 0.86 metric tonnes of methane loss per day in Hartford compares to the estimate of 4.0 metric tonnes of methane loss per day in in Boston. Note Boston has 3.5 times more public road miles than Hartford with 790 miles (Phillips et al., 2013). The Hartford leak rate represent an equivalent daily gas consumption of approximately 214 U.S. households. While this number is a small fraction of total households in Hartford, equal to approximately 45,800 (U.S. Census Bureau, 2018), the clear benefits to air quality, tree health, and public and private property safety of repairing leaks, as well as economic benefits should add impetus to the City of Hartford to address the problem.

From data provided to PHMSA (2015–17), in 2015 Connecticut ranked sixth among U.S. states in terms of the total number of miles of leak-prone, cast iron and wrought iron gas distribution pipeline, and first in miles of cast iron and wrought iron pipe in percentage of total miles (16.9%) of distribution pipeline. By comparison, Massachusetts ranked third and fourth in these categories, respectively. From 2005–15, according to the U.S. Energy Information Administration (U.S. Energy Information Administration (EIA), 2016a, b), CNG reduced its inventory of leak-prone cast iron and wrought iron pipe by 24%, about the same as the reduction attained by ES, and at twice the rate over the same period by the largest gas utility in the state, SCG (12% reduction from 2005–15).

The data from the two sources indicate that Hartford is substantially less prone to gas leaks than Boston, and may be in better shape than cities served by SCG. This may be attributed to better efforts by CNG to repair and replace leak-prone pipe in Hartford compared to National Grid, the

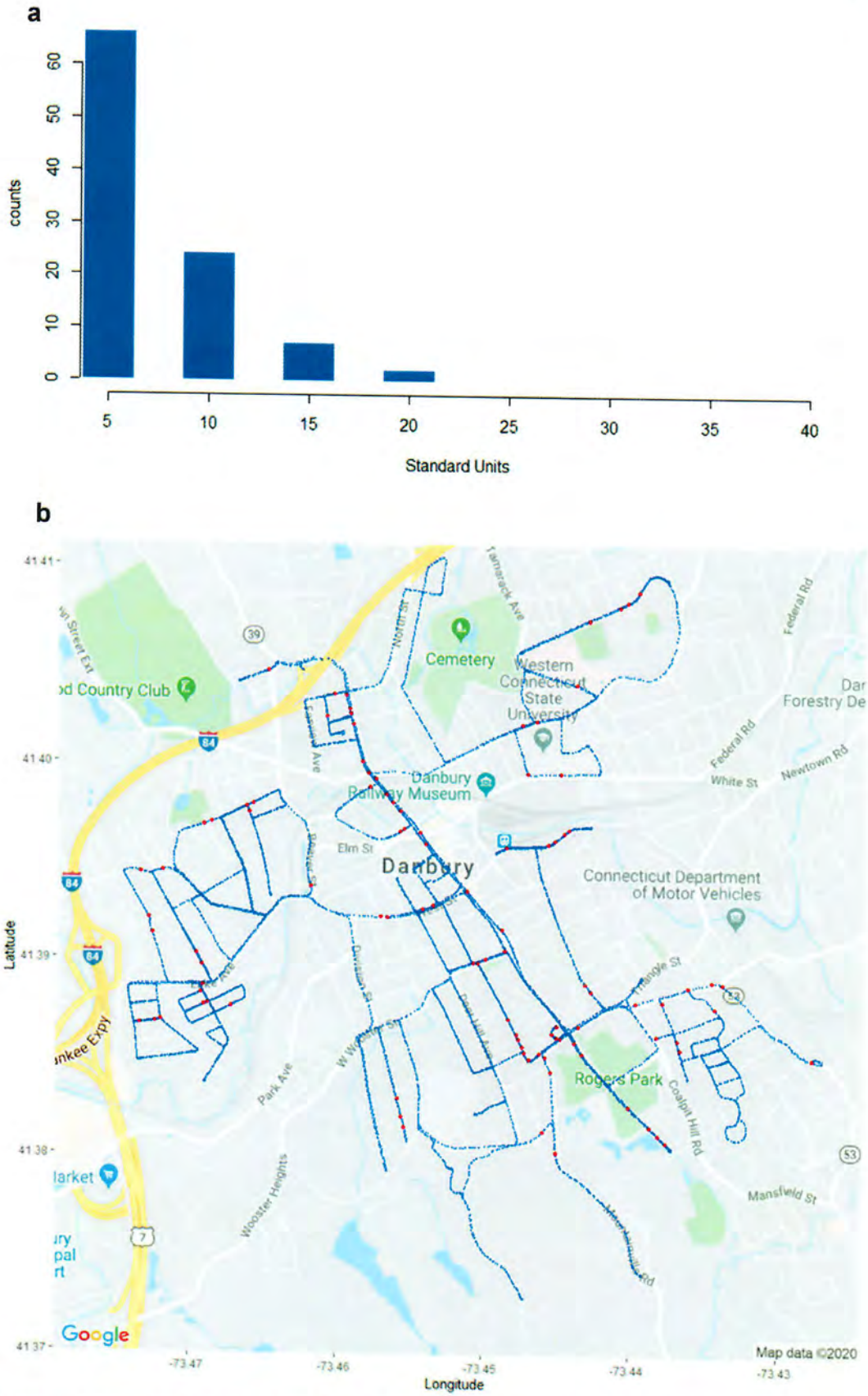


**Figure 8.** a: Histogram of z-scores for Predicted Leaks in Danbury, 2019. b: 2019 Danbury Survey Results Map (blue = measurement, red = leak).

Table 5. 2019 New London survey results.

| Survey | Measurements | Road Miles | Leaks | Leaks/Mile | Min $CH_4$ (ppm) | Max $CH_4$ (ppm) |
|---|---|---|---|---|---|---|
| New London, 2019 | 5,096 | 7.6 | 20 | 2.6 | 2.00 | 2.59 |

gas utility serving most of Boston, or SCG, which has reduced its leak-prone pipe miles by half the rate of CNG during the last decade (PHMSA, 2015–17). Figures 2 and 3 show the frequency of leaks recorded by PURA and those found in this study, by street name. PURA and the study clearly differ in terms of count and location. For example, see leaks associated with Franklin Street.

In 2014 "An Act Concerning Lost and Unaccounted for Gas" (PA 14–152) was passed by the Connecticut State legislature. This two-paragraph act permits Connecticut natural gas distribution companies to charge Connecticut ratepayers fees not clearly identified in their bills for lost unused gas. These companies are permitted to estimate the volume of "lost and unaccounted for" natural gas escaping from their equipment and charge customers to recoup the revenue. This provides a disincentive for repair and/or replacement of faulty pipes and joints in a timely manner, because it rewards the companies for leaking rather than penalizing them. As written earlier, it is estimated the State of Massachusetts currently loses approximately $90 million/year in lost value of leaked gas to the atmosphere. Though lacking reliable data, it can be inferred that the Connecticut natural gas pipeline system is also losing millions of dollars per year of gas revenue to the atmosphere.

The State of Connecticut possesses an energy policy which is committed to expanding public and corporate use of natural gas. Additionally, it supports the expansion of large capacity high pressure Interstate transmission pipelines through Connecticut from frack gas providers to consumers, international exporters, and business entities in other regions of the U.S. and Canada. Pressure is maintained using compressor stations spaced at intervals along the transmission pipelines. Evidence in the literature strongly suggests a correlation between exposure to gas infrastructure such as compressor stations and negative health outcomes. Compressor stations produce pollutants such as volatile organic compounds and particulate matter, which can be human carcinogens (Russo and Carpenter, 2019), and in a perspective to the New England Journal of Medicine, was noted to cause increased rates of respiratory illness, cardiovascular disease, and premature birth (Landrigan et al., 2020). Compressor stations release billions of tons of greenhouse gases, and the amount of methane released can vary widely, at times exceeding EPA standards (Subramanian et al., 2015; Payne et al., 2017). Compressor stations produce noise pollution (Boyle et al., 2017) which can cause stress, sleep loss and cognitive deficits (Landrigan et al., 2020). Homes with gas stoves have elevated levels of certain pollutants such as fine particulate matter and nitrogen dioxide that at times exceeded EPA standards (Singer et al., 2017), and the risk of asthma in children is higher in homes with gas stoves (Lin et al., 2013).

PURA is responsible for intrastate gas pipeline safety oversight, and is authorized by PHMSA/Office of Pipeline Safety to monitor interstate pipeline safety. PURA claims it records and monitors all leaks that are reported to it. A concern is that ES, CNG, and SCG have been reported to check their pipes remotely and electronically which may result in underestimation of gas leak events.

Given the results from the study, the rate of methane leaks appears to be much higher than PURA records show, and the gas expansion plan should be re-evaluated in light of this. The solution to the problem is legislative, and there should be a zero-leak tolerance policy maintained for natural gas pipelines, as there is for petroleum pipelines (Clean Water Act 33 U.S.C. 1251 et seq.).

To recap, PURA categorizes gas leaks into three classes or grades; Grade 1 (existing hazardous leak), Grade 2 (potential future hazardous leak), and Grade 3 (non-hazardous at the time of detection, expected to remain non-hazardous, and not required to be repaired). Grades 1 and 2 are reported to PURA in detail. Additionally, PURA does not require the volume of natural gas loss in Grades 1 and 2 to be reported. Grade 3 leaks are often numerous and may be seen as problematic, because a) they may progress into a higher Grade (i.e., are misclassified), b) the accumulated number of small leaks become equal in volume loss to fewer higher volume leaks and c), the often more widely distributed Grade 3 leaks may cause more human and environmental harm over a wider geographic area. Figures 4 and 5 plot the location of leaks found in this study, and leaks reported to PURA. Note that graphical representation of each leak is of constant size in Figure 4, as there was no direct method of comparison of the authors' study to PURA's.

From evidence provided in this study, it may be suggested that a proactive alternative to the PURA model of chiefly reactive reporting may be both economically and environmentally superior. This study identified natural gas leaks using vehicle mounted sensing equipment, while the PURA model appears to largely be dependent on voluntary human reporting. Considering the relative ease with which testing equipment can be mobilized, a proactive approach may be advantageous in terms of public health, the environment, and long-term cost-benefits to these urban areas, the state, and gas companies as well. The study illustrates a means to improve gas industry system-wide performance as well as enhance public understanding of the efficacy of mobile gas leak street-level monitoring.

## 4. Results from 2019 study

The 2019 study commenced with a revisit and update to the 2016 study done in Hartford, then expanded to other Connecticut towns. The leak-detection algorithm is identical between the two periods, with an updated approach to de-duplicating neighboring outliers, using the 30-meter spatial window, for final leak determination.

### 4.1. Town of Hartford

#### 4.1.1. Updated 2016 survey results

The revisited survey resulted in 766 leak detections found (as compared with 716 originally). Table 2 below displays key results from the Hartford, 2016 mobile methane survey. Further work on this survey was reported in Keyes et al. (2019). Figure 6a displays a histogram of standardized outliers, or "z-scores," assessing the statistical distance in standard deviation units that an outlier measurement is away from its local ambient mean level of methane. Note that counts are on the log10 scale. Clearly from this graph there are methane leaks significantly higher than ambient levels.

Figure 6b below shows a map of recorded measurements in blue, and predicted leaks in red.

#### 4.1.2. 2019 survey results

Table 3 below displays key results from the Hartford mobile methane survey done in 2019. Figure 7b illustrates that potential leaks continue to be distributed throughout the town. Given that this survey was not a census (i.e., not all 225 road miles of Hartford were driven), the Road Miles entry is a figure estimated using a ratio of the number of measurements taken in the 2019 study (62,546) to the number of measurements taken in the 2016 study (i.e., 100 miles ~62,546/140,602 × 225 miles). In our methodology, both sides of each roadway are driven, occasionally more than once, to isolate problematic areas in terms of $CH_4$ readings. We have purposively de-duplicated peak methane measurements in our algorithm, using spatial coordinates, but have yet to formulate a more precise determination of road miles driven (or the length of all roads on which measurements have been taken), which we

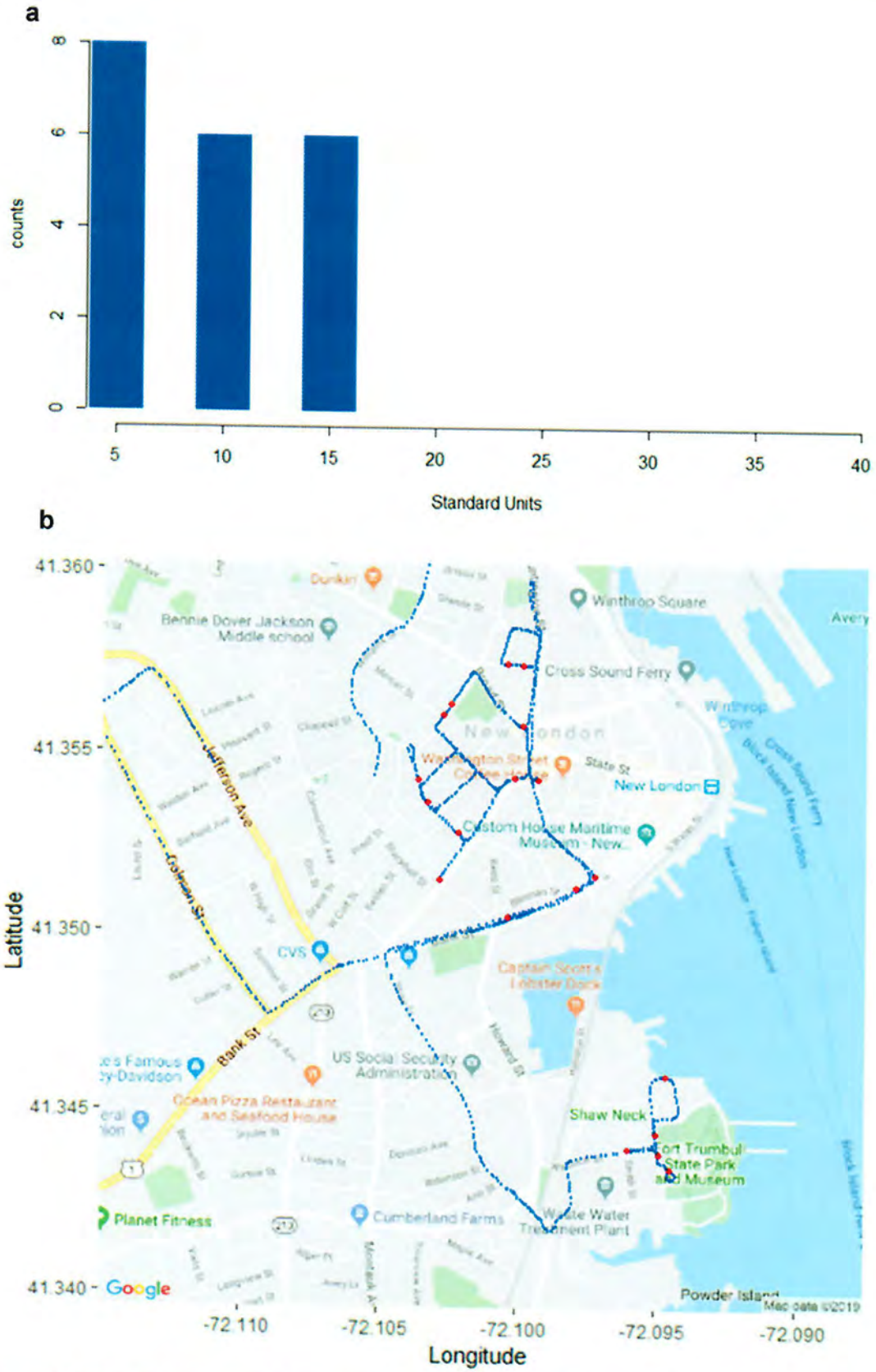


Figure 9. a: Histogram of z-scores for Predicted Leaks in New London, 2019. b: 2019 New London Survey Results Map (blue = measurement, red = leak).

leave for future surveys. Assuming reasonably that the surveying vehicle is travelling at the same speed in each survey, and each side of each road is surveyed, then a constant one-second sensor refresh rate implies that the total number of sensor readings is indicative of total miles driven. Note both the min and max leaks recorded in 2019 are above similar measurements from 2016, indicating that leak-prone pipelines in Hartford continue to be problematic, if not worsening as compared to 2016's survey. Figure 7a displays a histogram of standardized outliers. Owing to the log10 scale, singleton outliers in the 35 + range are plotted at zero.

Figure 7b below shows a map of recorded measurements in blue, and predicted leaks in red.

#### 4.1.3. Comparison of 2016 and 2019, and conclusions

Figures 6a,b and 7a,b suggest that leaks throughout the town continue to be problematic, and are persistent, for example along Albany Avenue/Main Street, Maple Avenue and the Keney Park area to the north of town, and east of the University of Hartford. Tables 2 and 3 indicate that the estimated number of leaks per road mile has increased from 3.2 per mile, to 4.3 per mile (coincidentally similar to the figure resulting from the earlier Boston study), although the latter figure is based on an estimate of road miles driven.

### 4.2. Town of Danbury

Table 4 below displays key results from the 2019 mobile methane survey for Danbury. Again, an estimate is made for the road miles driven, using the methodology explained above. Figure 8a below displays the histogram of standardized outliers, no longer on the log10 scale, and Figure 8b shows a map of recorded measurements in blue, and predicted leaks in red. This evidence shows there is a cluster of predicted leaks in the vicinity of Rogers Park, and also near the Railway Museum. The estimated leaks per mile is 3.6, consistent with the 2016 and 2019 results for Hartford.

### 4.3. Town of New London

Table 5 below displays key results from the 2019 mobile methane survey. Given the relative short distance covered (based on the estimation approach), the Leaks/Mile figure should be used with caution. Figure 9a shows the histogram of standardized outliers, not on the log10 scale. From Figure 9b, most of the leaks in New London appear to be in the central part of the town and in the Fort Trumbull area. The range of $CH_4$ ppm is relatively lower than that of Hartford and Danbury.

In conclusion, this report reflects the results of 2019 mobile methane surveys conducted in Hartford, Danbury, and New London, CT, with the Hartford results compared with a similarly executed survey done in 2016. The results support that methane leaks remain prevalent and persistent in Hartford and are also present in other Connecticut towns; Danbury has a leak propensity similar to that in Hartford, while New London has problematic leak indications, but less pronounced $CH_4$ readings than those in Hartford and Danbury.

This study outlines and demonstrates a straightforward yet innovative approach to pro-active leak management – one that could be employed by regulators or LDCs to improve system performance, or by state legislators to evaluate energy management policies.

Further advances to the analytic methodologies may include overlaying pipeline (methane and sewer) grid locations and methane pipeline operating pressures with the predicted leaks identified as a result of a survey, with the aim of further verifying (beyond the validation work done in 2016), that leaks can be assigned to specific pipeline sections, and therefore to specific remediation actions. These data may also help explain why certain roadways in surveyed towns possess a higher spatial density of leaks than others and would allow for an estimate of the likely rankings of leak rates from particular lengths of pipeline. Among the low-pressure distribution pipelines, operating pressures can vary substantially, from 0.5 psi to 60 psi or more. A pipe will leak at a rate that is proportional to the pipeline operating pressure, so leaks found in zones of higher operating pressure will be expected to leak higher volumes of natural gas. Proactive measures and management of all gas pipeline system defects, from small to large, with transparency taking into account both the frequency and severity of leaks, using established risk management procedures is recommended.

## Key findings

1. Leaked methane from natural gas distribution is a significant human and environmental health problem in urban areas.
2. A straightforward, innovative, and proactive measurement procedure is introduced and deployed in towns in the Northeast U.S. The procedure is easily transferable to any similar urban setting and is superior to current regulator practices.

## Declarations

### Author contribution statement

Tim Keyes: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Gale Ridge, Martha Klein, Nathan Phillips: Conceived and designed the experiments; Analyzed and interpreted the data; Wrote the paper.

Robert Ackley: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Wrote the paper.

Yufeng Yang: Conceived and designed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

### Funding statement

This work was supported by the Sierra Club.

### Competing interest statement

The authors declare the following conflict of interests: Tim Keyes and Robert Ackley were paid consultants, commissioned by the Sierra Club Connecticut for this work.

### Additional information

Data associated with this study has been deposited on Google Drive at the following locations: https://drive.google.com/drive/folders/17KOqmlky6Tx_aIOlYi0v2TBRBuZFepkz; https://drive.google.com/drive/folders/18oCTzG0Jp8jTDP9y8btJvAFbJvDLvAMh; https://drive.google.com/drive/folders/1gAZmwtY3C2bbZCahHcfz1n6obDfkkoFu; https://drive.google.com/drive/folders/1gAZmwtY3C2bbZCahHcfz1n6obDfkkoFu.

Supplementary content related to this article has been published online at https://doi.org/10.1016/j.heliyon.2020.e04876.

## Acknowledgements

The analytics work used in this study was adapted from methodologies developed in 2016 by Nathan Phillips and Yufeng Yang (who are co-authors of this report), and initially deployed in Hartford in 2016 and reported in Keyes et al. (2019). This material is based upon work partially supported by the National Science Foundation under Grant No. 1617053.

Contributions by Robert Ackley and Tim Keyes were sponsored by the Sierra Club Connecticut. The authors wish to thank reviewers for their helpful suggestions that improved the quality and clarity of the paper.

## References


Boyle, M.D., Soneja, S., Quirós-Alcalá, L., Dalemarre, L., Sapkota, A.R., Sangaramoorthy, T., Wilson, S., Milton, D., Sapkota, A., 2017. A pilot study to assess residential noise exposure near natural gas compressor stations. PLoS One 12 (4).

Chamberlain, S.D., Ingraffea, A.R., Sparks, J.P., 2016. Sourcing methane and carbon dioxide emissions from a small city: influence of natural gas leakage and combustion. Environ. Pollut. 218, 102–110.

Connecticut Department of Transportation, Public Road Mileage, 2014. Retrieved from. www.ct.gov/dot/lib/dot/documents/dpolicy/publicroad/PublicRoadMileage2014.pdf.

von Fischer, J.C., Cooley, D., Chamberlain, S., Gaylord, A., Griebenow, C.J., Hamburg, S.P., Salo, J., Schumacher, R., Theobald, D., Ham, J., 2017. Rapid, vehicle-based identification of location and magnitude of urban natural gas pipeline leaks. Environ. Sci. Technol. 51 (7), 4091–4099, 2017.

Gallagher, M.E., et al., 2015. Natural gas pipeline replacement programs reduce methane leaks and improve consumer safety. Environ. Sci. Technol. Lett. 2 (10), 286–291.

Hendrick, M.F., Ackley, R., Sanaie-Movahed, B., Tang, X., Phillips, N.G., 2016. Fugitive methane emissions from leak-prone natural gas distribution infrastructure in urban environments. Environ. Pollut. 213, 710–716.

Home Energy Efficiency Team (HEET) not dated. Gas Leak Maps. Retrieved from https://heetma.org/gas-leaks/gas-leak-maps/.

Hopkins, F.M., et al., 2016. Spatial patterns and source attribution of urban methane in the Los Angeles Basin. J. Geophys. Res. Atmos. 121 (5), 2490–2507.

Howarth, R.W., 2014. A Bridge to Nowhere: Methane Emissions and the Greenhouse Gas Footprint of Natural Gas. Energy, Science and Engineering: Perspective.

Intergovernmental Panel on Climate Change (IPCC), 2014. Climate Change 2013 – the Physical Science Basis: Working Group I Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge.

Jackson, R.B., et al., 2014. Natural gas pipeline leaks across Washington, DC. Environ. Sci. Technol. 48 (3), 2051–2058.

Keyes, T., Ridge, G., Klein, M., Phillips, N., Ackley, B., Yang, Y., 2019. Hartford, Connecticut Mobile Method Leak Survey. Retrieved from. https://ctsierraclub.wixsite.com/sierraclub-ct/hartford-mobile-methane-leaks-study.

Korte, G., 2018. USA TODAY. Senators: Natural Gas Pressure Was 12 Times normal Level before Massachusetts Explosions. Retrieved from. https://www.usatoday.com/story/news/nation/2018/09/18/massachusetts-natural-gas-explosions-pressure-ed-markey-elizabeth-warren-columbia/1345591002/.

Krasner, A., Jones, T.S., 2019. Cooking with Gas Can Harm Children: Cooking with Gas Stoves Is Associated with Increased Risk of Childhood Respiratory Illnesses, Including Asthma. Retrieved from. https://heetma.org/wp-content/uploads/2019/04/Gas-cooking-can-harm-children-4-15-19-clean-.pdf.

Lamb, B.K., et al., 2015. Direct measurements show decreasing methane emissions from natural gas local distribution systems in the United States. Environ. Sci. Technol. 49 (8), 5161–5169.

Lamb, B.K., et al., 2016. Direct and indirect measurements and modeling of methane emissions in indianapolis, Indiana. Environ. Sci. Technol. 50 (16), 8910. U530.

Landrigan, P.J., Frumkin, H., Lundberg, B.E., 2020. The false promise of natural gas. N. Engl. J. Med. 382, 104–107.

Lin, W.W., Brunekreef, B., Gehring, U., 2013. Meta-analysis of the effects of indoor nitrogen dioxide and gas cooking on asthma and wheeze in children. Int. J. Epidemiol. 42 #6, 1724–1737.

McKain, K., Down, A., Raciti, S.M., Budney, J., Hutyra, L.R., Floerchinger, C., Herndon, S.C., Nehrkorn, T., Zahniser, M.S., Jackson, R.B., Phillips, N., Wofsy, S.C., 2015. Methane emissions from natural gas infrastructure and use in the urban region of Boston, Massachusetts. Proc. Natl. Acad. Sci. Unit. States Am. 112, 1941–1946.

Olewuezi, N.P., Onoghojobi, B., Udeoyibo, C.V., 2015. A comparative study of different outlier detection method in linear regression. Far East J. Theor. Stat. 50, 171–179.

Payne, B.F., Ackley, R., Paige Wicker, A., Hildenbrand, Z.L., Carlton, D.D., Schug, K.A., 2017. Characterization of methane plumes downwind of natural gas compressor stations in Pennsylvania and New York. Sci. Total Environ. 580, 1214–1221.

Phillips, N.G., Ackley, R., Crosson, E.R., Down, A., Hutyra, L.R., Brondfield, M., Karr, J.D., Zhao, K., Jackson, R.B., 2013. Mapping urban pipeline leaks: methane leaks across Boston. Environ. Pollut. 173, 1–4.

Pipeline Hazardous Materials and Safety Administration (PHMSA), 2015-17. Gas distribution-gathering-transmission data. Retrieved from. https://www.phmsa.dot.gov/data-and-statistics/pipeline/gas-distribution-gas-gathering-gas-transmission-hazardous-liquids.

Pun, V.C., Hart, J.E., Kabrhel, C., Camargo, C.A., Baccarelli, A.A., Laden, F., 2015. Prospective study of ambient particulate matter exposure and risk of pulmonary embolism in the nurses' health study cohort. Environ. Health Perspect. 123 (12). Retrieved from.

Russo, N.R., Carpenter, D.O., 2019. Air emissions from natural gas facilities in New York state. Int. J. Environ. Res. Publ. Health 16 (9), 1591.

Santora, M., 2014. The New York times. At least 3 killed as gas explosion hits east harlem. Retrieved from. https://www.nytimes.com/2014/03/13/nyregion/east-harlem-building-collapse.html.

Shi, L., Zanobetti, A., Kloog, I., Coull, B.A., Koutrakis, P., Melly, S.J., Schwartz, J.D., 2016. Low-Concentration PM2.5 and Mortality: Estimating Acute and Chronic Effects in a Population- Based Study.

Singer, B.C., Zarin Pass, R., Delp, W.W., Lorenzetti, D.M., Maddalena, R.L., 2017. Pollutant concentrations and emission rates from natural gas cooking burners without and with range hood exhaust in nine California homes. Build. Environ. 122, 215–219.

Subramanian, R., Williams, L.L., Vaughn, T.L., Zimmerle, D., Roscioli, J.R., Herndon, S.C., Yacovitch, T.I., Floerchinger, C., Tkacik, D.S., Mitchell, A.L., Sullivan, M.R., Dallmann, T.R., Robinson, A.L., 2015. Methane emissions from natural gas compressor stations in the transmission and storage sector: measurements and comparisons with the EPA greenhouse gas reporting program protocol. Environ. Sci. Technol. 49 (5), 3252–3261.

U.S. Census Bureau, 2018. QuickFacts: Hartford Town, Hartford County, Connecticut. Retrieved from. https://www.census.gov/quickfacts/hartfordtownhartfordcountyconnecticut.

U.S. Energy Information Administration (EIA). Retrieved from. https://www.eia.gov/naturalgas/annual/.

U.S. Energy Information Administration (EIA), 2016. Hydraulically Fractured wells Provide Two-Thirds of U.S. Natural Gas Production. Retrieved from. https://www.eia.gov/todayinenergy/detail.php?id=26112.

Weller, Z.D., Yang, D.K., von Fischer, J.C., 2019. An open source algorithm to detect natural gas leaks from mobile methane survey data. PLoS One 14 (2), e0212287.

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Mon, Oct 19, 2020 at 6:13 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: ron@everyactioncustom.com <ron@everyactioncustom.com>
Sent: Friday, October 16, 2020 4:40 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Rebecca French,

I went solar panels in 2012 and Electric vehicle in 2015.
No electric bill and no gasoline bill.

I will add geo thermal heating cooling or heat pump / mini splits.

All clean and fossil fuel free.

EVERYONE must do it now.

It is easy and way less expensive than fossil fuel energy or transportation.

It can be done now and we will need 1,000,000 immigrants right away to build clean factories to build clean vehicles and clean heating units.
Millions of new jobs and factories and taxes for the Government!
We are at war and must act this very second.

AND

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to

draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Mr. Ron Nelson
165 Orchard Hill Ln  Fairfield, CT 06824-7348 ron@worldcarepetron.com

# Subject: GC3 Comments

**Steven Andrychowski** <vvcsteve@everyactioncustom.com>
to DEEP ClimateChange

Fri, Oct 16, 9:46 PM





Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

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3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Mr. Steven Andrychowski
105 Clinic Dr Apt 103 New Britain, CT 06051-4035
vvcsteve@yahoo.com

# Review of the ***Forest Sub-Group Draft Report***

**Submitted by: Thomas Degnan Jr.**
CT Forest & Park Association - Director/Forester
CT Certified Forester
Society of American Foresters - Certified Forester
Old Lyme Tree Warden
Senior Scientist – Burns & McDonnell Engineering

Introduction:

I would like to thank the Forest Sub-Group for their dedication and time to this very important cause. Connecticut's forests are critically important to creating the sense place that is unique to Connecticut. With the threat of climate change bearing down on us, these same forests can also support the much-needed opportunities our State needs to adopt to help change the direction of this global challenge.

This is a review of the 9/10/2020 draft report from the ***Forests Sub-Group*** of the ***Working and Natural Lands Working Group*** as part of the ***Governor's Council on Climate Change***. The numbered paragraphs in **bold** below reference sections of the report.

1. **The Executive Summary and The section on the Status of CT Forests** is good (pg 1-13). The values and uses of CT forests are very good. Forestry and wood products are mentioned and described well.
2. **Adopt a state-wide "No-Net Loss of Forest" Policy** is great policy that I feel everyone can get behind.
3. **Adaptations and Resilience Considerations for CT Forests**: This section is very good. Resilience is threatened by climate change, among other things. Forests need to be resilient to have a positive impact on climate change. I see examples of resilience being developed through active and passive forest management on State and private land throughout CT regularly.
4. **Actions to Increase Adaptation and Resilience of CT's Forests**:
    a. Short Term recommendations are generally good, but why is an increase in passive management recommended? Currently 33% of State land is passively managed and 71% of CT is in the hands of private ownership where there is very little active management according to this report. While passive management/forest reserves should continue to be part of the message to develop diversity in CT, has anyone shown, scientifically we need more? How much do we need? What does the science tell us?
    b. Long Term recommendations are very good. All very positive.
5. **Mitigation considerations in CT forests**: This section is very biased to proforestation and while other sections of the report are very well-rounded, this section is not. The claim that proforestation is "likely the most effective solution to preserve and foster further growth of accumulated carbon storage in woodlands" needs further vetting. One of the citations to this claim is written by the author of this section of the report. The other 2 citations never mention proforestation and make no claim to a preference. I suggest this claim needs further review by a forest biologist/scientist(s) before it is published.

    The first sentence of this section says *"Climate mitigation involves both reducing the emissions of*

*carbon dioxide and….*", but there no mention of the reduced emissions that come from choosing engineered wood products over more carbon intense building products such as concrete or steel. This is either negligence or ignorance by the writer. The use of wood to off-set carbon intense building material is not "theoretical science", it is real, quantifiable improvements in carbon storage and off-sets that the writer neglected to mention. This topic is briefly mentioned in the section on Actions to Increase Adaptation and Resilience of CT's Forests (page 22, Creating Strong Markets.

**Some Important Points from this Section of the Report:**

a. CT forests are being harvested at a relatively low intensity (only 17% of annual growth). This suggests that the removal of stored carbon is minimal and sequestration is occurring at a high rate.
b. The report concludes that "There is some concern that CT's forests are being high-graded". How can you make bombshell statement like that without some additional information? There is no further discussion on high-grading vs. good forestry or where is this high-grading occurring? It is not occurring State lands! You cannot solve the problem of high-grading on private lands by "locking up" public land. Reducing poor harvesting practices is certainly something the forestry community can get behind.
c. There is very little discussion in this section on good forest management and its role in sequestration and storage of carbon by growing and harvesting high-quality wood products. Urban forestry recovery is discussed to re-use urban trees only.
d. The stated goal = Permanently protect 50% of core forests. Yes, that is great if "protect" means protect from fragmentation and development and keep core forests as core forests, but what does protect mean? Currently, 71% of CT's forests are in private hands. State lands are already protected so if we are serious about protecting CT's forests, we need to focus on the 71% that is in private ownership. While I believe we can get consensus that CT's core forests should be protected, our goal should be to maintain them as forests and that they continue to provide all the benefits to society they currently provide.
e. Action Item being recommended is to "Designate Core Forest Natural Area Preserves on State Land". Why?
    i. Core forests can continue to function as core forests without being locked up.
    ii. 33% of State lands are already "protected" from harvesting and this report identifies private forests (71% of CT) as, "at risk".
    iii. My recommendations: Reserve areas should be included in all State forest management plans, but permanent designations for lands, other than vulnerable species communities, is not what is needed to save CT's core forests.
f. Another action Item recommended is to "Improve forestry practices in CT's working forests. The threat identified in this report is "high-grading". No all of CT's forestry practices need improvement. The forestry community can certainly get behind an outreach/education (possibly even a legislative fix) effort to inform/encourage/incentivize private landowners to practice good forestry.

6. **Improve the Management of CT's Working Forests**: The author is not a forester, forest scientist or silvicultural scientist. The author makes a few good suggestions, but overall this section is poorly written with a very obvious bias to stopping forest management. There is no mention on the importance of a diverse forest structure and regeneration to forest resilience or that fast growing,

younger trees are critical to the sequestration of carbon. Dr. Mark Ashton, sat on this sub-committee and is one of the leading scientists in the world on forestry and silviculture. His opinion is sadly missing from this entire section and is critical to the success and validity of the report.

7. Proforestation – Defined as "Continuous forest growth in natural areas **protected** from timber harvesting". The definition of "protect" is "keep safe from harm or injury". At Connecticut Forest & Park Association and as a private forester, I have always promoted good forest management, never once thinking that my management decisions to harvest trees was causing harm or injury to the forest. The authors of proforestation are saying this it is the "Most effective solution to preserving accumulated carbon and increase it". This is a bold statement that is not backed by the science community and should be removed from the report.

   There is no discussion on carbon that can be locked up from the harvesting of wood for wood products or the increase in the growth rate of the existing trees following forest management activities.

8. **Improve the Management of CT's Working Forest**: The recommendation is to extend harvest timelines and retain large trees. This is a fine idea, but an oversimplification of the silvicultural tools available and primarily focused on storage. There is only one mention of "silvicultural practices to increase forest growth rates (or sequestration). What about long-lived wood products for storage and as alternatives to more carbon intense building material?

   One recommendation was to hire more service foresters. This is a great idea and good start to improving the outreach and education to CT's private forest landowners, the "at risk" group identified in this report.
9. Other sections of this report include: **Climate Change Threats to Vulnerable Populations; Climate Threats to Vulnerable Forest Types; Funding, Programs, and Resources needed for Implementation; and Establishing a Forest Carbon Baseline for CT**. These sections are well written and have a lot of good ideas.

**Conclusion:**

CT's State lands **ARE WELL PROTECTED** (Remember Vote Yes on #2) and currently about 33% of them are not part of the active forest management program. Focusing on "locking up" more of CT State lands is not the place to focus attention. 71% of CT's forestland is private and most is not protected. Focusing attention on ways to keep private land as forest and reduce destructive logging practices such as high-grading would be something all groups could get behind.

I am in complete support of using CT's forests to mitigate against climate change and I believe that trees are part of the solution, but I have seen with my own eyes how scientific forest management can increase the health, resilience and growth of forests and how the use of forest products can lockup carbon. I feel strongly that there is not enough importance given to what the forestry community has always fought hard to educate CT on. Good forest management and the development of CT grown forest products.

Thank you

# Subject: GC3 Comments

**Tom McCormick** <tom@everyactioncustom.com>
to DEEP ClimateChange

Fri, Oct 16, 7:09 PM





Dear Rebecca French,

The DEEP Commissioner, K. Dykes is lying about Millstone being carbon-free. Millstone's operations are powered by the grid which is certainly not carbon-free. There are carbon emissions throughout the nuclear fuel cycle-- mining, milling, enrichment, and fuel fabrication. Much of the enrichment is powered by coal in the former Soviet Union. Keeping Millstone running requires a large workforce driving in and out of the plant with tailpipes spewing carbon. I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Tom McCormick
40 Avondale Rd West Hartford, CT 06117-1107
tom@tomforcongress.org

UCONN
UNIVERSITY OF CONNECTICUT

**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Mon, Oct 19, 2020 at 6:13 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: vickizach@everyactioncustom.com <vickizach@everyactioncustom.com>
Sent: Friday, October 16, 2020 4:19 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.
5. I would like to see more green energy initiatives like Wind power in CT.
6. Keep supporting Solar energy solutions to homeowners. Also expand smaller solar options to power small devices or to charge rechargeable batteries.

Thank you again for the opportunity to submit comments.

Sincerely,
Mrs. Victoria Zacharewicz
239 Hubbard Ave  Stamford, CT 06905-4818 vickizach@yahoo.com

**Southern New England Forest Management in an Era of Climate Change**

A Position of the Yankee Division of the Society of American Foresters

**Purpose:** This document reports the best available scientific findings and management strategies related to forests and carbon sequestration and storage in southern New England. This information will help guide development of public policy for forest management in this region. Forests are central to our history, identity and way of life. The forests of southern New England provide critical ecosystem services including water quality, biodiversity, carbon sequestration and storage, recreation, and human health, important products, and productive employment, while providing solace and sense of place. Climate change, coupled with New England's land use history and increasing human population, has heightened the need to responsibly manage these forests for multiple uses including sequestration and storage of atmospheric carbon.

**Scope:** This statement outlines the ways in which a spectrum of forest stewardship strategies in southern New England contribute to climate change mitigation and adaptation, provide services and products for society, and sustain resilient forests for future generations.

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## Position

It is the position of the Yankee Division of the Society of American Foresters (Yankee SAF) that active forest management, grounded in science, is essential to maintaining and promoting resiliency and ecosystem services. Such management will:

1) Promote carbon sequestration and storage (Evans and Perschel 2009, McGarvey et al. 2015);
2) Provide additional ecosystem services including air and water pollution mitigation (Cardinale et al. 2012);
3) Provide locally sourced and sustainable wood products that substitute for more carbon intensive materials (e.g., wood instead of concrete, biomass fuels instead of fossil fuels) (Rudell et al. 2007);
4) Reduce forest fragmentation, mismanagement, and conversion to non-forest both locally and globally; and
5) Improve biodiversity and the capacity of ecosystems in southern New England to withstand and adapt to the impacts of climate change.

## Issue

The issue of forests and carbon is complex and increasingly important. Carbon uptake (i.e., sequestration) occurs in growing forests, generally peaking in early stand development, but sometimes continuing at high rates through late-successional stages, particularly in structurally complex forest systems (Bormann and Likens 1979, Keeton et al. 2007, Keeton et al. 2011). Carbon storage occurs in the biomass of forested systems and in long-lasting wood products, such as lumber.

Wood products store carbon and help to offset the need for extraction and production of non-renewable, carbon-intensive materials, such as concrete, steel and petroleum-based plastics. Locally and regionally produced wood products have a relatively smaller carbon footprint due to lower transportation costs and are sourced from well-regulated forests (Kittredge et al 2002, Ashton et al. 2012).

Forest management, including timber harvesting, is consistent with goals of promoting long-term carbon sequestration and storage. Management practices continue to adapt as we gain a better understanding of the relationships between forestry and atmospheric carbon. Reducing harvest frequency and favoring high levels of structural retention, for example, can sequester up to 57% more carbon (Nunery and Keeton 2010). Reforestation also increases carbon sequestration (Rhemtulla et al. 2009). In urban areas this would also improve quality of life through other ecosystem services (Nowak and Greenfield 2008). Managing for a variety of values and uses on a long-term timescale using peer-reviewed forest science and a holistic understanding of the forest systems ensures that southern New England forests continue to capture and store carbon, maintain ecosystem functions and services, and decrease global deforestation and fossil fuel use. While reserve-based management is appropriate in some places, sustainable timber harvesting in most forests best serves human needs in the long term. Meeting these objectives will require a full suite of conservation strategies working together, including both sustainable harvesting and reserve-based management (Foster et al. 2017).

## Background

### *The Importance of Forests*

Forests are central to our history, identity, and way of life. The health of our forests will strongly influence our collective future. Forests renew the air we breathe and filter the water we drink. We rely on forests for a host of renewable raw materials for products from maple syrup and medicinal plants to fuel and lumber. Forests provide habitat to wildlife, beneficial insects and plant species. Forests prevent erosion, build soil, store nutrients, and sequester and store carbon. Forests also provide the joy of birdsong, inspiration, and renewal of spirit.

### *Forest Disturbance and the Need for Resilience*

Disturbances play an important role in structuring the forested landscape and are vital for functions including regeneration. Disturbances range in type, size, frequency and intensity

(Turner et al. 1998, Lorimer and White 2003). Variation in post-disturbance abundance and spatial arrangement of live and dead trees impacts species composition and carbon storage dynamics (Franklin et al. 2002, Seymour et al. 2002, Birdsey 2019).

While the most common natural disturbances in Southern New England forests are wind and ice storms, impacts of invasive insects and fungal diseases are increasing. Fire as a disturbance has only recently declined and could become influential again. Fire has a long and varied history in New England with its frequency, intensity, severity, and extent heavily influenced by changes in land use practices (Patterson and Sassaman 1988, Brose et al. 2014, Lorimer and White 2003, Hurteau et al. 2011, Janowiak et al. 2014). Anthropogenic disturbance (e.g., harvesting and silvicultural action) has also been an influential driver of forest condition, and response to decades of forest management is one of the largest factors shaping current forest conditions (Duveneck et al. 2017).

Climate change in the Northeast is altering ecosystem disturbance regimes (Evans and Perschel 2009). Changes vary seasonally and include increases to average temperatures, heavy precipitation events and drought, and decreases in snowfall and snowpack (Janowiak et al. 2018). Forest composition and condition models show varying responses to changes in climate and natural disturbance regimes (Tang and Beckage, 2010, Rustad et al., 2012). The impacts may happen at such a rate that the recovery of the forest ecosystem cannot keep pace (Liang et al., 2017), or cause substantial loss of species richness and diversity (Iverson and Prasad, 2001). At the same time, the landscape is facing loss of forests through conversion to other land uses (Kittredge, 2009, Olofsson et al. 2016).

Resiliency – a forest's capacity to recover function after a disturbance – is critically important for sustaining forest ecosystems in this era of rapidly changing climatic conditions. Resiliency enables the forest to maintain, restore or enhance ecosystem services, including carbon sequestration and storage, following disturbances. Informed forest management and protection of forestland from development provides the opportunity to maintain or improve resiliency by retaining connectivity, increasing complexity and maintaining or enhancing diversity across forested landscapes (Catanzaro and D'Amato, 2019).

***Forest Carbon***

Forested ecosystems provide a valuable ecosystem service by storing and sequestering carbon, reducing atmospheric $CO_2$. Temperate forest ecosystems have been widely acknowledged as a carbon sink (Ashton et al. 2012); U.S. terrestrial forests offset ten to thirty percent of annual U.S. $CO_2$ emissions (Houghton 2003).

Trees and forest vegetation sequester carbon from the atmosphere through the process of photosynthesis. Carbon is stored in various pools including live and dead aboveground biomass, belowground biomass, woody material and leaf litter, and soil (Fahey et al., 2005; Catanzaro and D'Amato, 2019). Amounts of sequestered and stored carbon are dynamic – constantly fluxing

between and within pools as forests and land-use change over time. Decades of research illuminate the variety of factors driving forest carbon sequestration and storage dynamics. Stand age is strongly predictive of aboveground biomass in the northeastern U.S., with other variables, including ecoregion and conifer composition, accounting for 25-33% of variability (Keeton et al. 2011). Disturbance, both natural and anthropogenic, is also a driving factor of carbon sequestration and storage dynamics (Birdsey et al. 1997, Duveneck et al. 2017).

Reports of carbon sequestration and storage vary widely due to these factors. In the Northeast, biomass (i.e., stored carbon) generally increases over time (Barford et al. 2001, Hadley and Schedlbauer 2002, Keeton et al. 2011), but can exhibit decline in different stand conditions or due to stressors (Fahey et al. 2005).

The rate in forest carbon uptake (i.e., sequestration) in the Northeast is declining (Birdsey et al. 2019), as has been observed in maturing forests (Bormann and Likens 1979, Keeton et al. 2007). However, managing for complex forest structure, as often found in primary and mature or old-growth secondary forests, can yield an increase or maintenance in net carbon sequestration (Luyssaert et al. 2008, Nunery and Keeton 2010).

The carbon stored in wood products adds to the complexity of carbon accounting. Hardwood flooring, dimension lumber, and plywood are forms of stored carbon and should be accounted for as such. Furthermore, the use of these products avoids carbon emissions from the extraction and production of more carbon-intensive materials such as vinyl, carpet, concrete, and steel (Oliver et al. 2014). Wood utilization and technology continue to improve the production of wood products and increase associated carbon storage (Tollefson 2017). Cross-laminated timber (CLT) is capable of replacing concrete for multi-story buildings (Robertson et al. 2012). A life cycle assessment of the four-story John W. Olver building at the University of Massachusetts found that the use of CLT and other wood products instead of concrete and steel reduced the building's global warming potential by 13% (Gu and Bergman 2018). Substituting wood for steel and concrete in new buildings world-wide would reduce global $CO_2$ emissions by 14 to 31% (Oliver 2014) and interest in this technology is rising (Struck 2019).

Sequestration in the forest and carbon emission offsets associated with wood products from sustainable forest management are critical components of carbon management. Research continues to increase our understanding and must guide forest practitioners to improving the capacity of this vital resource.

***Sustainable Forest Management and Timber Harvesting***

Sustainable forest management is a "dynamic and evolving concept, which aims to maintain and enhance the economic, social and environmental values of all types of forests, for the benefit of present and future generations" (FAO 2020). Yankee SAF strongly supports the practice of sustainable forest management that includes both limited reserves and responsible harvesting as

the best way to ensure that forests continue to provide a wide array of benefits. FAO lists the following climate change mitigation and adaptation actions for forests:

- Carbon sequestration enhancement by silvicultural practices
- Carbon stock conservation by preventing deforestation, implementing reduced impact logging, and pest control
- Substitution of wood products for steel, concrete, aluminum, and plastic
- Reducing the vulnerability and strengthening the adaptive capacity of trees and forests.

Sustainable forest management can accelerate development of complex structure in northeastern U.S. forests (Keeton 2006), making it possible for early successional canopies to support the complex functioning and biodiversity seen in late-successional or old-growth forests (Donato et al. 2012). Reducing harvesting frequency (Curtis 1997), increasing rotation lengths (Harmon and Marks 2002, Ryan et al. 2010), and encouraging post-harvest structural complexity (Keeton 2006, Franklin et al. 2007, Swanson 2009, Puettmann et al. 2009) have been found to increase stand-level carbon storage. Maintaining adequate stocking of large trees (Stephenson et al. 2014), while also allocating growing space for younger trees can promote higher rates of stand-level carbon storage and sequestration (D'Amato et al. 2011). These practices can also strengthen forest resiliency. Each parcel's unique species composition, forest structure, and landscape position must be evaluated to determine its vulnerability to disturbance and its role in benefiting present and future generations.

Sustainable forest management promotes diversity of species, ages, sizes, and spacing of trees, improving overall forest resilience. A gypsy moth outbreak that kills large oak trees will not harm tulip trees. A hurricane or tornado may flatten mature trees and not damage saplings that bend more readily. A drought can weaken or kill overcrowded trees but has less impact on trees freed from competition through active management.

Managing forests to promote resiliency and greater carbon storage is stand-specific. Sustainable forest management considers many different tree and site characteristics to determine the most suitable actions to meet the goals of forest management. The effects of certain management prescriptions on carbon sequestration and storage, for example, are dependent on stand age characteristics. Reducing harvest frequency more effectively increases carbon sequestration in uneven-aged New England stands than in even-aged stands (Nunery and Keeton 2010). Retaining such biological legacies as large old trees also promotes diversity by sustaining many organisms and critical ecosystem functions, such as soil stabilization, nutrient retention and recycling, and resilience to disturbance (Franklin et al. 2007, Hanson et al. 2012). Generally, silvicultural treatments that maintain a large proportion of mature trees maintain or increase aboveground carbon storage (D'Amato et al. 2011).

Sustainable forest management that includes harvesting reduces the volume of dead wood that will release carbon due to decay (Hoover and Stout 2007). The carbon in durable wood products such as plywood, framing, flooring and furniture is stored much longer than the carbon in dead

trees (Russell 2014). In southern New England, the volume of wood in trees that die naturally is over three times that contained in harvested trees (Oswalt et al. 2019).

Durable wood products are more carbon-efficient than alternative products, in addition to storing sequestered carbon that would otherwise be released back to the atmosphere through decay. In addition to the benefit from the carbon stored in durable wood products, there is less carbon released from harvesting and manufacturing wood products than from mining non-renewable resources and manufacturing products from them (Bergman et al. 2014). Many studies have documented that one of the key carbon sequestration benefits of active forest management is the substitution of products made from wood for those made from steel, aluminum, or concrete (Oliver 2014, Woodbury and Wightman, 2017).

Forest products are important to our local economy. In 2013, Southern New England's forest-based economy accounted for an estimated $5.8 billion dollars in gross regional output and provided employment to approximately 28,525 individuals (Northeast State Foresters Association 2015). In addition, revenue generated from the sale of forest products helps encourage keeping forests as forests and limiting their conversion to non-forest uses.

A resilient forested landscape is comprised of a variety of forest conditions. Sustainable harvesting and management to preserve old forests each result in the storage of significant amounts of carbon. Minimally disturbed forests provide critical habitat for some species and are invaluable for scientific research. Forest management that includes harvesting can proactively and intentionally create or enhance habitat for the myriad vertebrate and invertebrate species that depend on young forests or forests with heterogenic structure (DeGraaf and Rudis 1992, DeGraaf et al. 2005). Sustainable forest management that includes harvesting yields additional benefits for useful, renewable products, reduced carbon emissions, and important aspects of resilience that preservation does not.

Resilient, vigorous, functional and diverse forests are critical for continuing our way of life in southern New England. The disturbance regime that our forests experience has changed due to the loss of some species (including apex predators), the introduction of others (especially invasive species), and a changing climate. Sustainable forest management maintains and enhances ecosystem function and resiliency so that the forest resource continues to meet societal needs. Water quality, soil integrity, carbon capture, diverse wildlife habitat, forest products, recreational opportunities, and aesthetic beauty can be maintained or increased. We have the opportunity and the responsibility to be a part of the solution.

## References

Ashton, M.S., Tyrrell, M.L., Spalding, D. and Gentry B. (eds.) (2012) Managing Forest Carbon in a Changing Climate, Springer Science+Business Media, pp 77-99.

Barford C.C., Wofsy S.C., Goulden M.L., Munger J.W., Pyle E.H., Urbanski S.P., Hutyra L., Saleska S.R., Fitzjarrald D., and Moore K. (2001) Factors Controlling Long- and Short-Term Sequestration of Atmospheric $CO_2$ in a Mid-latitude Forest. Science 294:1688–1691.

Berlik, M.M., Kittredge, D.B., and Foster D.R. (2002) The Illusion of Preservation. Harvard Forest Bulletin No. 26.

Bergman R., Puettmann M., Taylor A., and Skog K.E. (2014) The Carbon Impacts of Wood Products. Forest Products Journal 64:220-231.

Birdsey R., Mickler R., Sandberg D., Tinus R., Zerbe J and O'Brian K, eds. (1997) USDA Forest Service Global Change Research Program Highlights: 1991-1995. Gen. Tech. Rep. NE-237. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 122 p. https://doi.org/10.2737/NE-GTR-237.

Birdsey R.A., Dugan A.J., Healey S.P., Dante-Wood K., Zhang F., Mo G., Chen J.M., Hernandez A.J.; Raymond C.L., and McCarter J. (2019) Assessment of the influence of disturbance, management activities, and environmental factors on carbon stocks of U.S. national forests. Gen. Tech. Rep. RMRS-GTR-402. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 116 pages plus appendices.

Bormann, F.H. and G.E. Likens, G.E., (1979) Pattern and Process in a Forested Ecosystem. Springer Verlag, New York. pp. 253.

Brose, P.H., Dey D.C., and Waldrop T. (2014) The Fire - Oak Literature of Eastern North America: Synthesis and Guidelines. NRS-GTR-135. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. https://doi.org/10.2737/NRS-GTR-135.

Cardinale et al. (2012) Biodiversity loss and its impact on humanity. Nature 486:56-67.

Catanzaro P., and D'Amato A. (2019) Forest Carbon, University of Massachusetts Amherst.

Catanzaro P., D'Amato A., and Huff E.S. (2016) Increasing Forest Resiliency for an Uncertain Future. University of Massachusetts Amherst.

Curtis, R., (1997) The role of extended rotations. In: Kohm, K., Franklin, J. (Eds.), Creating a Forestry for the Twenty-first century: The Science of Ecosystem Management. Island Press, Washington, DC, pp. 165–170.

D'Amato, A. W., Bradford, J. B., Fraver, S., and Palik, B. J. (2011) Forest management for mitigation and adaptation to climate change: insights from long-term silviculture experiments. *Forest Ecology and Management*, *262*(5), 803-816.

DeGraaf, R.M. and Rudis D.D. (1992) New England wildlife: habitat, natural history, and distribution. USDA Forest Service Gen. Tech. Report NE-108. 491 p.

DeGraaf, R.M., Yamasaki M., Leak W.B., and Lester A.M. (2005) Landowner's guide to wildlife habitat. University of Vermont Press. Burlington, VT. 111p.

Donato, D.C., Campbell, J.L., Franklin, J.F. (2012) Multiple successional pathways and precocity in forest development: can some forests be born complex? Journal of Vegetation Science **23**(3): 576-584.

Evans and Perschel (2009) A review of forestry mitigation and adaptation strategies in the Northeast U.S. Climatic Change 96(1):167-183.

Fahey T.J., Siccama T.G., Driscoll C.T., Likens G.E., Campbell J., Johnson C.E., Battles J.J., Aber J.D., Cole J.J., Fisk M.C., Groffman P.M., Hamburg S.P., Holmes R.T., Schwarz P.A. and Yanai R.D. (2005) The Biogeochemistry of Carbon at Hubbard PM Brook. Biogeochemistry 75, 109–176. https://doi.org/10.1007/s10533-004-6321-y

FAO (2018) Climate Change for Forest Policy-Makers. Food and Agriculture Organization of the United Nations. FAO Forestry Paper 181 v2.0. http://www.fao.org/3/CA2309EN/ca2309en.pdf

FAO (2020) Sustainable Forest Management, Food and Agriculture Organization of the United Nations, http://www.fao.org/forestry/sfm/en/

Foster, D.R. (1992) Land-use history (1730-1990) and vegetation dynamics in central New England, USA. Journal of ecology: 753-771.

Foster, D., et al. (2017) Wildlands and Woodlands, Farmlands and Communities, Broadening the Vision for New England. Harvard Forest, Harvard University, Petersham, Massachusetts.

Franklin, J.F., Berg D.R., Thornburgh D.A., Tappeiner J.C. (1997) Alternative silvicultural approaches to timber harvesting: variable retention harvest systems. Creating a Forest for the 21st Century: the Science of Ecosystem Management. Island Press, Washington, DC: 111-139.

Franklin, J.F., Spies, T.A., Van Pelt, R., Carey, A.B., Thornburgh, D.A., Berg, D.R., Lindenmayer, D.B., Harmon, M.E., Keeton, W.S., Shaw, D.C. (2002) Disturbances and structural development of natural forest ecosystems with silvicultural implications, using Douglas-fir forests as an example. *Forest Ecology and Management, 155*(1-3), 399-423.

Franklin, J.F., Mitchell R.J., and Palik B.J. (2007) Natural disturbance and stand development principles for ecological forestry. Gen. Tech. Rep. NRS-19. Newtown Square, PA: US Department of Agriculture, Forest Service, Northern Research Station. 44 p.

Grier, C.C., and Logan R.S. (1977) Old-growth Pseudotsuga menziesii communities of a western Oregon watershed: biomass distribution and production budgets. Ecological Monographs 47.4: 373-400.

Gu H. and Bergman R. (2018) Life Cycle Assessment and Environmental Building Declaration for the Design Building at the University of Massachusetts. U.S. Forest Service Forest Products Laboratory FPS-GTR-255.

Hadley J.L. and Schedlbauer J.L. (2002) Carbon exchange of an old-growth eastern hemlock (Tsuga canadensis) forest in central New England. Tree Physiology 22, 1079–1092.

Hamburg, S.P., Vadeboncoeur M.A., Johnson C.E., and Sanderman J. (2019) Losses of mineral soil carbon largely offset biomass accumulation 15 years after whole-tree harvest in a northern hardwood forest. Biogeochemistry (2019) 144:1–14. https://doi.org/10.1007/s10533-019-00568-3.

Hanson, J.J., Lorimer, C.G., Halpin, C.R., Palik, B.J. (2012) Ecological forestry in an uneven-aged, late-successional forest: Simulated effects of contrasting treatments on structure and yield. Forest Ecology and Management **270**: 94-107.

Harmon, M.E., Ferrell W.K., and Franklin J.F. (1990) Effects on carbon storage of conversion of old-growth forests to young forests. Science 247.4943: 699-702.

Harmon, M.E., and Marks B. (2002) Effects of silvicultural practices on carbon stores in Douglas-fir western hemlock forests in the Pacific Northwest, USA: Results from a simulation model." Canadian Journal of Forest Research 32.5: 863-877.

Harmon, M.E., Moreno, A., Domingo, J.B. (2009) Effects of partial harvest on the carbon stores in Douglas-fir/western hemlock forests: a simulation study.

Hoover C. and Stout S. (2007) The Carbon Consequences of Thinning Techniques: Stand Structure Makes a Difference. J Forestry 105(5):266–270.

Hurteau, M.D., and Brooks, M.L. (2011) Short- and Long-Term Effects of Fire on Carbon in US Dry Temperate Forest Systems. BioScience 61 (2): 139–46. https://doi.org/10.1525/bio.2011.61.2.9.

Iverson, Louis R., and Anantha M. Prasad (2001) Potential changes in tree species richness and forest community types following climate change. *Ecosystems* 4.3: 186-199.

Janowiak, Maria K., et al. (2018) New England and northern New York forest ecosystem vulnerability assessment and synthesis: a report from the New England Climate Change Response Framework project. *Gen. Tech. Rep. NRS-173. Newtown Square, PA: US Department of Agriculture, Forest Service, Northern Research Station. 234 p.* 173:1-234.

Keeton, W.S. (2006) Managing for late-successional/old-growth characteristics in northern hardwood-conifer forests. Forest Ecology and Management 235.

Keeton, W.S., Kraft, C.E., and Warren, D.R. (2007) Mature and old growth riparian forests: structure, dynamics, and effects on Adirondack stream habitats. Ecological Applications **17**(3): 852-868.

Keeton, W.S., Whitman, A.A., McGee, G.G., and Goodale, C.L. (2011) Late-successional biomass development in northern hardwood-conifer forests of the northeastern United States. Forest Science.

Kittredge, D.B. (2009). The fire in the East. Journal of Forestry April/May pp. 162-163.

Liang, Yu, et al. (2018) How disturbance, competition, and dispersal interact to prevent tree range boundaries from keeping pace with climate change. *Global change biology* 24.1: e335-e351.

Lorimer, C.G. and White, A.S. (2003) Scale and frequency of natural disturbances in the northeastern U.S., implications for early-successional forest habitats and regional age distributions. Forest Ecology and Management 185: 41-64.

McGarvey, J. C., Thompson, J. R., Epstein, H. E., and Shugart Jr, H. H. (2015) Carbon storage in old-growth forests of the Mid-Atlantic: toward better understanding the eastern forest carbon sink. *Ecology*, *96*(2), 311-317.

Mladenoff, D.J., and Pastor, J. (1993) Sustainable forest ecosystems in the northern hardwood and conifer forest region: concepts and management. Pages 145–180 in G. H. Aplet, N. Johnson, J. T. Olson, and V. A. Sample, editors. Defining Sustainability.

Northeast State Foresters Association (2015) The Economic Importance of the Forest-based Economies of the States of Connecticut, Massachusetts & Rhode Island, https://www.nefainfo.org/publications.html.

Nunery, J.S. and Keeton, W.S. (2010) Forest carbon storage in the northeastern United States: Net effects of harvesting frequency, post-harvest retention, and wood products. Forest Ecology and Management **259**(8): 1363-1375.

Oliver C.D., Nassar N.T., Lippke B.R., and McCarter J.B. (2014) Carbon, Fossil Fuel, and Biodiversity Mitigation with Wood and Forests, Journal of Sustainable Forestry, 33:3, 248-275.

Olofsson, P., Holden C.E., Bullock E.L., and Woodcock C.E. (2016) Time series analysis of satellite data reveals continuous deforestation of New England since the 1980s. Environmental Research Letters 11(6):1–8. https://iopscience.iop.org/article/10.1088/1748-9326/11/6/064002/pdf

Oswalt S.N., Smith W.B., Miles P.D., and Pugh S.A. (2018) Forest Resources of the United States, 2017: A technical document supporting the Forest Service 2020 RPA Assessment. Gen. Tech. Rep. WO97. Washington, DC: U.S. Department of Agriculture, Forest Service, Washington Office. 237 pp.

Patterson, W.A., and Sassaman K.E. (1988) Indian Fires in the Prehistory of New England. In Holocene Human Ecology in Northeastern North America, edited by George P. Nicholas, 107–35. Interdisciplinary Contributions to Archaeology. Boston, MA: Springer US. https://doi.org/10.1007/978-1-4899-2376-9_6.

Proceedings of the National Academy of Sciences Apr 2009, 106 (15) 6082-6087

Puettmann, K.J., Coates K.D., and Messier C.C. (2009) A critique of silviculture: managing for complexity. Island Press.

Rhemtulla, J.M., Mladenoff D.J., and Clayton M.K. (2009). Historical forest baselines reveal potential for continued carbon sequestration.

Robertson, B., Lam F.C.F., and Cole R.J. (2012) A comparative cradle-to-gate life cycle assessment of mid-rise office building construction alternatives: Laminated timber or reinforced concrete. Buildings 2.3:245-270.

Rudell, S., Sampson R., Smith M., Giffen R., Cathcart J., Hagan J., Sosland D., Godbee J., Heisenbuttle J., Lovett S., Helms J., Priceand W. and Simpson R. (2007) The role for sustainably managed forests in climate change mitigation. J. Forestry 105: 314–319.

Russell, M.B., Woodall C.W., Fraver S., D'Amato A.W., Domke G.M., and Skog K.E. (2014). Residence times and decay rates of downed woody debris biomass/carbon in the Eastern United States. Ecosystems 17:765-777.

Rustad, Lindsey, et al. (2012) Changing climate, changing forests: The impacts of climate change on forests of the northeastern United States and eastern Canada. *Gen. Tech. Rep. NRS-99. Newtown Square, PA: US Department of Agriculture, Forest Service, Northern Research Station. 48 p.* 99: 1-48.

Ryan, M.G., et al. (2010) A synthesis of the science on forests and carbon for US forests.

Seymour, R.S., White, A.S., and Demaynadier, P.G. (2002). Natural disturbance regimes in northeastern North America—evaluating silvicultural systems using natural scales and frequencies. Forest Ecology and Management **155**(1): 357-367.

Stephenson, L., et al. (2014) Rate of tree carbon accumulation increases continuously with tree size. Nature 507.7490: 90-93.

Struck, D. (2019) Forget the Log Cabin. Wood Buildings are Climbing Skyward with Pluses Planet Washington Post Climate Solutions. https://www.washingtonpost.com/climate-solutions/2019/12/12/forget-log-cabin-wood-buildings-are-climbing-skyward-with-pluses-planet/

Swanson, F.J., and Chapin F.S. (2009) Forest systems: living with long-term change. Principles of Ecosystem Stewardship. Springer, New York, NY, pp 149-170.

Tang, Guoping, and Brian Beckage (2010) "Projecting the distribution of forests in New England in response to climate change." *Diversity and Distributions* 16.1: 144-158.

Tollefson, J. (2017) The wooden skyscrapers that could help to cool the planet. Nature 545, 280–282.

Turner, M.G., Baker, W.L., Peterson, C.J, Peet, R.K. (1998) Factors influencing succession: lessons from large, infrequent natural disturbances. Ecosystems **1**(6): 511-523.

Woodbury P. and Wightman J. (2017) Forest Management & Greenhouse Gas Mitigation Opportunities. Information Sheet #7, Cornell University.

**From: The Yankee Division of the Society of American Foresters**

**To: The Governor's Council on Climate Change, Science and Technology Subcommittee**

The Yankee Division of the Society of American Foresters (SAF, the professional association of the forestry community in southern New England) respectfully submits the following comments on the draft report from the Science and Technology Subcommittee. Our intent is to foster more thorough inclusion of the science and the facts associated with forests and climate change in the overall GC3 process and specific reports.

The accompanying position statement from the Yankee Division SAF provides a thorough review of the current science on forest management and climate change and includes an exhaustive supporting list of peer-reviewed articles and studies from a wide array of forest scientists covering decades of research. The lack of representation on the Science and Technology Subcommittee from the professional forestry community or from credentialed forest ecologists has resulted in recommendations that are not consistent with a thorough review of the science associated with forests and climate change.

At issue are (1) the sentence on page 16 of the draft Subcommittee Report that, "*Proforestation (growing existing natural forests) has recently been identified as the most powerful, low cost, and immediate mitigation opportunity with multiple immediate co-benefits and proven long-term resilience."* and (2) the recommendation on page 37 that proforestation be prioritized on public land. We maintain that the inclusion of these ideas in the report is not justified by the science, nor by decades of experience managing forests in Connecticut. These topics are more properly dealt with by the Forest and Lands Subcommittee, where such scientific expertise and Connecticut forest management are represented. The uneven use of the existing science regarding the proforestation concept is at best an oversight, and represents serious errors of omission that can be most-effectively corrected within a subcommittee (forests and lands) that was structured to deal with forestry science and issues.

One example of the uneven use of the existing science is this sentence on page 16 "This has been further affirmed by recent data showing that New England's forests are growing even more than we thought: older forests are best able to withstand (and young trees are more vulnerable to) the stresses of climate change.70 "

This statement is completely unsupported by the citation. Reference #70 is a well-designed, albeit single-year, tended garden plot study of planted 20 cm (8") tall seedlings. Extending the results of a study of planted seedlings to all young forests is an incredible stretch. This ignores published research in highly regarded, peer-reviewed publications including:


Binkley, Dan, Jose L. Stape, Michael G. Ryan, Holly R. Barnard, and James Fownes. 2002. Age-related decline in forest ecosystem growth: An individual-tree, stand-structure hypothesis. Ecosystems 5:58–67.

Ryan, M. G., D. Binkley, and J. H. Fownes. 1997. Age-related decline in forest productivity: Pattern and process. Advances in Ecological Research 27:213–262.

Smith, F. W., and J. N. Long. 2001. Age-related decline in forest growth: An emergent property. Forest Ecology and Management 144:175–181.

Within the broad spectrum of forest climate science, proforestation has not been proven to be low cost, immediate, nor supportive of long-term resilience or long term carbon storage. It is a concept that requires more study, evaluation and comparison with other management alternatives over the wide variety of forest types and conditions found across our state. Our forests provide an expansive array of services, benefits, habitats and uses. Professional forest management has been practiced on public forest lands for decades, generating multiple-use benefits and the diverse assortment of forest conditions that support a resilient landscape. Proforestation approaches would likely be inappropriate strategies to maximize forest carbon sequestration and storage under many forest conditions in our state due to the resulting lack of resiliency and future losses of carbon due to future disturbances.

We can all agree that remnants of old growth forests should remain in passive management due to their rarity, and that minimal management activity might be appropriate for many years in some settings. A careful evaluation of current forest conditions, future growth trajectories, and management options using reliable carbon accounting methods (including assessments of other benefits and services from forest land) is what is needed; as opposed to the single, and unproven, suggestion of proforestation for all public forests.

# Signatories:

## Yankee Division and Connecticut Chapter Officers

Jeffrey S. Ward, PhD – Chair-Yankee Division, New England Society of American Foresters
Research scientist (forest dynamics) and certified forester with 41 years' experience

Lawrence Rousseau – Vice Chair-Yankee Division NESAF
CT DEEP Service Forester (retired) with 42 years' experience

Thomas E. Worthley, MS – Secretary/Treasurer-Yankee Division NESAF
UConn Associate Extension Professor with 45 years' experience

Joseph Orefice, PhD – Connecticut representative to New England Society of American Foresters (NESAF), CT certified forester with 13 years' experience

Frank Cervo, MF – Yankee Division NESAF
CT certified Forester with 7 years' experience

William R. Bentley PhD – Yankee Division NESAF
Retired faculty – UConn, SUNY ESF, Ford Foundation

Michael Ferrucci, MS – Consulting forester with 41 years' experience, including work on forestry issues in 37 states

Jerry Milne – Yankee Division NESAF, past Chair
CT certified Forester with 40 years' state experience

Andrea Urbano, MS (forest carbon) – Yankee Division NESAF
CT certified forester with 8 years' experience

Carol Youell, MS - Yankee Division NESAF, Natural Resources Administrator – MDC (retired)
CT certified Forester with 40+ year experience

To the Working Group:

I have read with interest the GC3 reports and I am heartened that our state is taking measures to address these issues. I would like to comment.

As a 26-year resident of Simsbury (and likely now a lifelong one) I have always appreciated my town's commitment to try to maintain the open spaces here, with all they contribute to the health of our ecosystem, our water, our wildlife, and, frankly, our mental wellbeing. I can't think of anywhere else I'd want to live.

As a biological anthropologist, with one focus on human ecology, I also recognize the importance of understanding the intimate relations among all aspects of the environment, not only in one time but through time. Changes that might seem immediately inconsequential can have lasting effects. And issues—such as the global climate change we are now experiencing—cannot be addressed with what amount to band-aid measures. The trends are already in place, in the complex matrix of interactions, and can take decades, if not more, to reverse. We must, based on the best science available, protect our environment, our water, our wildlife, and thus ourselves, *now*.

As ecologist Garrett Hardin put it, "You can never do merely one thing." We must look at the big picture. So I urge the council to take this big picture into account for our state, through the suggested plans. The New England region has been designated by the Global Safety Net as one of the top five ecoregions *in the world* that must be protected in order to try to stabilize our climate and, thus, our ecological relationships, for all species.

Sincerely,

Michael Alan Park, Ph.D.

Professor Emeritus, Central Connecticut State University

30 Woodhaven Drive

Simsbury, CT 06070

October 16, 2020

bioanthdoc@comcast.net

# Subject: GC3 draft report comments

**Judith H.Gott** <jgott.gott@everyactioncustom.com>
to DEEP ClimateChange

Sat, Oct 17, 6:05 PM





Dear Climate Change Bureau CT DEEP Climate Change Bureau,

Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals.

I particularly support these recommendations, and urge their inclusion in the final reports:

- Strengthen alignment between the state's decision-making and its greenhouse gas reduction goals. All regulatory decisions should be evaluated for consistency with meeting Global Warming Solutions Act targets.

- Move climate adaptation and resiliency measures—like nature-based solutions, forest and wetland protection, urban green infrastructure and tree planting, and making low/moderate income housing energy efficient and healthy—from demonstration project scale to widespread adoption and protection.

- Support robust, equitable state funding and financing (leveraged and matched by federal and local sources) for emissions reduction and adaptation programs. This is a large ($150-600 million/year) investment. Promising sources include:
  a) adopting the Transportation & Climate Initiative (up to $250 m/yr) and increasing the petroleum gross profits tax (~$100 m/yr). Connecticut can help ensure robust TCI implementation that drives down emissions while reinvesting auction proceeds in other high-impact and equitable programs;
  b) increasing or re-directing state bonding (up to $70 m/yr);

# Subject: GC3 draft report comments

**Alice Cruikshank** <pacruikshank@everyactioncustom.com>
to DEEP ClimateChange

Sat, Oct 17, 8:20 PM





Dear Climate Change Bureau CT DEEP Climate Change Bureau,

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  b) increasing or re-directing state bonding (up to $70 m/yr);

# Subject: GC3 draft report comments

**Alison Zyla** <barral11@everyactioncustom.com>
to DEEP ClimateChange

Sat, Oct 17, 7:34 PM





Dear Climate Change Bureau CT DEEP Climate Change Bureau,

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  b) increasing or re-directing state bonding (up to $70 m/yr);

# Subject: GC3 draft report comments

**Barbara Setlow** <bcsetlow@everyactioncustom.com>
to DEEP ClimateChange

Sat, Oct 17, 7:56 PM





Dear Climate Change Bureau CT DEEP Climate Change Bureau,

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  b) increasing or re-directing state bonding (up to $70 m/yr);

# Subject: GC3 draft report comments

**Carmela Garofalo** <carmelagarofalo26@everyactioncustom.com>
to DEEP ClimateChange

Sat, Oct 17, 6:56 PM



EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Climate Change Bureau CT DEEP Climate Change Bureau,

Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals.

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  b) increasing or re-directing state bonding (up to $70 m/yr);

# Subject: GC3 draft report comments

**David Sax** <davidmsax@everyactioncustom.com>
to DEEP ClimateChange

Sat, Oct 17, 8:11 PM





Dear Climate Change Bureau CT DEEP Climate Change Bureau,

We have all experienced what it is like to have our “normal” lives disrupted and if left unchecked, I fear the effects of climate change will lead to more of the same. The good news is that we have the collective ability to act and that doing so could be a huge opportunity for economic growth as well as cleaner air and water. The draft reports of the Governor’s Council on Climate Change work groups are an important step in achieving those goals.

I particularly support these recommendations, and urge their inclusion in the final reports:

- Strengthen alignment between the state’s decision-making and its greenhouse gas reduction goals. All regulatory decisions should be evaluated for consistency with meeting Global Warming Solutions Act targets.

- Move climate adaptation and resiliency measures—like nature-based solutions, forest and wetland protection, urban green infrastructure and tree planting, and making low/moderate income housing energy efficient and healthy—from demonstration project scale to widespread adoption and protection.

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  a) adopting the Transportation & Climate Initiative (up to $250 m/yr) and increasing the petroleum gross profits tax (~$100 m/yr). Connecticut can help ensure robust TCI implementation that drives down

UCONN
UNIVERSITY OF CONNECTICUT

Alec Shub <alec.shub@uconn.edu>

# FW: Comments: Progress on Mitigation Strategies WorkingGroup Draft Report

4 messages

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Mon, Oct 19, 2020 at 6:18 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Evans, Deane M. <deane.evans@njit.edu>
**Sent:** Saturday, October 17, 2020 12:03 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Comments: Progress on Mitigation Strategies WorkingGroup Draft Report



Dear Governor's Council on Climate Change

I am writing to provide comments on the Draft Report of the **Progress on Mitigation Strategies Working Group** that was released last month.

As an architect and Connecticut resident with a long commitment to sustainable design and construction, I am proud of our state's aggressive and forward-looking commitment to transition to a decarbonized economy and enhance the resiliency of the state's economic, cultural and natural resources to the impacts of climate change. In my experience, this commitment can only be achieved by equally forward-looking policies and standards that emphasize cost-efficient sustainability. The strategies described in the Draft Report are solid steps in this direction, and the following suggestions are made in the spirit of improving an already impressive, aspirational document.

Please note that my suggestions focus exclusively on Section 1. **Accelerate adoption of building thermal energy conservation improvements**.

Create Stretch Codes

I agree that stretch codes are helpful in "moving the dial" on building performance, but I would suggest that, to the extent possible, the strategies embedded in a potential stretch code be incorporated directly into the state building code as quickly as possible – to ensure maximum

impact. Stretch codes are typically voluntary and their impacts are often localized to early adopters. State codes, on the other hand, are mandatory and generate improvements across the state. If we are to reach GC3's ambitious goals in a timely matter, regularly updated state codes – that incorporate and eventually move beyond stretch code requirements – will be critical.

Reduce GHG Emissions from State and Municipal Buildings

I would expand the target audience for this initiative to include "State-Funded Buildings" as well – to increase the scope and impact of what is proposed.

Building Performance Office/Building Energy Concierge

I think this is a great idea and have seen it be successfully implemented in other EE programs.

Harness the Power of Data

This is also a great idea. As it moves forward, it may be helpful to structure data collection activities so that the resulting information can be useful to – and potentially used by – other, non-energy stakeholders. For example, I would imagine that detailed information on individual buildings could benefit police and fire departments, the real estate industry, the insurance industry, and a range of other entities and organizations across the state. Some of these may also be sources of funding for the data collection efforts.

Develop Capacity to Scale Up Deep Energy Retrofits

This is an important and ambitious goal. As part of efforts in this area, I would suggest placing significant emphasis on what is suggested in the 5th bullet: "…use phased approaches as building conditions/project support and allow comprehensive incentives to continue with project timing." This type of "opportunistic" energy retrofitting – incenting an action that a building owner is doing anyway (for example, re-roofing) to make sure that this action is as energy efficiently as possible – is a key to unlocking energy savings at scale in existing buildings. A common strategy in EE programs is to search for ways to implement deep energy retrofits "all at once." Unfortunately, this approach has resulted in little widespread success anywhere in the country. A "phase approach" as suggested in the Draft Report can achieve the same results only over a longer time frame. In addition, such an approach that takes advantage of what a building owner is going to do – and pay for – anyway results in much higher cost efficiencies than undertaking upgrades purely for the energy benefits.

Finally, I would suggest that the Report committee, as they move forward with their recommendations, strongly consider the inclusion of a strategy that could generate some form of "innovation lab" or "accelerator" that could position Connecticut at the forefront of the technological revolution that will be necessary to achieve GC3's decarbonization and economic development goals.

Thank you for your consideration

Deane Evans, FAIA

Fox Run Productions, LLC

8 Fox Run Road

Norwalk, CT 06850

**French, Rebecca** <Rebecca.French@ct.gov> Mon, Oct 19, 2020 at 6:22 PM
To: "bernard.pelletier@comcast.net" <bernard.pelletier@comcast.net>, "Pascua, Dino" <Ferdinand.Pascua@ct.gov>, "Howard, Jeff (DEEP)" <Jeff.L.Howard@ct.gov>, "Li, Michael" <Michael.Li@ct.gov>
Cc: "Shub, Alec" <alec.shub@uconn.edu>

*Message sent from a system outside of UConn.*

Hi Bernie,

We will get you a copy of all public comments related to the Progress on Mitigation Strategies Working Group, but the letter below was more detailed to Buildings than others I have seen.

Best,

Rebecca

[Quoted text hidden]

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**Bernard Pelletier** <Bernard.Pelletier@comcast.net> Mon, Oct 19, 2020 at 6:46 PM
To: "French, Rebecca" <Rebecca.French@ct.gov>
Cc: "Pascua, Dino" <Ferdinand.Pascua@ct.gov>, "Howard, Jeff (DEEP)" <Jeff.L.Howard@ct.gov>, "Li, Michael" <Michael.Li@ct.gov>, "Shub, Alec" <alec.shub@uconn.edu>

*Message sent from a system outside of UConn.*

Thank you Rebecca. This seems to be a really informed set of comments!
[Quoted text hidden]

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**Pascua, Dino** <Ferdinand.Pascua@ct.gov> Tue, Oct 20, 2020 at 7:32 AM
To: Bernard Pelletier <Bernard.Pelletier@comcast.net>, "French, Rebecca" <Rebecca.French@ct.gov>
Cc: "Howard, Jeff (DEEP)" <Jeff.L.Howard@ct.gov>, "Li, Michael" <Michael.Li@ct.gov>, "Shub, Alec" <alec.shub@uconn.edu>

*Message sent from a system outside of UConn.*

Consideration of Deane Evans' suggestion of a strategy for an innovation lab or accelerator should include a review of PURA's Docket No. 17-12-03RE05, PURA INVESTIGATION INTO DISTRIBUTION SYSTEM PLANNING OF THE ELECTRIC DISTRIBUTION COMPANIES – INNOVATIVE TECHNOLOGY APPLICATIONS AND PROGRAMS (INNOVATION PILOTS). on 5/6/2020, PURA issued an RFP for "a Consultant with expertise in and experience with: (1) electric utility regulatory sandboxes; (2) state-level programs for fostering electric sector innovation; (3) the development and design of state-level programs and processes, including metrics for determining program success and strategies for evaluating prospective innovative technology applications; and (4) state public utility commissions." According to the RFP, "[t]he Consultant will be treated as an extension of Authority staff for functional purposes. The Consultant will assist in developing a structure that can support the ongoing development and deployment of all forms of innovative

technology applications and programs in Connecticut by leveraging lessons learned from Connecticut's EEP Program, as well as from electric utility regulatory sandboxes and programs in other jurisdictions designed to foster electric sector innovation."

PURA received four responses to the RFP. I'm not aware of a selection being made, but the RFP indicates that the selected consultant would assist PURA with a straw proposal, which has not been issued at this time.

**Dino Pascua**
Associate Rate Specialist
Office of Energy Supply
Bureau of Energy and Technology Policy
Connecticut Department of Energy and Environmental Protection
Ten Franklin Square, New Britain, CT 06051
P: 860.827.2633 | E: ferdinand.pascua@ct.gov

---

**From:** Bernard Pelletier <Bernard.Pelletier@comcast.net>
**Sent:** Monday, October 19, 2020 6:46 PM
**To:** French, Rebecca <Rebecca.French@ct.gov>
**Cc:** Pascua, Dino <Ferdinand.Pascua@ct.gov>; Howard, Jeff (DEEP) <Jeff.L.Howard@ct.gov>; Li, Michael <Michael.Li@ct.gov>; Shub, Alec <alec.shub@uconn.edu>
**Subject:** Re: Comments: Progress on Mitigation Strategies WorkingGroup Draft Report

[Quoted text hidden]

# Subject: GC3 draft report comments

**Elisabeth Brivic** <ebrivic@everyactioncustom.com>
to DEEP ClimateChange

Sat, Oct 17, 10:57 PM





Dear Climate Change Bureau CT DEEP Climate Change Bureau,

Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals.

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  b) increasing or re-directing state bonding (up to $70 m/yr);

# Subject: GC3 draft report comments

**Elizabeth Gibbs** <tishgibbs35@everyactioncustom.com>
to DEEP ClimateChange

Sat, Oct 17, 5:17 PM





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# Subject: GC3 draft report comments

**Ellen Vitolo** <Lnv65@everyactioncustom.com>
to DEEP ClimateChange

Sat, Oct 17, 5:14 PM





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# Subject: GC3 draft report comments

**George Ryan** <george_e_ryan@everyactioncustom.com>
to DEEP ClimateChange

Sat, Oct 17, 6:04 PM





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  b) increasing or re-directing state bonding (up to $70 m/yr);

# Subject: GC3 Comments

**Helder Prata** <info@everyactioncustom.com>
to DEEP ClimateChange

Sat, Oct 17, 9:17 AM





Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.
5. Increase tax on all fossil fuel vehicles and equipment sold in CT
6. Create tax deductions for electric vehicles and other equipment like landscaping machines.
7. Incentivize stores to install more quick charging stations for electric vehicles.
8. Change all street and traffic lights to be solar powered
9. Ban single use plastics
10. Tax goods that are packaged in plastic.
11. Require all gas stations to take back old gas and mixed fuel for 2 stroke engines.
12. Tax all wholesale electric that is produced by fossil fuels
13 tax all beef products
14. Tax people who own a second home in CT for out of state cars! Many people avoid paying their fair share by registering their cars out of state and lie about live here in ct part time.

Comments on the G3 Forests Subgroup Draft Report
From: Jane Seymour, Wildlife Biologist
October 17, 2020

Thank you for the opportunity to comment on the Forests Sub-Group Draft Report. As a wildlife biologist who cares about the existence of the full array of Connecticut's native wildlife, I must speak out against the sections of this report that recommend stopping forest management. These recommendations would not only harm many species of Connecticut's native wildlife, it would do so with no benefit to climate mitigation.

Protecting undeveloped lands from land-use change is certainly important in order to sequester carbon. However, the management of forests should not be misconstrued as land-use change. It should also be noted that protecting non-forested natural lands, such as grasslands and shrublands, is also important.

The Forest Subgroup Report has many beneficial recommendations, such as protecting natural and working lands from conversion to development, and promoting strong markets for local forest products. Setting aside some forest areas with little or no forest management is a great idea, but greatly reducing forest management in general, and wildlife habitat management in particular, will have only negative consequences.

Below are comments pertaining to specific segments of the Report. Some of these segments suggest that stopping forest management will mitigate climate change, however the cited references do not support these claims. Therefore, as stated above, if forest management was limited to the extent recommended in this report, it would have significant negative impacts to many of Connecticut's native species, without any real climate mitigation benefits. In addition, greatly limiting forest management would have a negative impact to Connecticut's economy and would lead to greater carbon emissions due to forest products being imported from elsewhere.

Additional comments not related to wildlife habitat or forest management are also included below.

Comments are in order that they appear in the Report.

Black – from Forest Sub-Group Report
Red – my comments
Highlighted – citation numbers
Purple – from citations
**Bold** and CAPS are my emphasis

Page 1. In its 2018 report, Building a Low Carbon Future for Connecticut: Achieving a 45% GHG Reduction by 2030,1 the Governor's Council on Climate Change (GC3) recognized natural and working lands as important carbon sinks … This 2018 report supports working lands and does not imply that timber harvests should be stopped: "Natural and working lands consist of forests, farms, rangelands, and wetlands that sequester carbon and support Connecticut's economy, communities, and ecosystems. Collectively, these lands provide us with an important carbon sink."

Page 1. The GC3 recommended that Connecticut continue to work with non-governmental organizations like the U.S. Climate Alliance in efforts to regionally develop carbon sequestration and storage practices.3 This citation from the U.S. Climate Alliance includes a recommendation to: "adopt practices that increase **long-term** carbon sequestration in forests and **forest products**;" This is a great recommendation and identifies the importance of forest products in storing carbon. It does not imply that harvesting trees should stop. Forest management, for forest products or wildlife habitat, results in long-term carbon sequestration.

I agree with the above wording from the Forest Subgroup Report. My point is that these statements should not be misconstrued to argue for stopping forest management.

The specific recommendations to stop forest management are further in this Report (see below). These recommendations have no basis in science and would be harmful to wildlife, as well as to Connecticut's economy, and would not provide any meaningful climate mitigation benefits.

Page 11. Forests Benefit Wildlife
…**Butterflies and insect pollinators** help ensure that same vegetation produces the next generation of life-supporting trees. This section describes only mature forest, but so many of our **butterflies and insect pollinators** depend on an abundance of flowering plants that are found in grasslands and shrublands. In fact, a study conducted by Wagner et. al (2003) found that state-listed butterflies and moths in Connecticut depend on shrublands more than any other habitat, and that mechanical cutting and prescribed fire are now necessary to maintain habitat for these butterflies and moths. Plus, most native bees nest underground in open sunny areas with little vegetation. Mature forest is one type of habitat for one suite of wildlife. Let's not ignore the plants, birds, mammals, reptiles and thousands of insects that cannot exist without early stages of forest succession such as shrublands and young forest.

Page 19. Forest Management Approaches ● Increase the reserve (passive management) acreage in the state to promote local and landscape/regional resilience (e.g., as buffers against extinction/extirpation2) and to provide controls to assess the outcomes of experimental manipulations. Reference 2 is a link to a page of links to Greenhouse Gas Reduction reports:
https://portal.ct.gov/DEEP/Climate-Change/CT-Greenhouse-Gas-Inventory-Reports
How does this support the recommendation to limit forest management?

Providing buffers against extinction/extirpation requires providing habitat. Stopping wildlife habitat management would lead to extinction/extirpation.

Page 23. Recreational trail payments to landowners for public access on private lands. Since the purpose is to sequester carbon, the payment should be to maintain their land in an undeveloped state. Landowners may be reluctant to enter an agreement that requires allowing access, especially if they are concerned about wildlife (see comments for page 25 below).

Page 24. Available climate mitigation solutions in forests

- Avoided conversion of forest to non-forest sustains the mitigation value of forests and is a prerequisite for both proforestation and improved forest management.86
    - Avoiding conversion of forest to non-forest is good, but does not mean stopping forest management. Interesting note – this reference also emphasizes the importance of protecting grasslands, and converting low-productivity croplands to perennial grasses for both energy and carbon sequestration.
- Proforestation (natural forest growth in areas protected from timber harvesting) is likely the most effective solution to preserve and foster further growth of accumulated carbon storage in woodlands.87,88,89
    - "Proforestation" is NOT the most effective solution according to the reference cited by Moomaw, Faison and Masino (87). In their Proforestation paper, Moomaw, Faison and Masino cite Houghton and Nassikas who claim that: "Stopping harvest may NOT be the most effective strategy for managing carbon . . . but harvesting for long-lasting wood products could result in greater carbon storage on land." Houghton and Nassikas specify that stopping **tropical deforestation** and expanding forests **in the tropics** can lead to significant negative emissions, but this was not the case for expanding forests in boreal and temperate zones.
    - Houghton and Nassikas also state that "the net flux [of emissions] may be nearly zero if the same lands are used over and over" in other words, harvesting timber and allowing the forest to regrow results in a net emission of zero over time. Remember, the U.S. Climate Alliance advocates for adopting practices that increase **long-term** carbon sequestration
    - In support of proforestation (areas protected from timber harvesting), Moomaw et. al cite research in the tropics that finds that "natural forests hold 40 times more carbon than plantations." Managed forests should not be misconstrued as plantations. Plantations and managed forests are two completely different things.
    - Cantanzaro and D'Amato (89) state that while passive management may store more carbon in the short term, it may reduce resiliency in the face of disturbance – "Though active forest management would temporarily reduce the amount of carbon stored in the forest, it may help prevent an even larger reduction in carbon storage by avoiding losses due to a large-scale disturbance." This publication also shows how younger forests (20-

70 years old) take more carbon out of the atmosphere than older forests. This is part of the climate mitigation equation. Again, the U.S. Climate Alliance advocates for adopting practices that increase **long-term** carbon sequestration

- Mitigation-focused forest management – (e.g., **extending rotation periods** and retaining more and larger trees) has important potential to retain carbon storage on managed lands, while providing long-lived wood products.
    - There is no reference here, but if Moomaw et. al (see above) is being used for this justification, it should be noted that this paper cites Law et. al (2018) to advocate extending harvest cycles on public land in the Northwest. The Northwest harvest rotation in Law's paper is 45 years. The paper recommends a rotation of 80 years, which is already typical for CT.
    - Moomaw's paper also ignores the increased carbon capture rate of young forests vs older forests (see above).

- Reforestation (conversion from non-forest to forest) generally has the highest potential rate of carbon dioxide sequestration among these four solutions.
    - Sounds great, but where will this be done? Certainly not on grasslands, shrublands or other non-forest habitats as this would destroy entire ecosystems! Perhaps cities could accommodate more trees.
- A combination of avoided conversion, proforestation, and mitigation-focused forest management is critical to maintain these carbon stocks.91
    - Don't have access to this journal, but this is from the abstract: "considering carbon storage on land as a means to 'offset' $CO_2$ emissions from burning fossil fuels (an idea with wide currency) is scientifically flawed. The capacity of terrestrial ecosystems to store carbon is finite and the current sequestration potential primarily reflects depletion due to past land use." Therefore, this paper appears to be saying that proforestation will not offset carbon emissions.
- Temperate deciduous forests typically develop structural complexity naturally as they age and are exposed to moderate severity disturbances; this complexity can lead to greater carbon sequestration that helps maintain carbon storage in mature forests well beyond the 100-year mark.97 98
    - Domke et al (98) state that "**Most of the North American carbon sink is in temperate U.S. forests that are managed relatively intensively for wood products and other services**, indicating that managed forests typically are maintained with a lower stand density and lower carbon stocks than mature forests but have potentially higher growth rates." Our middle-aged forests in Connecticut typically lack structural complexity, but forest management is a way to mimic the natural disturbances that created that complexity. Natural disturbances such as wildfires and beaver flooding are controlled so we must depend on forest management to create forest layers and forest stages.

Page 25

- Recent surveys of private forestland owners suggest a relatively low interest in timber harvests on their land with their top reasons for owning their woodlands being to enjoy the beauty and scenery, followed by privacy, home, and protecting wildlife habitat, nature, and biological diversity.
    - This report states that 59% of CT woodland owners "assign high importance to benefits such as beauty, **biodiversity**, privacy, hunting and recreation." Improving biodiversity can be achieved through forest management.
    - 10% "gives the highest importance ratings to all reasons for owning woodland." Including financial. 5% are mostly interested in the financial benefit of owning woodland. That relatively few people are interested solely in the financial benefit of owning woodland is not a good reason to reduce forest management on state lands.

Page 27.

- increase forest cover to safely above 60% of the state's land area with reforestation (defined here as conversion of land from non-forest to forest) – This is great as long as it is not converting critical or early stage habitats such as grasslands or shrublands.
- This increase in forest land cover could be achieved through natural forest succession on currently unforested land in residential, rural, and urban areas (i.e., grass and turf, reclaimed and remediated lands, marginal and abandoned fields) – Again, let's leave some early stage habitat for wildlife, especially abandoned fields.
- It could also be achieved by deliberate re-plantings (as needed), - Connecticut's forests are adapted to disturbances and should be able to regrow on their own. If planting is deemed necessary, make sure the source is native, local ecotype.

Page 28.

- Develop educational programs … on the climate mitigation benefits of reforesting urban and settled areas – this sounds great but how will this affect homes and businesses that use or plan to use solar panels? Perhaps keep re-growing trees in urban and settled area that can be used for fuel or other wood products?
- Greatly reduce clear-cutting of mature forests as a habitat management practice benefiting young forest species. It would be irresponsible to eliminate thousands of native species (including many pollinators) from Connecticut! If we think about the reasons for why it is so important to combat climate change, one of the top reasons is to protect biodiversity. To wipe out native species in the name of saving nature is totally senseless. Plus, it has already been established, by references cited in this document, that cutting and re-growing forests results in long-term emissions close to zero, and maintaining young forest on the landscape increases resiliency which can "prevent an even larger reduction in carbon storage by avoiding losses due to a large-scale disturbance." In addition, at least 26 species of birds in Connecticut that nest in mature forest depend on young forest for finding food after the young leave the nest. These birds must find enough food to fuel their migration. In other words, birds that nest in mature

forest must then find food in young forest, and there must be enough young forest to provide for both mature forest and young forest species.

Why the attack on young forest and young forest species? These habitats and their associated species have existed in Connecticut for thousands of years, but now there is less land in these early stages of forest than when the settlers first arrived. But since we don't see young forest (because it has become far less common), we don't think of it as attractive. Plus we hear about deforestation in the tropics which is having terrible consequences for wildlife and the climate. Deforestation is not the same as managing forests. Deforestation means converting forest to another type of land use such as agriculture or cities and suburbs. We need to keep all of Connecticut's native species by maintaining all of Connecticut's native habitats. And, I will repeat, it has already been established, by references cited in this document, that cutting and re-growing forests results in long-term emmissions close to zero, and maintaining young forest on the landscape increases resiliency which can "prevent an even larger reduction in carbon storage by avoiding losses due to a large-scale disturbance."

- Establish financial incentives for landowners who allow their lawns or abandoned fields to reforest. – or revert to native wildflowers and shrubs which also stores carbon and provides important habitat, including habitat for pollinators which are in serious decline!
- Proforestation (defined as continuous forest growth in natural areas protected from timber harvesting) is the most effective solution to preserve accumulated carbon storage and enable it to continue to increase.126 – Again, this cites Moomaw et. al whose reference contradicts this statement (see comments for page 24). The reference cited in Moomaw's paper actually states that : "Stopping harvest may NOT be the most effective strategy... but harvesting for long-lasting wood products could result in greater carbon storage on land."
- Since 1927, the USDA Forest Service has established over 430 Research Natural Areas (RNAs) across the nation where commercial harvests and salvage logging are excluded and where natural processes predominate.127 – this fails to mention that many of these areas are protected because they contain unique habitats such as barrens, glades, dunes, prairie and meadows.

Page 29. This section stresses the need to protect core forests. Core forests are important, however core forest should not in any way be misconstrued to mean unmanaged forest. Core forest means unfragmented forest. UConn CLEAR's Forest Fragmentation Project defines core forest as "relatively undisturbed by development". As has been stated previously, forests that contain a diversity of forest stages are more resilient and provide for more diversity. Certain areas of core forest could certainly be left alone as control areas. It should be noted, since trails are mentioned several times in this report, that the development of recreational trails should be steered away from core forest as trails create consistent, on-going negative impacts to wildlife (see bullet 4 on page 17 of the Report).

As mentioned in my introduction, the G3 Forests Sub-Group Draft Report contains important recommendations such as protecting natural and working lands, and promoting strong markets for local forest products. However, to reiterate, stopping

wildlife habitat management will not only harm so many of Connecticut's native species, it will do so with no benefit to climate mitigation.

Greatly reducing wildlife habitat management will greatly reduce the diversity of species in Connecticut, both plants and animals. Where do you find the monarch butterfly? Not in mature forest. Where do you find milkweed, the monarch caterpillar's host plant? Not in mature forest. Where do you find the bees that pollinate our food crops? Not in mature forest. The vast majority of the undeveloped land in Connecticut will continue to be mature forest, but we must not boot out the thousands of Connecticut's native species (including plants and insects) that depend on young stages of forest.

Greatly reducing wildlife habitat management will not only harm young-forest animals, it will also take away vital habitat from mature-forest species. Deep-forest birds like wood thrush and ovenbird depend on young forest habitat after the chicks have fledged. They need the nutritious food that young forests provide in order to survive their long journeys south.

The Cornell Lab of Ornithology and other bird conservation organizations are trying to bring young forest habitat back to the landscape in order to stop the downward trend of many bird populations. This graphic from the Lab's website illustrates the need for both new and old forest for the survival of both young-forest birds and mature-forest birds. https://www.allaboutbirds.org/news/old-growth-is-great-but-heres-why-we-need-new-growth-forests-too/


Landscapes with a mosaic of young and mature forest offer habitat for different birds at different stages. For example, Golden-winged Warblers nest in young forest but move their fledglings to older forest to feed on insects before their first migration. Meanwhile, Wood Thrushes nest in mature forest and move their fledglings to younger forest to feast on berries and fruits. *Graphic by Bartels Science Illustrator Phillip Krzeminski.*

Native species that would fade away from Connecticut without young forest stages:
Eastern towhee, monarch butterfly, fireflies, field sparrow, metallic green sweat bee, box turtle, prairie warbler, New England cottontail, indigo bunting, willow flycatcher, hog-nosed snake, silver-spotted skipper, hummingbird clearwing moth, spring azure butterfly, American kestrel, song sparrow, common yellowthroat, flower beetles, flower flies, milkweed, milkweed bugs, milkweed beetle, American lady butterfly, buckeye butterfly, golden digger wasps, American woodcock, alder flycatcher, wood turtle, viceroy butterfly, mason bee, orchard bee, bumble bees, brown thrasher, black-and white warbler, gray catbird, six-spotted tiger beetle, ruffed grouse, mountain mint, wild bergamot, early goldenrod, blue-stem goldenrod, showy goldenrod, seaside goldenrod, brown-hooded owlet, short-eared owl, butterfly milkweed, black swallowtail butterfly, bluebird, tree swallow, hobomok skipper butterfly, great-spangled fritillary butterfly, calico American-aster, small white American-aster, New England American-aster, tall white-aster, New York American-aster, blue-winged warbler, cecropia moth, Baltimore checkerspot butterfly, meadowhawk dragonflies, Joe-pye weed, New York ironweed, whip-poor-will, green darner dragonfly, smooth green snake, white-throated sparrow, Carolina rose, blackberry, black raspberry, eastern kingbird, white-eyed vireo, crickets, grasshoppers, killdeer, meadow jumping mouse, spicebush swallowtail butterfly, eastern tiger swallowtail butterfly, eastern red-cedar, common evening primrose, wild geranium, northern black racer, chestnut-sided warbler, purple lovegrass, hawthorn, spring beauty, meadow beauty, pearl crescent butterfly, red admiral butterfly, pitch pine, maleberry, pearly everlasting, blue dasher dragonfly, squash bees, American copper butterfly, deer tongue, pin cherry, dogbane, dogbane beetle…to name just a few.

In short, I strongly agree with the Report's recommendations to protect Connecticut's natural and working lands, and to promote local, long-lasting wood products. We must also protect the full array of Connecticut's wildlife and habitats.

Thank you for your consideration,

*Jane Seymour*

# Subject: GC3 Comments

**Jennifer Starble** <jenstarble@everyactioncustom.com>
to DEEP ClimateChange

Sat, Oct 17, 9:00 AM





Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Jennifer Starble
245 Steele Rd  New Hartford, CT 06057-2616
jenstarble@sbcglobal.net

# Subject: GC3 draft report comments

**Jocelyn Lillis** <celynwmn@everyactioncustom.com>
to DEEP ClimateChange

Sat, Oct 17, 5:57 PM





Dear Climate Change Bureau CT DEEP Climate Change Bureau,

Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals.

I particularly support these recommendations, and urge their inclusion in the final reports:

- Strengthen alignment between the state's decision-making and its greenhouse gas reduction goals. All regulatory decisions should be evaluated for consistency with meeting Global Warming Solutions Act targets.

- Move climate adaptation and resiliency measures—like nature-based solutions, forest and wetland protection, urban green infrastructure and tree planting, and making low/moderate income housing energy efficient and healthy—from demonstration project scale to widespread adoption and protection.

- Support robust, equitable state funding and financing (leveraged and matched by federal and local sources) for emissions reduction and adaptation programs. This is a large ($150-600 million/year) investment. Promising sources include:
  a) adopting the Transportation & Climate Initiative (up to $250 m/yr) and increasing the petroleum gross profits tax (~$100 m/yr). Connecticut can help ensure robust TCI implementation that drives down emissions while reinvesting auction proceeds in other high-impact and equitable programs;
  b) increasing or re-directing state bonding (up to $70 m/yr);

# Subject: GC3 Comments

**John Curotto** <jncurotto@everyactioncustom.com>
to DEEP ClimateChange

Sat, Oct 17, 8:34 AM





Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

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3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Mr. John Curotto
621 Quinebaug Rd  Quinebaug, CT 06262-7723
jncurotto@yahoo.com

# Subject: GC3 draft report comments

**Kevin Banach** <k.banach@everyactioncustom.com>
to DEEP ClimateChange

Sat, Oct 17, 5:31 PM





Dear Climate Change Bureau CT DEEP Climate Change Bureau,

Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals.

I particularly support these recommendations, and urge their inclusion in the final reports:

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  b) increasing or re-directing state bonding (up to $70 m/yr);

# Subject: GC3 draft report comments

**Laura McMillan** <mcmillan.laura@everyactioncustom.com>
to DEEP ClimateChange

Sat, Oct 17, 5:02 PM





Dear Climate Change Bureau CT DEEP Climate Change Bureau,

Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals.

I particularly support these recommendations, and urge their inclusion in the final reports:

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- Move climate adaptation and resiliency measures—like nature-based solutions, forest and wetland protection, urban green infrastructure and tree planting, and making low/moderate income housing energy efficient and healthy—from demonstration project scale to widespread adoption and protection.

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  b) increasing or re-directing state bonding (up to $70 m/yr);

# Subject: GC3 draft report comments

**Mary Pelletier** <Maryp@everyactioncustom.com>
to DEEP ClimateChange

Sat, Oct 17, 11:06 PM





Dear Climate Change Bureau CT DEEP Climate Change Bureau,

Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals. I agree with the following recommendations be included in the final reports:

- Strengthen alignment between the state's decision-making and its greenhouse gas reduction goals. All regulatory decisions should be evaluated for consistency with meeting Global Warming Solutions Act targets.

- Move climate adaptation and resiliency measures—like nature-based solutions, forest and wetland protection, urban green infrastructure, PLANT NATIVE UNDERSTORY VEGETATION THAT CAN RE-ESTABLISH WILDLIFE AND BIRD HABITAT and MINIMIZE MOWING IN ORDER FOR FOREST ECOSYSTEMS TO REGENERATE NATURALLY, and making low/moderate income housing energy efficient and healthy—from demonstration project scale to widespread adoption and protection.

- Support robust, equitable state funding and financing (leveraged and matched by federal and local sources) for emissions reduction and adaptation programs. This is a large ($150-600 million/year) investment. Promising sources include:
  a) adopting the Transportation & Climate Initiative (up to $250 m/yr) and increasing the petroleum gross profits tax (~$100 m/yr). Connecticut can help ensure robust TCI implementation that drives down emissions while reinvesting auction proceeds in other high-impact and equitable programs;
  b) increasing or re-directing state bonding (up to $70 m/yr);

# Subject: GC3 draft report comments

**Patrick McCann** <pjmccann3@everyactioncustom.com>
to DEEP ClimateChange

Sat, Oct 17, 10:57 PM





Dear Climate Change Bureau CT DEEP Climate Change Bureau,

Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals.

I particularly support these recommendations, and urge their inclusion in the final reports:

- Strengthen alignment between the state's decision-making and its greenhouse gas reduction goals. All regulatory decisions should be evaluated for consistency with meeting Global Warming Solutions Act targets.

- Move climate adaptation and resiliency measures—like nature-based solutions, forest and wetland protection, urban green infrastructure and tree planting, and making low/moderate income housing energy efficient and healthy—from demonstration project scale to widespread adoption and protection.

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  b) increasing or re-directing state bonding (up to $70 m/yr);

# Subject: GC3 draft report comments

**Paula Bacolini** <pbacolini@everyactioncustom.com>
to DEEP ClimateChange

Sat, Oct 17, 5:14 PM



EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Climate Change Bureau CT DEEP Climate Change Bureau,

Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals.

I particularly support these recommendations, and urge their inclusion in the final reports:

- Strengthen alignment between the state's decision-making and its greenhouse gas reduction goals. All regulatory decisions should be evaluated for consistency with meeting Global Warming Solutions Act targets.

- Move climate adaptation and resiliency measures—like nature-based solutions, forest and wetland protection, urban green infrastructure and tree planting, and making low/moderate income housing energy efficient and healthy—from demonstration project scale to widespread adoption and protection.

- Support robust, equitable state funding and financing (leveraged and matched by federal and local sources) for emissions reduction and adaptation programs. This is a large ($150-600 million/year) investment. Promising sources include:
  a) adopting the Transportation & Climate Initiative (up to $250 m/yr) and increasing the petroleum gross profits tax (~$100 m/yr). Connecticut can help ensure robust TCI implementation that drives down emissions while reinvesting auction proceeds in other high-impact and equitable programs;
  b) increasing or re-directing state bonding (up to $70 m/yr);

# Subject: GC3 Comments

**Philip Dooley** <philip.dooley@everyactioncustom.com>
to DEEP ClimateChange

Sat, Oct 17, 12:25 AM





Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.
5. Build more windmills and solar farms.

Thank you again for the opportunity to submit comments.

Stop Global Warming NOW, or nothing else we do will matter.

Sincerely,
Mr. Philip Dooley
192 Goose Ln  Tolland, CT 06084-3821
philip.dooley@snet.net

# Subject: GC3 draft report comments

**Philip Dooley** <philip.dooley@everyactioncustom.com>
to DEEP ClimateChange

Sat, Oct 17, 9:08 PM



EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Climate Change Bureau CT DEEP Climate Change Bureau,

Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals.

I particularly support these recommendations, and urge their inclusion in the final reports:

- Strengthen alignment between the state's decision-making and its greenhouse gas reduction goals. All regulatory decisions should be evaluated for consistency with meeting Global Warming Solutions Act targets.

- Move climate adaptation and resiliency measures—like nature-based solutions, forest and wetland protection, urban green infrastructure and tree planting, and making low/moderate income housing energy efficient and healthy—from demonstration project scale to widespread adoption and protection.

- Support robust, equitable state funding and financing (leveraged and matched by federal and local sources) for emissions reduction and adaptation programs. This is a large ($150-600 million/year) investment. Promising sources include:
  a) adopting the Transportation & Climate Initiative (up to $250 m/yr) and increasing the petroleum gross profits tax (~$100 m/yr). Connecticut can help ensure robust TCI implementation that drives down emissions while reinvesting auction proceeds in other high-impact and equitable programs;
  b) increasing or re-directing state bonding (up to $70 m/yr);

# Subject: GC3 draft report comments

**Richard Stanley** <rjacksonstanley@everyactioncustom.com>
to DEEP ClimateChange

Sat, Oct 17, 5:42 PM





Dear Climate Change Bureau CT DEEP Climate Change Bureau,

Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals.

I particularly support these recommendations, and urge their inclusion in the final reports:

- Strengthen alignment between the state's decision-making and its greenhouse gas reduction goals. All regulatory decisions should be evaluated for consistency with meeting Global Warming Solutions Act targets.

- Move climate adaptation and resiliency measures—like nature-based solutions, forest and wetland protection, urban green infrastructure and tree planting, and making low/moderate income housing energy efficient and healthy—from demonstration project scale to widespread adoption and protection.

- Support robust, equitable state funding and financing (leveraged and matched by federal and local sources) for emissions reduction and adaptation programs. This is a large ($150-600 million/year) investment. Promising sources include:
  a) adopting the Transportation & Climate Initiative (up to $250 m/yr) and increasing the petroleum gross profits tax (~$100 m/yr). Connecticut can help ensure robust TCI implementation that drives down emissions while reinvesting auction proceeds in other high-impact and equitable programs;
  b) increasing or re-directing state bonding (up to $70 m/yr);

# Subject: GC3 Comments

**Royal Graves** <royal5@everyactioncustom.com>
to DEEP ClimateChange

Sat, Oct 17, 9:32 AM





Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Mr. Royal Graves
21 Prospect St  Wethersfield, CT 06109-3756
royal5@cox.net

# Subject: GC3 draft report comments

**shirley mccarthy** <shirley.mccarthy@everyactioncustom.com>
to DEEP ClimateChange

Sat, Oct 17, 6:35 PM



EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Climate Change Bureau CT DEEP Climate Change Bureau,

Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals.

I particularly support these recommendations, and urge their inclusion in the final reports:

- Strengthen alignment between the state's decision-making and its greenhouse gas reduction goals. All regulatory decisions should be evaluated for consistency with meeting Global Warming Solutions Act targets.

- Move climate adaptation and resiliency measures—like nature-based solutions, forest and wetland protection, urban green infrastructure and tree planting, and making low/moderate income housing energy efficient and healthy—from demonstration project scale to widespread adoption and protection.

- Support robust, equitable state funding and financing (leveraged and matched by federal and local sources) for emissions reduction and adaptation programs. This is a large ($150-600 million/year) investment. Promising sources include:
  a) adopting the Transportation & Climate Initiative (up to $250 m/yr) and increasing the petroleum gross profits tax (~$100 m/yr). Connecticut can help ensure robust TCI implementation that drives down emissions while reinvesting auction proceeds in other high-impact and equitable programs;
  b) increasing or re-directing state bonding (up to $70 m/yr);

# Subject: GC3 draft report comments

**Stephen Aulenbach** <sjaulenbach@everyactioncustom.com>
to DEEP ClimateChange

Sat, Oct 17, 9:55 PM





Dear Climate Change Bureau CT DEEP Climate Change Bureau,

Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals.

I particularly support these recommendations, and urge their inclusion in the final reports:

- Strengthen alignment between the state's decision-making and its greenhouse gas reduction goals. All regulatory decisions should be evaluated for consistency with meeting Global Warming Solutions Act targets.

- Move climate adaptation and resiliency measures—like nature-based solutions, forest and wetland protection, urban green infrastructure and tree planting, and making low/moderate income housing energy efficient and healthy—from demonstration project scale to widespread adoption and protection.

- Support robust, equitable state funding and financing (leveraged and matched by federal and local sources) for emissions reduction and adaptation programs. This is a large ($150-600 million/year) investment. Promising sources include:
  a) adopting the Transportation & Climate Initiative (up to $250 m/yr) and increasing the petroleum gross profits tax (~$100 m/yr). Connecticut can help ensure robust TCI implementation that drives down emissions while reinvesting auction proceeds in other high-impact and equitable programs;
  b) increasing or re-directing state bonding (up to $70 m/yr);

# Subject: GC3 draft report comments

**Susan marlatt** <susan.marlatt@everyactioncustom.com>
to DEEP ClimateChange

Sat, Oct 17, 8:38 PM





Dear Climate Change Bureau CT DEEP Climate Change Bureau,

Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals.

I particularly support these recommendations, and urge their inclusion in the final reports:

- Strengthen alignment between the state's decision-making and its greenhouse gas reduction goals. All regulatory decisions should be evaluated for consistency with meeting Global Warming Solutions Act targets.

- Move climate adaptation and resiliency measures—like nature-based solutions, forest and wetland protection, urban green infrastructure and tree planting, and making low/moderate income housing energy efficient and healthy—from demonstration project scale to widespread adoption and protection.

- Support robust, equitable state funding and financing (leveraged and matched by federal and local sources) for emissions reduction and adaptation programs. This is a large ($150-600 million/year) investment. Promising sources include:
  a) adopting the Transportation & Climate Initiative (up to $250 m/yr) and increasing the petroleum gross profits tax (~$100 m/yr). Connecticut can help ensure robust TCI implementation that drives down emissions while reinvesting auction proceeds in other high-impact and equitable programs;
  b) increasing or re-directing state bonding (up to $70 m/yr);

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Mon, Oct 19, 2020 at 6:18 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: pipman77-news@everyactioncustom.com <pipman77-news@everyactioncustom.com>
Sent: Saturday, October 17, 2020 2:56 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Wayne Pipke
41 Fern St  Rocky Hill, CT 06067-2014
pipman77-news@yahoo.com

# Subject: Prevent the Destruction of America's Final Hope for Conservation

**Abz Kearney** <ann.nourishnaturally@gmail.com>
to DEEP ClimateChange

Sun, Oct 18, 6:06 PM



To Whom it may concern,

We are lifelong CT residents and the things that we most appreciate about our state are it's water resources, clean air, and forests. Those are the reasons that we decided to raise our three children in CT. With the current climate emergency, it is more important than ever to protect our natural resources. Connecticut can and should be a global leader in natural resource protection. We should be focused on proforestation.

We need 21% of the state protected from development. We need a strategic landscape plan for a balance among research, responsible resource production, and sufficient and connected nature preserves to protect our headwaters, special habitats, core forests, old-growth, and corridors!

Sincerely,

William and Ann Kearney

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 draft report comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 9:19 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: koepfer@everyactioncustom.com <koepfer@everyactioncustom.com>
Sent: Sunday, October 18, 2020 9:56 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 draft report comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Climate Change Bureau CT DEEP Climate Change Bureau,

Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals.

I particularly support these recommendations, and urge their inclusion in the final reports:

- Better align the state's decision-making with GHG reduction goals. All regulatory decisions should be evaluated for meeting Global Warming Solutions Act targets. ANY GRANT MONEY OR REIMBURSEMENT (eg STEAP grants, Urban Center grants, block grants etc.) SHOULD BE UNDER THE CONDITION THAT THE FUNDED PROJECT CONFORMS AND COMPLIES TO GHG GOALS.

- Move climate adaptation and resiliency measures—like nature-based solutions, forest and wetland protection, urban green infrastructure and tree planting, and making low/moderate income housing energy efficient and healthy—from demonstration project scale to widespread adoption and protection.

- Support robust, equitable state funding and financing (leveraged and matched by federal and local sources) for emissions reduction and adaptation programs. This is a large ($150-600 million/year) investment. Promising sources include:
  a) adopting the Transportation & Climate Initiative (up to $250 m/yr) and increasing the petroleum gross profits tax (~$100 m/yr). Connecticut can help ensure robust TCI implementation that drives down emissions while reinvesting auction proceeds in other high-impact and equitable programs;
  b) increasing or re-directing state bonding (up to $70 m/yr);
  c) adopting the Maryland "flush tax" model (up to $75 m/yr).

- Reduce stormwater pollution and flooding, and help municipalities afford green infrastructure and resiliency investments, by passing statewide enabling legislation for stormwater authorities.

- Target future building projects to already-developed areas, and prioritize the conservation and preservation of naturally-resilient coastal marsh, dunes, and forests.

- Develop and fund a community engagement strategy, including grants for community-based NGOs partners and ensuring environmental justice needs are met.

- INCLUDE FUNDING FOR ELECTRIFICATION OF SCHOOL BUS AND DELIVERY FLEETS, USPS etc

The reports could be made even stronger. Please consider these additions and modifications:

- Emphasize the importance and urgency of strong climate mitigation action, by:
  a) highlighting the current and projected health and economic impacts of climate change in Connecticut;
  b) identifying the GHG potential of suggested projects;
  c) prioritizing the  polices that will be most effective in driving down emissions (REDUCE, not recapture emissions!) and transitioning to a carbon-free economy.

- Add dams to the proposed statewide GIS database of culverts, flood gates, tide gates, and other water control structures, and create a dynamic list that prioritizes structures for replacement, removal, and/or modification—including identifying dams that are vulnerable to our changing climate, and ensuring culverts can handle 100-year floods and allow migratory fish to pass.

- Encourage municipalities to adopt green infrastructure as a first-choice solution to flooding and stormwater pollution.

Together, this suite of policies can reduce Connecticut's contribution to climate change and help our region adapt to the changes that are already occurring—while protecting public health, generating good jobs, and protecting vulnerable communities from storms, flooding, and air pollution.

Thank you for your consideration.

Sincerely,
Mrs. Adelheid Koepfer
35 Whiffle Tree Rd  Wallingford, CT 06492-2861 koepfer@gmx.net

# Subject: Prevent the Destruction of America's Final Hope for Conservation

**Amelia Kearney** <ameliamkearney@gmail.com>
to DEEP ClimateChange

Sun, Oct 18, 6:23 PM



To whom it may concern,

I'm sixteen years old, and I've lived in Connecticut my whole life. Environmentalism is something I'm very interested in, and care a lot about. CT is an amazing state, filled with beautiful natural places. I love being outside, whether it's hiking, rock climbing, swimming in lakes and rivers, kayaking, biking on trails, going to the beach, tent camping, or journaling quietly outside. I love how CT has so many natural places, and I'm so glad that I'm lucky enough to live here.

But that being said, I feel like there is still a lot that can be changed and improved by the government to protect our environment and these natural resources, in CT, and nationwide.

There are so many more places that need protecting, so many more laws and restrictions that need to be put in place to limit the use of fossil fuels, reduce our carbon footprint, reduce the mining and fracking that goes on across the country. In addition to the planet being destroyed for human life, along with the natural places we (people) can still go to relieve ourselves from stress and improve our mental health, the habitats for so many other species are also being destroyed. That is a fact, and there is so much research to back it up. My generation and all the ones to follow, are the ones that will have to deal with the mess that our planet is. We are the ones that will have to come up with solutions, and then *actually implement them*. But these are things that could change right now. We've known about climate change, we've had solutions, ideas, options, for years. Please do whatever you can to save our planet, to save us, to protect the environment.

# Subject: GC3 draft report comments

**Bettina Hall** <nhall@everyactioncustom.com>
to DEEP ClimateChange

Sun, Oct 18, 11:21 AM (13 days ago)





Dear Climate Change Bureau CT DEEP Climate Change Bureau,

Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals.

I particularly support these recommendations, and urge their inclusion in the final reports:

- Strengthen alignment between the state's decision-making and its greenhouse gas reduction goals. All regulatory decisions should be evaluated for consistency with meeting Global Warming Solutions Act targets.

- Move climate adaptation and resiliency measures—like nature-based solutions, forest and wetland protection, urban green infrastructure and tree planting, and making low/moderate income housing energy efficient and healthy—from demonstration project scale to widespread adoption and protection.

- Support robust, equitable state funding and financing (leveraged and matched by federal and local sources) for emissions reduction and adaptation programs. This is a large ($150-600 million/year) investment. Promising sources include:
  a) adopting the Transportation & Climate Initiative (up to $250 m/yr) and increasing the petroleum gross profits tax (~$100 m/yr). Connecticut can help ensure robust TCI implementation that drives down emissions while reinvesting auction proceeds in other high-impact and equitable programs;
  b) increasing or re-directing state bonding (up to $70 m/yr);

# Subject: GC3 Comments

**Cathie Mestemaker-Harris** <Cathie@everyactioncustom.com> Sun, Oct 18, 8:16 PM (13 days ago)
to DEEP ClimateChange





Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Mrs. Cathie Mestemaker-Harris
94 Flat Rock Rd  Plainfield, CT 06374-2132
Cathie@atlanticbb.net

# Subject: GC3 draft report comments

**Dan Potter** <danpottervia@everyactioncustom.com>
to DEEP ClimateChange

Sun, Oct 18, 8:17 AM (13 days ago)





Dear Climate Change Bureau CT DEEP Climate Change Bureau,

Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals.

I particularly support these recommendations, and urge their inclusion in the final reports:

- Strengthen alignment between the state's decision-making and its greenhouse gas reduction goals. All regulatory decisions should be evaluated for consistency with meeting Global Warming Solutions Act targets.

- Move climate adaptation and resiliency measures—like nature-based solutions, forest and wetland protection, urban green infrastructure and tree planting, and making low/moderate income housing energy efficient and healthy—from demonstration project scale to widespread adoption and protection.

- Support robust, equitable state funding and financing (leveraged and matched by federal and local sources) for emissions reduction and adaptation programs. This is a large ($150-600 million/year) investment. Promising sources include:
  a) adopting the Transportation & Climate Initiative (up to $250 m/yr) and increasing the petroleum gross profits tax (~$100 m/yr). Connecticut can help ensure robust TCI implementation that drives down emissions while reinvesting auction proceeds in other high-impact and equitable programs;
  b) increasing or re-directing state bonding (up to $70 m/yr);

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Reports

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 9:13 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Daniel Piano <pfam12@comcast.net>
**Sent:** Sunday, October 18, 2020 10:24 AM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** GC3 Reports

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

As a long time citizen of CT., I would like to add my comments to the excellent work that has been done by the GC3 teams regarding Climate change here in CT.

**Protecting nature wherever possible** is imperative for, as the report states, there is so much we do not know about our natural world. What we do know is that nature's timeline is long

and how important it is to have a plan that respects that timeline, for climate impacts are inevitable, even here in CT. I too acknowledge that **nature is an essential backbone of everything!**

Clean water, species migration and sustainability of resource production areas.

A good example of respecting this long timeline is the local effort in Simsbury, CT. regarding the Massacoe Forest, a rapidly growing healthy forest on the east-west wildlife corridor on the Eastern

Wildway. It is a real gem that is now on the list to be logged. This forest not only supports wildlife but the local community as an educational resource and refuge for so many in these trying times.

I believe it is essential to protect such core forests. Natural forest growth is more powerful than we realize, yet only 1% of CT. is protected on the level of a National Park. Not protecting these

healthy forested areas of our state is irresponsible since we know so little about how complicated the web of life works.

After so much time given to the GC3 it is my sincere hope that our beautiful state will be one of the first in our nation to come up with a concrete plan to do what we can to protect and preserve

all natural spaces for us and for the future generations that will surely be faced with huge issues if we do not move on this NOW!!!!

Sincerely yours,

Pat Piano

33 Rocklyn Drive

West Simsbury, CT 06092

# Subject: Prevent the Destruction of America's Final Hope for Conservation

**Elijah Kearney** <elijahpkearney@gmail.com>
to DEEP ClimateChange

Sun, Oct 18, 6:09 PM



i'm a connecticut resident who spends a lot of time in our connecticut forests and rivers, and it is important that the connecticut government protects them.

We need 21% of the state protected from development. We need a strategic landscape plan for a balance among research, responsible resource production, and sufficient and connected nature preserves to protect our headwaters, special habitats, core forests, old-growth, and corridors!

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 9:16 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: evan.griswold@everyactioncustom.com <evan.griswold@everyactioncustom.com>
Sent: Sunday, October 18, 2020 1:31 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities. This can be accomplished by creating a statewide inventory of available rooftop and other developed space for solar arrays. At the same time, ban the conversion of carbon-sequestering forest and agricultural lands to solar electricity production.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation. Amend state building codes and tax incentives to increase use of commercial and industrial buildings for solar electric. Mandate that all new buildings are solar -ready by 2025.

Thank you again for the opportunity to submit comments.

Sincerely,
Mr. Evan Griswold
24 Osprey Rd  Old Lyme, CT 06371-2609
evan.griswold@cbmoves.com

# Subject: GC3 draft report comments

**Francesca Jones** <fabjones918@everyactioncustom.com>
to DEEP ClimateChange

Sun, Oct 18, 9:52 AM (13 days ago)



EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Climate Change Bureau CT DEEP Climate Change Bureau,

Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals.

I particularly support these recommendations, and urge their inclusion in the final reports:

- Strengthen alignment between the state's decision-making and its greenhouse gas reduction goals. All regulatory decisions should be evaluated for consistency with meeting Global Warming Solutions Act targets.

- Move climate adaptation and resiliency measures—like nature-based solutions, forest and wetland protection, urban green infrastructure and tree planting, and making low/moderate income housing energy efficient and healthy—from demonstration project scale to widespread adoption and protection.

- Support robust, equitable state funding and financing (leveraged and matched by federal and local sources) for emissions reduction and adaptation programs. This is a large ($150-600 million/year) investment. Promising sources include:
  a) adopting the Transportation & Climate Initiative (up to $250 m/yr) and increasing the petroleum gross profits tax (~$100 m/yr). Connecticut can help ensure robust TCI implementation that drives down emissions while reinvesting auction proceeds in other high-impact and equitable programs;
  b) increasing or re-directing state bonding (up to $70 m/yr);

# Subject: GC3 draft report comments

**Julie Wagner** <juwagner@everyactioncustom.com>
to DEEP ClimateChange

Sun, Oct 18, 12:45 PM (13 days ago)



Dear Climate Change Bureau CT DEEP Climate Change Bureau,

Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals.

I particularly support these recommendations, and urge their inclusion in the final reports:

- Strengthen alignment between the state's decision-making and its greenhouse gas reduction goals. All regulatory decisions should be evaluated for consistency with meeting Global Warming Solutions Act targets.

- Move climate adaptation and resiliency measures—like nature-based solutions, forest and wetland protection, urban green infrastructure and tree planting, and making low/moderate income housing energy efficient and healthy—from demonstration project scale to widespread adoption and protection.

- Support robust, equitable state funding and financing (leveraged and matched by federal and local sources) for emissions reduction and adaptation programs. This is a large ($150-600 million/year) investment. Promising sources include:
  a) adopting the Transportation & Climate Initiative (up to $250 m/yr) and increasing the petroleum gross profits tax (~$100 m/yr). Connecticut can help ensure robust TCI implementation that drives down emissions while reinvesting auction proceeds in other high-impact and equitable programs;
  b) increasing or re-directing state bonding (up to $70 m/yr);

# Subject: GC3 Comments

**Kathleen Repole** <repland@everyactioncustom.com>
to DEEP ClimateChange

Sun, Oct 18, 10:40 PM (13 days ago)





Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation and regenerative agriculture especially with small farmers.

Thank you again for the opportunity to submit comments.

Sincerely,
Ms. Kathleen Repole
106 Sport Hill Rd  Redding, CT 06896-3017
repland@optonline.net

# Subject: Prevent the Destruction of America's Final Hope for Conservation

**Kathy And Stan** <edgewater78@comcast.net>
to DEEP ClimateChange

Sun, Oct 18, 5:27 PM



We need 21% of the state protected from development. We need a strategic landscape plan for a balance among research, responsible resource production, and sufficient and connected nature preserves to protect our headwaters, special habitats, core forests, old-growth, and corridors!

Kathryn Rothstein
Sent from my iPhone

# Subject: GC3 draft report comments

**Louise Washer** <lbwasher@everyactioncustom.com>
to DEEP ClimateChange

Sun, Oct 18, 6:50 PM (13 days ago)





Dear Climate Change Bureau CT DEEP Climate Change Bureau,

Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals.

I particularly support these recommendations, and urge their inclusion in the final reports:

- Strengthen alignment between the state's decision-making and its greenhouse gas reduction goals. All regulatory decisions should be evaluated for consistency with meeting Global Warming Solutions Act targets.

- Move climate adaptation and resiliency measures—like nature-based solutions, forest and wetland protection, urban green infrastructure and tree planting, and making low/moderate income housing energy efficient and healthy—from demonstration project scale to widespread adoption and protection.

- Support robust, equitable state funding and financing (leveraged and matched by federal and local sources) for emissions reduction and adaptation programs. This is a large ($150-600 million/year) investment. Promising sources include:
  a) adopting the Transportation & Climate Initiative (up to $250 m/yr) and increasing the petroleum gross profits tax (~$100 m/yr). Connecticut can help ensure robust TCI implementation that drives down emissions while reinvesting auction proceeds in other high-impact and equitable programs;
  b) increasing or re-directing state bonding (up to $70 m/yr);

# Subject: GC3 draft report comments

**Luella Landis** <gwla620@everyactioncustom.com>
to DEEP ClimateChange

Sun, Oct 18, 11:11 AM (13 days ago)





Dear Climate Change Bureau CT DEEP Climate Change Bureau,

As you know, Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals.

I particularly support these recommendations, and urge their inclusion in the final reports:

- Strengthen alignment between the state's decision-making and its greenhouse gas reduction goals. All regulatory decisions should be evaluated for consistency with meeting Global Warming Solutions Act targets.

- Move climate adaptation and resiliency measures—like nature-based solutions, forest and wetland protection, urban green infrastructure and tree planting, and making low/moderate income housing energy efficient and healthy—from demonstration project scale to widespread adoption and protection.

- Support robust, equitable state funding and financing (leveraged and matched by federal and local sources) for emissions reduction and adaptation programs. This is a large ($150-600 million/year) investment. Promising sources include:
  a) adopting the Transportation & Climate Initiative (up to $250 m/yr) and increasing the petroleum gross profits tax (~$100 m/yr). Connecticut can help ensure robust TCI implementation that drives down emissions while reinvesting auction proceeds in other high-impact and equitable programs;
  b) increasing or re-directing state bonding (up to $70 m/yr);

# Subject: GC3 draft report comments

**michael oconnor** <moconnor@everyactioncustom.com>
to DEEP ClimateChange

Sun, Oct 18, 8:41 AM (13 days ago)





Dear Climate Change Bureau CT DEEP Climate Change Bureau,

Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals.

I particularly support these recommendations, and urge their inclusion in the final reports:

- Strengthen alignment between the state's decision-making and its greenhouse gas reduction goals. All regulatory decisions should be evaluated for consistency with meeting Global Warming Solutions Act targets.

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  b) increasing or re-directing state bonding (up to $70 m/yr);

# Subject: GC3 draft report comments

**Michael Riggio** <mike.riggio@everyactioncustom.com>
to DEEP ClimateChange

Sun, Oct 18, 5:21 PM (13 days ago)





Dear Climate Change Bureau CT DEEP Climate Change Bureau,

Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals.

I particularly support these recommendations, and urge their inclusion in the final reports:

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  a) adopting the Transportation & Climate Initiative (up to $250 m/yr) and increasing the petroleum gross profits tax (~$100 m/yr). Connecticut can help ensure robust TCI implementation that drives down emissions while reinvesting auction proceeds in other high-impact and equitable programs;
  b) increasing or re-directing state bonding (up to $70 m/yr);

# Subject: GC3 draft report comments

**Mike Papa** <artscapeorganiccarellc@everyactioncustom.com> Sun, Oct 18, 4:00 AM (13 days ago)
to DEEP ClimateChange





Dear Climate Change Bureau CT DEEP Climate Change Bureau,

Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals.

I particularly support these recommendations, and urge their inclusion in the final reports:

- Strengthen alignment between the state's decision-making and its greenhouse gas reduction goals. All regulatory decisions should be evaluated for consistency with meeting Global Warming Solutions Act targets.

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  b) increasing or re-directing state bonding (up to $70 m/yr);

# Subject: GC3 draft report comments

**Mike Wallace** <michael_d_wall8303@everyactioncustom.com> Sun, Oct 18, 5:35 PM (13 days ago)
to DEEP ClimateChange





Dear Climate Change Bureau CT DEEP Climate Change Bureau,

Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals.

I particularly support these recommendations, and urge their inclusion in the final reports:

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  b) increasing or re-directing state bonding (up to $70 m/yr);

# Subject: GC3 draft report comments

**Myra Aronow** <myraaronow@everyactioncustom.com>
to DEEP ClimateChange

Sun, Oct 18, 8:09 AM (13 days ago)



Dear Climate Change Bureau CT DEEP Climate Change Bureau,

Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals.

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  b) increasing or re-directing state bonding (up to $70 m/yr);

# Subject: GC3 draft report comments

**Roberta Barbieri** <robbarbieri@everyactioncustom.com>
to DEEP ClimateChange

Sun, Oct 18, 9:59 AM (13 days ago)





Dear Climate Change Bureau CT DEEP Climate Change Bureau,

Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals.

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  b) increasing or re-directing state bonding (up to $70 m/yr);

# Subject: GC3 draft report comments

**Russell Heller** <rmheller@everyactioncustom.com>
to DEEP ClimateChange

Sun, Oct 18, 9:20 AM (13 days ago)





Dear Climate Change Bureau CT DEEP Climate Change Bureau,

Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals.

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  b) increasing or re-directing state bonding (up to $70 m/yr);

# Subject: GC3 draft report comments

**Sarah Middeleer** <viridis@everyactioncustom.com>
to DEEP ClimateChange

Sun, Oct 18, 8:20 AM (13 days ago)





Dear Climate Change Bureau CT DEEP Climate Change Bureau,

Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals.

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  b) increasing or re-directing state bonding (up to $70 m/yr);

# Subject: Prevent the Destruction of America's Final Hope for Conservation

**Kathy And Stan** <edgewater78@comcast.net>
to DEEP ClimateChange

Sun, Oct 18, 5:27 PM





We need 21% of the state protected from development. We need a strategic landscape plan for a balance among research, responsible resource production, and sufficient and connected nature preserves to protect our headwaters, special habitats, core forests, old-growth, and corridors!

Stanley Rothstein
Sent from my iPhone

# Subject: GC3 draft report comments

**Storm Kuchta** <stormmkuchta@everyactioncustom.com>
to DEEP ClimateChange

Sun, Oct 18, 6:07 AM (13 days ago)





Dear Climate Change Bureau CT DEEP Climate Change Bureau,

Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals.

I particularly support these recommendations, and urge their inclusion in the final reports:

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  a) adopting the Transportation & Climate Initiative (up to $250 m/yr) and increasing the petroleum gross profits tax (~$100 m/yr). Connecticut can help ensure robust TCI implementation that drives down emissions while reinvesting auction proceeds in other high-impact and equitable programs;
  b) increasing or re-directing state bonding (up to $70 m/yr);

# Subject: GC3 draft report comments

**Timothy Alstrum** <pitatimo@everyactioncustom.com>
to DEEP ClimateChange

Sun, Oct 18, 11:02 AM (13 days ago)





Dear Climate Change Bureau CT DEEP Climate Change Bureau,

Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals.

I particularly support these recommendations, and urge their inclusion in the final reports:

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  b) increasing or re-directing state bonding (up to $70 m/yr);

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Trinity Student Cares about Forests

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 10:03 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Camuy, Alicia M. (2022) <alicia.camuy@trincoll.edu>
**Sent:** Monday, October 19, 2020 9:21 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Trinity Student Cares about Forests



Hello there,

I am a student at Trinity College, and I care about climate change and the future of our world.

I've learned as I advanced in my education that rising temperatures due to the accumulation of CO2 in our atmosphere is causing a myriad of problems: ocean acidification, extreme weather disturbances, decreased biodiversity across the board. This is caused by us, humans, using fossil fuels. And its also due to our gross neglect of the gift of our natural environment.

Forests are the key to the survival of humanity.

I spent three months in one of the most biodiverse places on earth, Costa Rica. I studied their ecosystems over time, and they spent much of human occupancy capitalizing off the land. By 1980, most of it was chopped down and used for agricultural practice. The beef market was hardly lucrative, and the country was going under. Finally, the government created financial incentives for forested land and ecotourism was born. They now have a booming ecotourism economy and bountiful natural beauty to show the world. However, even though these forests were added back to the land, there was still significant biodiversity loss that permanently hinders the health of the forests there. Connecticut still has much of its native beauty, but this land will never be the same if we decide to cut it down.

One could learn in an introductory biology course that OLD NATIVE TREES are the foundation of the forest. They communicate via mycelium beneath the forest floor and communicate intelligently to provide nutrients to weaker trees and warn of potential attacks. Many of the stumps that I've witnessed after careless logging still have signs of life in that secondary phloem carrying the nutrients from the hub tree. I haven't even mentioned carbon sequestration or biodiversity preservation.

Old forests are NECESSARY and BEAUTIFUL! They aren't worth the few bucks you can make off of their lumber - they're worth infinitely more than that. We need to honor the original stewards of the land on which we live, the Mohegans, because this land is not even ours to take. Many native american tribes believe in the seven-generation rule: act with the wellbeing of your seventh generation of descendants in mind. As a young person, I NEED to care about the future. I worry that my own children won't have a world to live in.

We must act now by taking care of what we have left.

Protect Public Forests for All People and the Planet, not just Now but Forever

Stop exporting and burning our public forests – STOP SUBSIDIZING BIOMASS

I look forward to hearing back from you and in the meantime, I will be sharing this message with as many of my peers as I can.

Best,

Alicia M. Camuy

Ella/she/her/hers

Clinical/Cognitive Neuroscience Major

Trinity College Illinois Scholar '22

Research Assistant, ReMIND Laboratory

Chair, Community Service Committee, Multicultural Affairs Council

Community Service Chair, La Voz Latina

# Subject: Governor?s Council on Climate Change: No new fracked gas plant; We want 100% clean energy

**Ben Martin (bendicoot@yahoo.com) Sent You a Person**… Mon, Oct 19, 10:39 AM (13 days ago)
to DEEP ClimateChange



EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Governor's Council on Climate Change,

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
- Stop the 650 megawatt Killingly gas plant from being built and halt future fossil fuel power plants from our state.
- Set a goal of 100% clean and renewable zero-emission electricity, transportation and buildings that centers equity and creates good jobs.

Thank you for the opportunity to comment.

Sincerely,

Ben Martin
329 ward st
Wallingford, CT 06492
bendicoot@yahoo.com
(203) 215-0395

# Subject: GC3 Comments

**Beverly Propen** <bpropen@everyactioncustom.com>
to DEEP ClimateChange

Mon, Oct 19, 9:24 AM (12 days ago)





Dear Rebecca French,

As a conservationist and wildlife advocate, I am extremely concerned about Connecticut's environment. I want a sustainable planet for all future generations. I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant. Connecticut should be focusing on clean, renewable energy sources not continued fracking and and oil and gas development. As a member of multiple wildlife and environmental organizations, I want clean air and clean water for Connecticut, not polluting chemicals spewed into our atmosphere.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation. Connecticut needs to protect our coastlines and our salt marshes. As a member of Connecticut Audubon Society and Sierra Club Connecticut, I am concerned about the higher tides decimating our marshes and beaches which help protect our avian wildlife. The Saltmarsh sparrow is fast disappearing from our state because higher tides are washing out its nests. We should be protecting our forests from logging and clearing, and protect our rivers and waterways from toxic pollutants. Connecticut's natural resources provide habitat for our majestic wildlife.

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Governor?s Council on Climate Change: No new fracked gas plant; We want 100% clean energy

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 9:59 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: Carol Tomusiak (catwmn725@yahoo.com) Sent You a Personal Message <automail@knowwho.com>
Sent: Monday, October 19, 2020 4:26 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: Governor?s Council on Climate Change: No new fracked gas plant; We want 100% clean energy

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Governor's Council on Climate Change,

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
- Stop the 650 megawatt Killingly gas plant from being built and halt future fossil fuel power plants from our state.
- Set a goal of 100% clean and renewable zero-emission electricity, transportation and buildings that centers equity and creates good jobs.

Thank you for the opportunity to comment.

Sincerely,

Carol Tomusiak
229 Branford Rd
North Branford, CT 06471
catwmn725@yahoo.com
(860) 306-6591

This message was sent by KnowWho, as a service provider, on behalf of an individual associated with Sierra Club. If you need more information, please contact Lillian Miller at Sierra Club at core.help@sierraclub.org or (415) 977-5500.

# Subject: GC3 Comments

**Carole Osborn** <longing4desertskies@everyactioncustom.com> Mon, Oct 19, 8:43 AM (12 days ago)
to DEEP ClimateChange





Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Ms. Carole Osborn
11 Brook St  Winsted, CT 06098-1209
longing4desertskies@gmail.com

UCONN
UNIVERSITY OF CONNECTICUT

**Alec Shub <alec.shub@uconn.edu>**

# FW: Governor?s Council on Climate Change: No new fracked gas plant; We want 100% clean energy

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 9:35 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: Carolyn Hahn-Re (chahnre4@gmail.com) Sent You a Personal Message <automail@knowwho.com>
Sent: Monday, October 19, 2020 2:44 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: Governor?s Council on Climate Change: No new fracked gas plant; We want 100% clean energy

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Governor's Council on Climate Change,

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
- Stop the 650 megawatt Killingly gas plant from being built and halt future fossil fuel power plants from our state.
- Set a goal of 100% clean and renewable zero-emission electricity, transportation and buildings that centers equity and creates good jobs.

Thank you for the opportunity to comment.

Sincerely,

Carolyn Hahn-Re
69 Maple Tree Ave #4
Stamford, CT 06906
chahnre4@gmail.com
(203) 249-7072

# Subject: GC3 Comments

**Deirdre Doran** <deirdredoran@everyactioncustom.com>
to DEEP ClimateChange

Mon, Oct 19, 11:15 AM (12 days ago)





Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Deirdre Doran
24 Spruce Dr  Wilton, CT 06897-2724
deirdredoran@aol.com

# Subject: GC3 Comments

**Dwight Stover** <linger1@everyactioncustom.com>
to DEEP ClimateChange

Mon, Oct 19, 9:33 AM (12 days ago)



Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.
5. I would like to see the local cities and towns across the state invest and transition towards electric school buses over time as they replace their older gas and diesel buses. I had understood that there are money's available from the volts wagon settlement which could help fund this initiative.
Several communities across the country have already begun their transition.

Thank you again for the opportunity to submit comments.

Sincerely,
Dwight Stover
72 Kings Hwy  North Haven, CT 06473-1208
linger1@att.net

UCONN
UNIVERSITY OF CONNECTICUT

**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 10:02 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: ecom332@everyactioncustom.com <ecom332@everyactioncustom.com>
Sent: Monday, October 19, 2020 7:59 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Rebecca French,

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2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
E Smith
PO Box 310565 Newington, CT 06131-0565
ecom332@yahoo.com

# Subject: GC3 Comments

**Elizabeth Scott** <ehscott1@everyactioncustom.com>
to DEEP ClimateChange

Mon, Oct 19, 8:45 AM (12 days ago)





Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Elizabeth Scott
49 Tuttle Ct  Bethany, CT 06524-3027
ehscott1@comcast.net

# Subject: GC3 Comments

**Emily Dickinson-Adams** <emmytwin2@everyactioncustom.com> Mon, Oct 19, 3:19 PM (12 days ago)
to DEEP ClimateChange





Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Mrs. Emily Dickinson-Adams
335 N Grand St  West Suffield, CT 06093-3409
emmytwin2@cox.net

# Subject: GC3 Comments

**Jordano Quaglia** <jord.quaglia@everyactioncustom.com> Mon, Oct 19, 11:50 AM (12 days ago)
to DEEP ClimateChange





Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Dr. Jordano Quaglia
10 Stony Corners Ln  Southbury, CT 06488-3908
jord.quaglia@sbcglobal.net

# Subject: GC3 Comments

**Judith Hunt** <judithhuntlmf@everyactioncustom.com>
to DEEP ClimateChange

Mon, Oct 19, 8:32 AM (12 days ago)





Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Ms. Judith Hunt
27 Filley St  Bloomfield, CT 06002-1804
judithhuntlmf@sbcglobal.net

# Subject: GC3 Comments

**Julie Morton** <julie@everyactioncustom.com>
to DEEP ClimateChange

Mon, Oct 19, 12:39 PM (12 days ago)





Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Julie Morton
130 Sandy Beach Rd  Ellington, CT 06029-3110
julie@sjridingcamp.com

# Subject: Governor?s Council on Climate Change: No new fracked gas plant; We want 100% clean energy

**Kate Rozen (katerozen@gmail.com) Sent You a Person**... Mon, Oct 19, 10:42 AM (13 days ago)
to DEEP ClimateChange



EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Governor's Council on Climate Change,

Your legacy and this decision on this are tied together. Katie Dyke's, too.

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
- Stop the 650 megawatt Killingly gas plant from being built and halt future fossil fuel power plants from our state.
- Set a goal of 100% clean and renewable zero-emission electricity, transportation and buildings that centers equity and creates good jobs.

Thank you for the opportunity to comment.

Sincerely,

Kate Rozen
1087 Johnson Road
Woodbridge, CT 06525
katerozen@gmail.com

# Subject: GC3 Comments

**Kevin Gallagher** <honkyis@everyactioncustom.com>
to DEEP ClimateChange

Mon, Oct 19, 8:31 AM (12 days ago)





Dear Rebecca French,

Invest in natural climate solutions such as forest, river, and wetland conservation.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Mr. Kevin Gallagher
64 Hillandale Rd Danbury Ct 6811  Danbury, CT 06811
honkyis@gmail.com

# Subject: GC3 Comments

**Margaret Bounds** <margaret.bounds@everyactioncustom.com> Mon, Oct 19, 9:19 AM (12 days ago)
to DEEP ClimateChange





Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Margaret Bounds
7 Joseph Perkins Rd  Norwich, CT 06360-3507
margaret.bounds@gmail.com

# Subject: GC3 Comments

**Maria Teresa van der Ree** <mtvdree@everyactioncustom.com> Mon, Oct 19, 12:26 PM (12 days ago)
to DEEP ClimateChange





Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

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3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Mrs. Maria Teresa van der Ree
E20 ENFIELD TERRACE Ext  Enfield, CT 06082
mtvdree@msn.com

# Subject: GC3 Comments

**Meg Smith** <megsmith1215@everyactioncustom.com>
to DEEP ClimateChange

Mon, Oct 19, 1:06 PM (12 days ago)





Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

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2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Meg Smith
66 High St  Guilford, CT 06437-3481
megsmith1215@gmail.com

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 10:03 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: wellshillfarm@everyactioncustom.com <wellshillfarm@everyactioncustom.com>
Sent: Monday, October 19, 2020 10:40 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Michelle Fracasso
43 Wells Hill Rd  Weston, CT 06883-2626
wellshillfarm@gmail.com

# Subject: GC3 Comments

**Myra Aronow** <myraaronow@everyactioncustom.com>
to DEEP ClimateChange

Mon, Oct 19, 8:28 AM (12 days ago)





Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Mrs. Myra Aronow
1 Haddam Dock Rd  Haddam, CT 06438-1306
myraaronow@aol.com

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**Alec Shub <alec.shub@uconn.edu>**

# FW: EHHI comment on the GC3 Agriculture/Soils Sub-Group Draft Report

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 9:36 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

---

**From:** Patricia Taylor <ptaylor.ehhi@gmail.com>
**Sent:** Monday, October 19, 2020 2:56 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** EHHI comment on the GC3 Agriculture/Soils Sub-Group Draft Report



This comment by Environment and Human Health, Inc. (EHHI) is submitted as part of the public review process for the working group reports developed as ordered by Governor Ned Lamont in Executive Order 3.

**1)** EHHI is **in support** of the report's #2 strategy for mitigation, which is to reduce emissions from petroleum products.

See page 17/52 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_WNL_Agriculture_soils_draft_report_public_comment_092120.pdf

and

EHHI **opposes** the report's #5 strategy for mitigation, which endorses burning wood and characterizes wood burning furnaces as "clean". **We oppose because *woody biomass emissions are harmful to human health and the environment, and other options should be found to heat farms.***

See page 17/52 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_WNL_Agriculture_soils_draft_report_public_comment_092120.pdf

> *Strategies for mitigation*:
> 1. Reduce conversion of forest and farmland to residential, commercial, industrial
> **2. Reduce emissions from the use of fossil fuels in farm equipment. [EHHI supports this strategy.]**
> 3. Utilize soil health practices that reduce tillage, increase soil carbon, and reduce denitrification.
> 4. Utilize methane digesters, manure storage covers, gas collection systems, liquid solid separation, improved manure transfer and distribution to reduce emissions.
> **5. Utilize woody biomass from sustainably harvested sources with clean furnaces for heating and energy production on farms. [EHHI opposes this strategy because woody biomass emissions are harmful to human health, and other options should be found to heat farms.**
> 6. Increase use of farm based composting of manure, food and yard waste to reduce emissions, store carbon, and reduce petroleum-based fertilizer use.
> 7. Utilize more rotational grazing systems and highly managed forages for all grazing animals.
> 8. Reduce lawn and turf areas that require frequent mowing, upgrade equipment to mulching and electric mowers
> 9. Avoid or mitigate loss of Core Forest or Prime Farmland to large scale solar arrays. Plan for couse with agriculture or utilize certified pollinator friendly vegetation and management.

**2)** EHHI is **in support** of funding for additional weather stations, and we **also recommend that you add the sentence *These weather stations should include air quality monitors that measure fine particles and ozone levels.***

See page 20/52 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_WNL_Agriculture_soils_draft_report_public_comment_092120.pdf

> 20. Fund the installation of additional weather stations to better capture CT's microclimates, and utilize Cornell's Climate Smart Weather Tools. **[add These weather stations should include air quality monitors that measure fine particles and ozone levels.]**

**4)** EHHI **opposes** and we ask the authors to **strike this sentence** in support of woody biomass burning, and **to replace** this sentence**. We oppose because *woody biomass emissions are harmful to human health and the environment, and other options should be found to heat farms.***

See the bottom of page 24, top of 25/52 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_WNL_Agriculture_soils_draft_report_public_comment_092120.pdf

> **Strike** ~~Biomass is a viable option for heating greenhouses or using manure from dairy and poultry farms to create electricity and heat~~. [**Replace with Woody biomass emissions are harmful to human health and the environment, and other options should be found to heat farms.]**

**5)** EHHI is **in support** of #3 of the top goals for this group, which is **to reduce emissions from petroleum products.**

See page 35/52 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_WNL_Agriculture_soils_draft_report_public_comment_092120.pdf

> 3. Reduce emissions from use of fossil fuels from equipment, petroleum-based fertilizers and pesticides, loss of soil carbon and denitrification.

and

EHHI is also **in support** of the #2 strategy for mitigation, because it also seeks to reduce emissions from petroleum products.

See page 35/52 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_WNL_Agriculture_soils_draft_report_public_comment_092120.pdf

> 2. Reduce emissions from use of fossil fuels from equipment, petroleum based fertilizers and pesticides.

and

EHHI **opposes** the #3 strategy for mitigation, and we ask you to **strike** this strategy because ***woody biomass emissions are harmful to human health and the environment, and other options should be found to heat farms.***

See page 35/52 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_WNL_Agriculture_soils_draft_report_public_comment_092120.pdf

> **Strike** ~~5. Utilize woody biomass from sustainably harvested sources with clean furnaces for heating and energy production on farms.~~

**6)** EHHI is **in support** of policy recommendation and action #15 that pertains to lawns and lawn care.

See page 38/52 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_WNL_Agriculture_soils_draft_report_public_comment_092120.pdf

> 15. Develop tax incentives and outreach strategy to reduce lawn/turf in urban suburban areas. Increase the principles of organic lawn care, IPM, nutrient management, composting, upgrade equipment to mulching and electric mowers.

and

EHHI is also **in support** of policy recommendation and action #19 that pertains to weather stations, and we **also recommend that you add the sentence** ***These weather stations should include air quality monitors that measure fine particles and ozone levels.***

See page 38/52 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_WNL_Agriculture_soils_draft_report_public_comment_092120.pdf

> 19. Fund the installation of additional weather stations to better capture CT's microclimates, and utilize Cornell's Climate Smart Weather Tools. **[add These weather stations should include air quality monitors that measure fine particles and ozone levels.]**

Thank you for the opportunity to comment on this report.

Patricia Taylor, Director of the Plastics and Waste Project for EHHI.

October 19, 2020

--

**Patricia Taylor**

**Director of the Plastics And Waste Project**

**Environment and Human Health, Inc.**

**www.ehhi.org/plastics.php**

**Telephone: (203) 227-4100**

**Mobile: (203) 856-3544**

**ptaylor.ehhi@gmail.com**

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Alec Shub <alec.shub@uconn.edu>

# FW: EHHI comment on the GC3 Forests Sub-Group Draft Report

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 9:33 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

---

**From:** Patricia Taylor <ptaylor.ehhi@gmail.com>
**Sent:** Monday, October 19, 2020 12:49 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** EHHI comment on the GC3 Forests Sub-Group Draft Report



This comment by Environment and Human Health, Inc. (EHHI) is submitted as part of the public review process for the working group reports developed as ordered by Governor Ned Lamont in Executive Order 3.

EHHI is **in support** of the Forests Sub-Group Draft Report's recommendation about funds for projects, and **we also recommend that you add the phrase *air pollution monitoring programs*** to the note on that recommendation.

**This recommendation requires no legislation for an increase of state funding; it requires legislation to expand the types of projects the Green Bank can promote investment in.**

See page 49/69 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_WNL_Forests_DRAFT_report_public_comment_091120.pdf

> **Utilize Portion of State Revolving Funds for Land Conservation/Green Infrastructure Projects**
>
> - **Source of funds**: Existing state revolving funds (SRF) for clean water and drinking water
> - **Action Required**: None. Currently up to 10% of SRF may be used to finance green infrastructure projects, which may include street trees, bio-swales, land conservation, etc. However, legislative action would be required to mandate spending on green infrastructure projects. In 2019, S.B. No. 927, **An Act Creating the Environmental Infrastructure Fund Within the Connecticut Green Bank**, proposed

expanding the types of projects the Green Bank can promote investment in to include environmental infrastructure, which, under the bill, is structures, facilities, systems, services, and improvement projects related to water, waste and recycling, zero-emission vehicle refueling, climate adaptation and resiliency, agriculture, land conservation, parks and recreations, and other environmental markets.

· **Note**: This is an opportunity for cross-sector dialogue about tapping into the Green Bank for creative financing for infrastructure projects to leverage co-benefits of land conservation including **air pollution reduction, [add air pollution monitoring programs,]** carbon removal, flood protection, food production, avoided costs for healthcare system, etc. See also, Urban Forest Carbon Credit Program.

Thank you for the opportunity to comment on this report.

Patricia Taylor, Director of the Plastics and Waste Project for EHHI.

October 19, 2020

--

**Patricia Taylor**

**Director of the Plastics And Waste Project**

**Environment and Human Health, Inc.**

**www.ehhi.org/plastics.php**

**Telephone: (203) 227-4100**

**Mobile: (203) 856-3544**

**ptaylor.ehhi@gmail.com**

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Alec Shub <alec.shub@uconn.edu>

# FW: EHHI Comment on the GC3 Infrastructure and Land Use Adaptation Working Group Draft Report

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 10:02 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

---

**From:** Patricia Taylor <ptaylor.ehhi@gmail.com>
**Sent:** Monday, October 19, 2020 7:54 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** EHHI Comment on the GC3 Infrastructure and Land Use Adaptation Working Group Draft Report



This comment for the GC3 Infrastructure and Land Use Adaptation Working Group by Environment and Human Health, Inc. (EHHI) is submitted as part of the public review process for the working group reports developed as ordered by Governor Ned Lamont in Executive Order 3.

**1)** EHHI **recommends** the addition of ***public health professionals*** to the entities this report lists for the state-wide climate adaption implementation committee.

See page 9/26 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_Infrastructure_LandUse_draft_report_public_comment_092120.pdf

> **Implementation Entities -** State agencies, **[add public health professionals,]** COGs, CIRCA, NGOs, Water Planning Council; representatives from vulnerable communities

**2)** EHHI **recommends** that the database outlined in this report should include ***information from state-wide water testing for pollutants such as industrial chemicals, PFAS, and sewer contaminants that may run off into the***

***drinking water supply during storms and floods***. EHHI also **recommends** the addition of ***public health professionals*** to the implementation entities listed in this section of the report.

See page 14/26 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_Infrastructure_LandUse_draft_report_public_comment_092120.pdf

> **Recommended Implementation Action Description** - Water management systems provide resilience but can also be the choke points that increase flooding when not properly maintained. There is currently no state-wide database with the locations of these flooding control measures which are necessary for more accurate localized modeling [add **. The database should include state-wide water test results for for pollutants such as industrial chemicals, PFAS, and sewer contaminants that may run off into the drinking water supply during storms and floods.]**

and

> **Implementation Entities -** CTDOT, CTDEEP, CIRCA, **[add public health professionals, and]** Municipalities

**3)** To the report's recommended actions planned for a community resilience program, EHHI **recommends** that ***CT DEEP should be required to notify all television and radio stations when the air quality is not within EPA standards and therefore may be harmful to public health.*** EHHI also **strongly supports** the inclusion of **local health directors** among the implementation entities listed in this section of the report.

See page 15/26 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_Infrastructure_LandUse_draft_report_public_comment_092120.pdf

> **Recommended Implementation Action Description -** The program would ensure consistent and comprehensive approach to accelerate greater local to state resilience to extreme weather and other climate related impacts, with a focus on more resilient development, land use and building practices. It would provide technical assistance to municipalities and COGs on resilience actions. It would include activities and actions that relate to inland and coastal, urban and rural, towns and cities, across Connecticut. **[add CT DEEP should be required to notify all television and radio stations when the air quality is not within EPA standards and therefore may be harmful to the public's health.]** It would address both short-term and long-term impacts of climate change. It would also endeavor to bring together all relevant planning documents and local stakeholders. This effort should prioritize vulnerable populations who may not have the resources to self- evacuate in an emergency.

and

> **Implementation Entities** CGA, CT DEEP, OPM, CTDOT, CT DOH, Municipalities, COGs, CIRCA, Eastern CT State University Sustainable CT, DPH, **local Health Directors,** CT SeaGrant, Uconn CLEAR (AdaptCT), NGOs

**4)** For the recommended task force, EHHI **supports** the inclusion **of local health directors**. EHHI **recommends** that ***committees always include public health professionals.***

See page 16/26 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_Infrastructure_LandUse_draft_report_public_comment_092120.pdf

> **Implementation Entities** - CGA OPM, DAS, DEEP, DOT, DECD, municipalities, NGOs, COGs, DPH, **Local Health Directors**

**5)** To this report's recommended action description for energy efficiency upgrades, EHHI **recommends** the addition of **a safety statement** that ***while it is important to understand what the existing barriers to upgrades are, it is also important to require that the removal of these barriers be accomplished using methods that are safe for workers, residents, and the community-at-large; and to ensure that regulations are not reduced or eliminated in order to expedite the removal of these barriers.***

See page 17/26 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_Infrastructure_LandUse_draft_report_public_comment_092120.pdf

> **Recommended Implementation Action Description** - Provide direct grants and incentives to LMI households for energy efficiency upgrades including the removal and remediation of the barriers to these upgrades. LMI households have limited utility budgets and are therefore most impacted by the immediate health effects of climate change effects such as extreme heat and cold. Energy upgrades can reduce utility budgets, improve indoor air quality (with significant health benefits) and provide comfort and safety throughout the year. LMI households often have less access to participate in healthy homes programs and related incentives, and it is important to note that LMI families do not typically live in sponsored affordable housing developments which must meet standards of efficiency and building quality. Furthermore, energy efficiency measures are often not possible or safe when there are barriers such as hazardous materials in the home including asbestos, mold, PCBs, or Lead Based Paint. It is also not safe to air seal homes when these and other hazards such as High Carbon Monoxide from combustible furnaces or appliances, radon gas vapor, natural gas leak **encroachment are present. Improving energy efficiency for LMI households is not possible unless these health and safety barriers are also addressed.** that **[add While it is important to understand what the existing barriers to upgrades are, it is also important to require that the removal of these barriers be accomplished using methods that are safe for workers, residents, and the community-at-large; and to ensure that regulations are not reduced or eliminated in order to expedite the removal of these barriers.]** A holistic approach to the delivery of healthy home retrofits is needed.

**6)** To this report's recommendations on implementing updates of water testing, EHHI **recommends** the addition of **a safety statement** that ***when there are floods, it is important to have additional testing of drinking water supplies to determine if there is contamination from industrial chemicals, PFAS, and sewer contaminants that may run off into the drinking water system during storms and floods.*** EHHI also **recommends** the addition of ***public health professionals*** to the implementation entities listed in this section of the report.

See page 18/26 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_Infrastructure_LandUse_draft_report_public_comment_092120.pdf

> **Recommended Implementation Action Description** - Existing safe daily yield calculations are based on outdated precipitation and use scenarios for the state's drinking water reservoirs. This is necessary to ensure adequate supply of state drinking water supplies. Water quality testing and protection measures need to be reevaluated and upgraded to match changing and predicted conditions and the new points of risk. **[add When there are floods, it is important to have additional testing of drinking water supplies to determine if there is contamination from industrial chemicals, PFAS, and sewer contaminants that may run off into the drinking water system during storms and floods.]**

and

> **Implementation Entities** - CT DEEP, CT DPH, **[add public health professionals,]** Executive Branch, CGA, Public Health Professionals, Municipalities, NGOs, Academic Institutions, Relevant Utilities

7) Regarding the redevelopment of brownfields that is under review in this plan EHHI **offers** this **caution:**

> **As the state of Connecticut and municipalities consider the redevelopment of sites within established neighborhoods that contain contamination, the protection of public health should be the primary consideration. Public health professionals should be fully engaged in every step of this process, at both state and municipal levels.**

See page 18/26 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_Infrastructure_LandUse_draft_report_public_comment_092120.pdf

> **Recommended Implementation Action Description**
> Low impact infill redevelopment includes promoting and prioritizing redevelopment and infill development in urban centers and village centers to preserve greenspace, offer housing and commercial opportunities to a diverse racial and socio-economic population, and reduce transportation impacts. Additionally, in less developed area conservation subdivisions should be required in local zoning to increase forest block side and reduce negative edge effects. Consider adaptive reuse and urban infill projects targeted to benefit a diverse group of racial and socio-economic households and communities. **Increase incentives for brownfield remediation; require stricter standards for both state funded and private development for removal, consolidation, or in-situ treatment of historical contamination. Historic industrial and manufacturing uses throughout the state have created an abundance of underutilized development sites with significant levels of contamination. The underdeveloped sites decrease the ability for municipalities to enact infill development strategies or create more resilient environments through additional open space. Additionally, a significant portion of these site are located in or adjacent to EJ communities so these communities are negatively affected directly by the increased contamination levels and indirectly through decreased environmental resilience. Furthermore, the locations of many brownfield sites along the coastal and riverine areas of the state further exacerbate their vulnerabilities to climate change through increased inundation and transport, salt water intrusion and storm water capture. This action would prioritize the remediation of these contaminated sites, focusing on those in or near EJ communities to standards that would allow for redevelopment or the creation of resilient open space.**
> Low impact infill redevelopment includes promoting and prioritizing redevelopment and infill development in urban centers and village centers to preserve greenspace, offer housing and commercial opportunities to a diverse racial and socio-economic population, and reduce transportation impacts. Additionally, in less developed area conservation subdivisions should be required in local zoning to increase forest block side and reduce negative edge effects. Consider adaptive reuse and urban infill projects targeted to benefit a diverse group of racial and socio-economic households and communities. **Increase incentives for brownfield remediation; require stricter standards for both state funded and private development for removal, consolidation, or in-situ treatment of historical contamination. Historic industrial and manufacturing uses throughout the state have created an abundance of underutilized development sites with significant levels of contamination. The**

> **underdeveloped sites decrease the ability for municipalities to enact infill development strategies or create more resilient environments through additional open space. Additionally, a significant portion of these site are located in or adjacent to EJ communities so these communities are negatively affected directly by the increased contamination levels and indirectly through decreased environmental resilience. Furthermore, the locations of many brownfield sites along the coastal and riverine areas of the state further exacerbate their vulnerabilities to climate change through increased inundation and transport, salt water intrusion and storm water capture. This action would prioritize the remediation of these contaminated sites, focusing on those in or near EJ communities to standards that would allow for redevelopment or the creation of resilient open space.**

Thank you for the opportunity to comment on this report.

Patricia Taylor, Director of the Plastics and Waste Project for EHHI.

October 19, 2020

--

**Patricia Taylor**

**Director of the Plastics And Waste Project**

**Environment and Human Health, Inc.**

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Alec Shub <alec.shub@uconn.edu>

# FW: EHHI comment on the GC3 Progress on Mitigation Strategies Working Group Report

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 10:01 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Patricia Taylor <ptaylor.ehhi@gmail.com>
**Sent:** Monday, October 19, 2020 6:30 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** EHHI comment on the GC3 Progress on Mitigation Strategies Working Group Report



This comment by Environment and Human Health, Inc. (EHHI) is submitted as part of the public review process for the working group reports developed as ordered by Governor Ned Lamont in Executive Order 3.

**1)** EHHI **recommends the addition of a sentence** to the report's recommendation covering extreme weather events warning systems saying that ***DPH also needs to notify all Connecticut television and radio stations on "bad air days."***

See page 10/116 at **https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_Public_health_safety_draft_report_public_comment_092120.pdf**

> [Weather] [e]vent warnings originate in CT DESPP/ DEMHS and are transmitted to CT State Agencies and non-profit partners via the Everbridge Mass Notification and Incident Communications System. DEMHS notifies its partners of an upcoming event and DPH notifies the local health departments, hospitals, and eldercare facilities and provides them with recommendations. [**add DPH also needs to notify all Connecticut television and radio stations when the state is experiencing an EPA non-compliant air standard day that will negatively affect the public's health. These "bad air days" typically occur when summer temperatures rise to 90 degrees Fahrenheit or above. The notification should be given to weather reporters so that they can add this information to their weather reports.]**

**2)** EHHI is **in support** of the creation of a multi-stakeholder "blue ribbon" commission to develop guidance for schools, day cares, and youth sports teams for prevention of heat-related illness and death; and **recommends** that the ***implementation entities include local health directors***.

See page 25/116 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_Public_health_safety_draft_report_public_comment_092120.pdf

> **Create a multi-stakeholder "blue ribbon" commission to develop guidance for schools, day cares, and youth sports teams for prevention of heat-related illness and death.**
> **Recommended Implementation Action Description** - This action is a revision to the 2011 Recommendation "Develop criteria for school closings and outdoor play during extreme heat events". It expands the scope of the recommendation to include guidance for day cares, and provide[s] the specific action needed to support the development of guidelines. The Commission will also provide a biennial report on all heat-related illness and deaths in Connecticut and associated causes using surveillance data available from the Connecticut Hospital Association and the Connecticut Deaths Registry.

and

> **Implementation Entities** - By appointment by the Governor, with representation from CT Department of Education, school districts, DPH, **[add local health directors,]** CIRCA, Connecticut universities, school athletic associations, and sports medicine experts, stakeholders from impacted communities

**3)** EHHI is **in strong support** of establishing evidence-based standards for local heat and air quality response plans, and **recommends the addition** ***of public service announcements mandated on very hot days and when air quality is not within EPA air standards, and therefore may be harmful to human health***; and **recommends** that the ***implementation entities include local health directors*.**

See page 28/116 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_Public_health_safety_draft_report_public_comment_092120.pdf

> **Establish evidence-based standards for local heat and air quality response plans.**
> **Recommended Implementation Action Description** - This action is an expansion of the 2011 Recommendation to "Develop cooling station best management practices." This action intends to promote the development of state-issued criteria to support heat and air quality response planning, including funding, to be carried out at the local level. This action moves beyond a focus on cooling stations, as proposed in 2011, to include the establishment of evidence-based standards for early and immediate warning systems, including but not limited to communication tools, **public service announcements**, preparedness protocols, adaptation measures, and vulnerability re-assessment. **[add Public service announcements to television and radio stations should be mandatory on very hot days, and when air quality is not within EPA air standards, and therefore may be harmful to human health.]** This includes multi-purpose use of shelters and other designated community sites, including in response to air quality alert days and high pollen days, which are events exacerbated by warming temperatures. Local plans will be incorporated into municipalities' Emergency Operations Plans. Development of the plans requires involvement of the most vulnerable populations in the local planning process to assure that it is acceptable and meets their needs. State issued criteria for response to extreme heat events should also be incorporated as a formalized plan into the state's Incident Command Systems.

and

> **Implementation Entities** - DPH, DEMHS, CADH, Regional Councils of Government, local governments, **[add local health directors, and]** stakeholders from impacted communities

**4)** EHHI is **in strong** support of the report's recommendation to evaluate ozone alert education efforts, especially in its consideration of new ways of informing the public including wireless emergency alerts via all phones, social media, direct communications to vulnerable populations and direct alerts to institutions such as: youth camps, schools, nursing homes and medical providers; and EHHI also **recommends** that the ***implementation entities include local health directors*.**

See page 33/116 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_Public_health_safety_draft_report_public_comment_092120.pdf

> **Evaluate Ozone Alert Education Efforts**
> **Recommended Implementation Action Description** - This recommendation is similar to the 2011 Recommendation, "Evaluate ozone non-attainment alert systems". DEEP and DPH should conduct an evaluation on air quality forecasting and public education and outreach efforts DEEP currently implements on a year round basis. In particular, DPH should survey the public on their awareness of summertime warning about ozone through the Behavioral Risk Factor Surveillance System. Community outreach and focus groups within vulnerable communities should be developed to ascertain input on alert systems and effective communication strategies. In addition, **the evaluation should consider new ways of informing the public including wireless emergency alerts via all phones, social media, direct communications to vulnerable populations and direct alerts to institutions such as: youth camps, schools, nursing homes and medical providers. A study in Canada found that air quality alerts alone had limited effectiveness in protecting public health[1].**

and

> **Implementation Entities -** DEEP, DPH, American Lung Association, CADH, NWS, DEMHS, **[add local health directors, and]** stakeholders from impacted communities

**4)** EHHI is **in support** of the plan to increase monitoring of airborne allergens, and also **recommends** that the ***implementation entities include local health directors*.**

See page 34/116 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_Public_health_safety_draft_report_public_comment_092120.pdf

> **Recommended Implementation Action Description -** This recommendation is a restatement of the identically-named 2011 Recommendation. There is currently only one monitoring station in Connecticut that collects data on pollen and mold concentrations, located at Waterbury Hospital. That station does not receive any outside funding and is supported by the hospital. **More monitoring of airborne allergens should be a long-term strategy**. The state should partner with hospitals and the American Lung Association to establish and fund more robust monitoring systems. Federal grants on this problem should be explored and partners developed who can help with this effort.

and

> **Implementation Entities** - DEEP, DPH, American Lung Association, and the national Allergy Bureau – The American Academy of Allergy, Asthma and Immunology (formerly funded by Waterbury Hospital) **[add , and local health directors]**

**5)** EHHI is **in strong support** of the plan to research, estimate, and identify the potential effects of worsening air quality on the health of Connecticut residents. EHHI also **recommends** that ***the research plan should include the installation of air quality monitors; and the data from those monitors should be shared with the public in real time, so that residents can take measures to protect their health***. EHHI also **recommends** that the ***implementation entities include local health directors.***

See page 35/116 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_Public_health_safety_draft_report_public_comment_092120.pdf

> **Estimate the impacts of climate change on 2030 and 2050 ozone levels in Connecticut and identify potential effects on the health of Connecticut residents**.
> **Recommended Implementation Action Description**
> Climate change is predicted to worsen air quality through increased production of ground-level ozone and particulate matter due to higher temperatures, wildfire emissions, and air stagnation events, among other factors. However, impacts will vary by region and state-level projections of impacts on air quality and health are currently not available. Research is needed into the combined effects of air pollution sources in vulnerable locations like cities combined with the predicted increase in ozone levels. **[add The research plan should include the installation of air quality monitors; and the data from those monitors should be shared with the public in real time, so that residents can take measures to protect their health.]** Ozone projections are based on complex phot-chemical grid modeling informed by projected emissions inventories and climate condition should be developed for 2030 and 2050, with subsequent projections of impacts on the health of the residents of Connecticut. Successful implementation of this project is contingent on adequate funding

and

> **Implementation Entities** - DPH, DEEP, Connecticut universities **[add , and local health directors]**

**6)** EHHI is **in support** of the establishment of a State Climate and Health Coordinator position.

See page 87/116 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_Public_health_safety_draft_report_public_comment_092120.pdf

> **Establish a State Climate and Heath Coordinator Position**
> **Recommended Implementation Action Description** - The challenge of climate change to public health and safety is vast and complex. The U.S. Centers for Disease Control and Prevention has developed the Building Resilience Against Climate Effects (BRACE) framework as an adaptive management approach for health departments to use to address challenge Currently 17 state and local governments receive federal funding to implement this framework and are actively developing interventions to protect the health and safety of their residents from the negative effects of climate change. Connecticut has not yet adopted this framework and has no program to coordinate and oversee such essential actions. A recent report from the Yale Center on Climate Change and Health highlighted the limitations for action of climate and health resilience by DPH in the absence of additional funding (Bozzi and Dubrow 2020). Responsibilities of this position will include coordination among state and local agencies, Yale Center on Climate Change and Health, CIRCA, and internal DPH programs to monitor environmental and climatic changes, track climate-sensitive health

> outcomes, and implement recommendations to protect public health and safety, prioritizing vulnerable populations, from the negative health impacts of climate adopted by the GC3; coordination with other state health departments throughout the Northeast currently funded by the CDC Climate and Health program to implement the BRACE framework in Connecticut; build strategic partnerships to improve health resilience throughout the state; and competitive grant proposal submissions to support a climate and health program at DPH.

Thank you for the opportunity to comment on this report.

Patricia Taylor, Director of the Plastics and Waste Project for EHHI.

October 19, 2020

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Correction - EHHI Comment on the GC3 Public Health & Safety Work Group

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 10:01 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Patricia Taylor <ptaylor.ehhi@gmail.com>
**Sent:** Monday, October 19, 2020 6:37 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Correction - EHHI Comment on the GC3 Public Health & Safety Work Group



**This comment was incorrectly sent titled for the Mitigation Strategies group at 6:30PM. A comment was correctly sent to Mitigation Strategies at 5:37PM. My apologies for the error!**

This comment for the GC3 Public Health & Safety Work Group by Environment and Human Health, Inc. (EHHI) is submitted as part of the public review process for the working group reports developed as ordered by Governor Ned Lamont in Executive Order 3.

**1)** EHHI **recommends the addition of a sentence** to the report's recommendation covering extreme weather events warning systems saying that ***DPH also needs to notify all Connecticut television and radio stations on "bad air days."***

See page 10/116 at **https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_Public_health_safety_draft_report_public_comment_092120.pdf**

> [Weather] [e]vent warnings originate in CT DESPP/ DEMHS and are transmitted to CT State Agencies and non-profit partners via the Everbridge Mass Notification and Incident Communications System. DEMHS notifies its partners of an upcoming event and DPH notifies the local health departments, hospitals, and eldercare facilities and provides them

> with recommendations. [**add DPH also needs to notify all Connecticut television and radio stations when the state is experiencing an EPA non-compliant air standard day that will negatively affect the public's health. These "bad air days" typically occur when summer temperatures rise to 90 degrees Fahrenheit or above. The notification should be given to weather reporters so that they can add this information to their weather reports.]**

**2)** EHHI is **in support** of the creation of a multi-stakeholder "blue ribbon" commission to develop guidance for schools, day cares, and youth sports teams for prevention of heat-related illness and death; and **recommends** that the ***implementation entities include local health directors***.

See page 25/116 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_Public_health_safety_draft_report_public_comment_092120.pdf

> **Create a multi-stakeholder "blue ribbon" commission to develop guidance for schools, day cares, and youth sports teams for prevention of heat-related illness and death.**
> **Recommended Implementation Action Description** - This action is a revision to the 2011 Recommendation "Develop criteria for school closings and outdoor play during extreme heat events". It expands the scope of the recommendation to include guidance for day cares, and provide[s] the specific action needed to support the development of guidelines. The Commission will also provide a biennial report on all heat-related illness and deaths in Connecticut and associated causes using surveillance data available from the Connecticut Hospital Association and the Connecticut Deaths Registry.

and

> **Implementation Entities** - By appointment by the Governor, with representation from CT Department of Education, school districts, DPH, **[add local health directors,]** CIRCA, Connecticut universities, school athletic associations, and sports medicine experts, stakeholders from impacted communities

**3)** EHHI is **in strong support** of establishing evidence-based standards for local heat and air quality response plans, and **recommends the addition** ***of public service announcements mandated on very hot days and when air quality is not within EPA air standards, and therefore may be harmful to human health***; and **recommends** t hat the ***implementation entities include local health directors.***

See page 28/116 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_Public_health_safety_draft_report_public_comment_092120.pdf

> **Establish evidence-based standards for local heat and air quality response plans.**
> **Recommended Implementation Action Description** - This action is an expansion of the 2011 Recommendation to "Develop cooling station best management practices." This action intends to promote the development of state-issued criteria to support heat and air quality response planning, including funding, to be carried out at the local level. This action moves beyond a focus on cooling stations, as proposed in 2011, to include the establishment of evidence-based standards for early and immediate warning systems, including but not limited to communication tools, **public service announcements**, preparedness protocols, adaptation measures, and vulnerability re-assessment. **[add Public service announcements to television and radio stations should be mandatory on very hot days, and when air quality is not within EPA air standards, and therefore may be harmful to human health.]** This includes multi-purpose use of shelters and other designated community sites, including in response to air quality alert days and high pollen days, which are events exacerbated by warming temperatures. Local plans will be incorporated into municipalities' Emergency Operations Plans. Development of the plans requires involvement of the most vulnerable

> populations in the local planning process to assure that it is acceptable and meets their needs. State issued criteria for response to extreme heat events should also be incorporated as a formalized plan into the state's Incident Command Systems.

and

> **Implementation Entities** - DPH, DEMHS, CADH, Regional Councils of Government, local governments, **[add local health directors, and]** stakeholders from impacted communities

**4)** EHHI is **in strong** support of the report's recommendation to evaluate ozone alert education efforts, especially in its consideration of new ways of informing the public including wireless emergency alerts via all phones, social media, direct communications to vulnerable populations and direct alerts to institutions such as: youth camps, schools, nursing homes and medical providers; and EHHI also **recommends** that the ***implementation entities include local health directors*****.**

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> **Evaluate Ozone Alert Education Efforts**
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> **Implementation Entities -** DEEP, DPH, American Lung Association, CADH, NWS, DEMHS, **[add local health directors, and]** stakeholders from impacted communities

**4)** EHHI is **in support** of the plan to increase monitoring of airborne allergens, and also **recommends** that the ***implementation entities include local health directors*****.**

See page 34/116 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_Public_health_safety_draft_report_public_comment_092120.pdf

> **Recommended Implementation Action Description -** This recommendation is a restatement of the identically-named 2011 Recommendation. There is currently only one monitoring station in Connecticut that collects data on pollen and

> mold concentrations, located at Waterbury Hospital. That station does not receive any outside funding and is supported by the hospital. **More monitoring of airborne allergens should be a long-term strategy**. The state should partner with hospitals and the American Lung Association to establish and fund more robust monitoring systems. Federal grants on this problem should be explored and partners developed who can help with this effort.

and

> **Implementation Entities** - DEEP, DPH, American Lung Association, and the national Allergy Bureau – The American Academy of Allergy, Asthma and Immunology (formerly funded by Waterbury Hospital) **[add , and local health directors]**

**5)** EHHI is **in strong support** of the plan to research, estimate, and identify the potential effects of worsening air quality on the health of Connecticut residents. EHHI also **recommends** that ***the research plan should include the installation of air quality monitors; and the data from those monitors should be shared with the public in real time, so that residents can take measures to protect their health***. EHHI also **recommends** that the ***implementation entities include local health directors.***

See page 35/116 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_Public_health_safety_draft_report_public_comment_092120.pdf

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> **Recommended Implementation Action Description**
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and

> **Implementation Entities** - DPH, DEEP, Connecticut universities **[add , and local health directors]**

**6)** EHHI is **in support** of the establishment of a State Climate and Health Coordinator position.

See page 87/116 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_Public_health_safety_draft_report_public_comment_092120.pdf

> **Establish a State Climate and Heath Coordinator Position**
> **Recommended Implementation Action Description** - The challenge of climate change to public health and safety is vast and complex. The U.S. Centers for Disease Control and Prevention has developed the Building Resilience Against Climate Effects (BRACE) framework as an adaptive management approach for health departments to use to address challenge Currently 17 state and local governments receive federal funding to implement this framework and are actively developing interventions to protect the health and safety of their residents from the negative effects of climate change. Connecticut has not yet adopted this framework and has no program to coordinate and oversee such essential actions. A recent report from the Yale Center on Climate Change and Health highlighted the limitations for action of climate and health resilience by DPH in the absence of additional funding (Bozzi and Dubrow 2020). Responsibilities of this position will include coordination among state and local agencies, Yale Center on Climate Change and Health, CIRCA, and internal DPH programs to monitor environmental and climatic changes, track climate-sensitive health outcomes, and implement recommendations to protect public health and safety, prioritizing vulnerable populations, from the negative health impacts of climate adopted by the GC3; coordination with other state health departments throughout the Northeast currently funded by the CDC Climate and Health program to implement the BRACE framework in Connecticut; build strategic partnerships to improve health resilience throughout the state; and competitive grant proposal submissions to support a climate and health program at DPH.

Thank you for the opportunity to comment on this report.

Patricia Taylor, Director of the Plastics and Waste Project for EHHI.

October 19, 2020

--

**Patricia Taylor**

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Alec Shub <alec.shub@uconn.edu>

# FW: EHHI comment on the GC3 Rivers Sub-Group Draft Report

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 9:36 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Patricia Taylor <ptaylor.ehhi@gmail.com>
**Sent:** Monday, October 19, 2020 3:32 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** EHHI comment on the GC3 Rivers Sub-Group Draft Report



This comment by Environment and Human Health, Inc. (EHHI) is submitted as part of the public review process for the working group reports developed as ordered by Governor Ned Lamont in Executive Order 3.

**1)** To targets to be implemented in less than two years, EHHI **recommends an additional target** of ***statewide implementation of drinking water testing to identify pollutants such as industrial chemicals, PFAs, and lawn care and tree care chemicals such as insecticides, herbicides, and fungicides. The findings should be required to be made public.***

See page 18/23 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_WNL_Rivers_draft_report_public_comment_092220.pdf

> **Targets, Indicators, and Completion Timeframe**
> Less than 2 years
> • Establish a funding mechanism similar to Massachusetts' Water Quality Grant Program to provide resources to NGOs to supplement DEEP's ambient monitoring program to reduce the number of streams that are unassessed or do not have sufficient data for each Water Quality Report cycle.
> • Establish ongoing forums for participants to coordinate effort, share data (take advantage of existing conference, event, or network opportunities).
> • Develop educational campaigns for climate change adaptation awareness in CT targeted at multiple sectors
> • Standardized, funded support and training for citizen participants in monitoring—schools, non-profits, & other.
> • **[add Statewide implementation of drinking water testing to identify pollutants such as industrial**

> **chemicals, PFAs, and lawn care and tree care chemicals such as insecticides, herbicides, and fungicides. The findings should be required to be made public.]**

**2)** To targets to be implemented in less than two years, EHHI **recommends a phrase to be added** to the first target of funding for wastewater infrastructure and solutions to ***include additional testing for new pollutants***.

and

EHHI **also recommends an additional target** to ***implement statewide testing of drinking water to identify pollutants such as industrial chemicals, PFAs,and lawn care and tree care chemicals such as insecticides, herbicides, and fungicides. The findings should be required to be made public.***

See page 19/23 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_WNL_Rivers_draft_report_public_comment_092220.pdf

**Targets, Indicators, and Completion Timeframe**

Less than two years

- Advocate for an increase in federal funding for wastewater infrastructure **[add and for additional testing for new pollutants that are not presently tested for,]** and wastewater solutions.
- Maintain/Increase funding for Clean Water Fund.
- Evaluate enhanced nitrogen and phosphorus wastewater treatment technologies
- Evaluate barriers to implementing alternative treatment waste systems (ATS) and integrate and coordinate permitting across DPH and DEEP to enable use and oversight of high performing ATS.
- Improve effectiveness of existing regulatory, planning and funding framework for wastewater treatment and disposal in unsewered areas (CT DEEP and CT DPH Workgroup)
- Maintain high standards for Combined Sewer Overflow (CSO) reduction in CSO communities
- **[add Statewide implementation of drinking water testing to identify pollutants such as industrial chemicals, PFAs, and lawn care and tree care chemicals such as insecticides, herbicides, and fungicides. The findings should be required to be made public.]**

Thank you for the opportunity to comment on this report.

Patricia Taylor, Director of the Plastics and Waste Project for EHHI.

October 19, 2020

--

**Patricia Taylor**

**Director of the Plastics And Waste Project**

**Environment and Human Health, Inc.**

**www.ehhi.org/plastics.php**

**Telephone: (203) 227-4100**

**Mobile: (203) 856-3544**

**ptaylor.ehhi@gmail.com**

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Alec Shub <alec.shub@uconn.edu>

# FW: EHHI comment on the GC3 Wetlands Sub-Group Draft Report

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 9:35 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Patricia Taylor <ptaylor.ehhi@gmail.com>
**Sent:** Monday, October 19, 2020 1:24 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** EHHI comment on the GC3 Wetlands Sub-Group Draft Report



This comment by Environment and Human Health, Inc. (EHHI) is submitted as part of the public review process for the working group reports developed as ordered by Governor Ned Lamont in Executive Order 3.

**1)** EHHI is **in support** of the Wetlands Sub-Group Draft Report's recommendation to develop and implement an invasive species plan, and **we also recommend that you add the sentences** ***This plan should use the least toxic methods possible to control invasive plant species. Avoiding toxic chemical treatments is always preferable.***

See page 13/37 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_WNL_Wetlands_draft_report_public_comment_092120.pdf

> **Completion Timeframe**
> **Less than 2 years**
> • Assessment and implementation of additional vessel speed and area restrictions.
> • **Develop and implement invasive species plan. [add This plan should use the least toxic methods possible to control invasive plant species. Avoiding toxic chemical treatments is always preferable.]**

> • Adoption of wetland buffer regulations for coastal and inland wetlands at all government levels.
> • Fund research and tool development.

**2)** EHHI is **in support** of the recommendation to work with municipalities on restoration for mosquito management, and **we also recommend that you add the sentences *This plan should use the least toxic methods possible to control mosquitoes. Avoiding toxic chemical treatments is always preferable.***

See page 16/37 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_WNL_Wetlands_draft_report_public_comment_092120.pdf

> **Indicators and Targets**
> **Target 1.** Adoption of the most recent Flood Insurance Rate Maps (FIRM) for all of Connecticut's municipalities to be used in combination with the latest information from CIRCA to inform state and local land use decisions in determining base flood elevations for predicted changes in sea level rise and flooding.
> **Target 2.** Revised state and municipal floodplain regulations consistent with science driven adaptive management practices including preservation and enhancement of wetlands and use of green infrastructure.
> **Target 3.** Water Planning Council will evaluate freshwater wetlands in drinking water supply watersheds and incorporate recommendations into the State Water Plan.
> **Target 4. DEEP will expand its wetlands program to work with municipalities on wetland management/restoration for mosquito management. [This plan should use the least toxic methods possible to control mosquitoes. Avoiding toxic chemical treatments is always preferable.]**

> **Target 5.** Develop climate change sentinels monitoring program to ensure that key indices, such as salt marsh bird and plant measures, are measured every 3-5 years.

**3)** EHHI is **in support** of Target 4, and **we also recommend that you add the sentences *Restoration should use the least toxic methods possible to control invasive plant species and mosquitoes. Avoiding toxic chemical treatments is always preferable.***

See page 30/37 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_WNL_Wetlands_draft_report_public_comment_092120.pdf

> **Target 4.** Improve vector disease control by protecting and restoring wetlands to healthy ecosystems. **[add Restoration should use the least toxic methods possible to control invasive plant species and mosquitoes. Avoiding toxic chemical treatments is always preferable. ]**

Thank you for the opportunity to comment on this report.

Patricia Taylor, Director of the Plastics and Waste Project for EHHI.

October 19, 2020

--

**Patricia Taylor**

**Director of the Plastics And Waste Project**

**Environment and Human Health, Inc.**

**www.ehhi.org/plastics.php**

**Telephone: (203) 227-4100**

**Mobile: (203) 856-3544**

**ptaylor.ehhi@gmail.com**

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 9:59 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: paulneri@everyactioncustom.com <paulneri@everyactioncustom.com>
Sent: Monday, October 19, 2020 4:44 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Mr. Paul Neri
146 Ironworks Rd  Clinton, CT 06413-1223 paulneri@sbcglobal.net

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Governor?s Council on Climate Change: No new fracked gas plant; We want 100% clean energy

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 9:57 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: Rachel McLoughlin (rmclough1@gmail.com) Sent You a Personal Message <automail@knowwho.com>
Sent: Monday, October 19, 2020 3:40 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: Governor?s Council on Climate Change: No new fracked gas plant; We want 100% clean energy

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Governor's Council on Climate Change,

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
- Stop the 650 megawatt Killingly gas plant from being built and halt future fossil fuel power plants from our state.
- Set a goal of 100% clean and renewable zero-emission electricity, transportation and buildings that centers equity and creates good jobs.

Thank you for the opportunity to comment.

Sincerely,

Rachel McLoughlin
228 Daybreak Road
Southport, CT 06890
rmclough1@gmail.com
(203) 520-8963

This message was sent by KnowWho, as a service provider, on behalf of an individual associated with Sierra Club. If you need more information, please contact Lillian Miller at Sierra Club at core.help@sierraclub.org or (415) 977-5500.

October 19, 2020.

First – let me say thanks to all working on this effort. I know that a lot of time was put in to create these reports. Some specific comments and then general comment at the end:

Financing –

- p 35 – legislation to allow for creation of storm water utilities: I would suggest a bit broader legislation. In Stonington, we have a Climate Change Task Force. We tried to get it changed to commission status and give it some authority to carry out duties but were told there was no enabling state statute authorizing climate change commissions. Some towns, including Stonington, have Flood and Erosion Control Boards that have fairly significant powers, though Stonington's is in name only (Board of Selectmen can fulfill duties if population < 25,000). Stonington also has a Storm Water Task Force. Maybe re-write the FECB statutes to have a combined Climate Change, Storm Water and Flood and Erosion Control Board as the duties would seem to overlap and it would be easier for towns to fill the slots on one commission rather than three separate commissions.
- Finance group members may be interested in reading "A New Coast" by Jeffrey Peterson. It is a comprehensive look at our changing coast and solutions (many involve changes at the federal level, which I agree with).

Infrastructure – various

- The three to five year timeline for implementation is too far in the future. Before local coastal towns can figure out what, if anything, they can do regarding sea level rise, both AMTRAK and CT Department of Transportation need to tell the towns what they plan on doing with the shoreline rail route and state roads along the shoreline (i.e. do they plan on raising the rail / roads?). AMTRAK's plan to move the shoreline route a bit inland was already blocked by some eastern CT towns. If AMTRAK is eventually going to abandon the route due to sea level rise, some of the rail bed might be able to be used as a basis for a berm to block the rising seas. Several state roads are also forecasted to be overcome due to sea level rise or currently block salt marsh migration. The towns can't plan without knowing what AMTRAK and DOT plans are.
- Solar – page 22. CGS 8-30g should be revised to require inclusion of solar power in affordable housing projects. A very nice street of duplexes is being built in Stonington – all units are suitable for solar but have none.
- Sea level rise – page 5. CGS 25-68o(b) needs to be changed to require UCONN CIRCA update the sea level rise forecast more frequently than every 10 years. Conditions are changing so rapidly that the current forecast is most likely outdated.

Forests – trees

- CGS 8-30g should be revised to require trees in affordable housing projects. A very nice street of duplexes is being built in Stonington – not a tree anywhere, thus making the area hotter than it could be. The town is unable to specify landscaping requirements due to being below the 10% threshold for affordable housing.

Equity – affordable housing

- CGS 8-30g needs to be revised to prohibit the construction of affordable housing in the FEMA flood zones. Recently a project went through in Pawcatuck to add high density housing with portions targeted to low and moderate income residents. Flood factor on the parcel is a "6". The state DEEP SLAMM mapping shows all roads in downtown Pawcatuck are eventually going to be impacted by sea level rise. The town had no ability to prevent the project as the town is below the 10% minimum required for affordable housing. The same project could have been built on other property outside the flood zone.

Science – mapping p41.

- There should be one single mapping tool for the entire state. If every entity that is spending funding on their own mapping would instead send the funds to UCONN Clear they could hire enough people to make comprehensive and accurate maps. Too much money is wasted on everyone doing their own mapping and none of it is accurate.
- There should be a statewide map that has a layer adding sea level rise to the FEMA flood zone so towns know where the future FEMA flood zone is likely to be.

General – there is a massive amount of material in the reports. I admit I didn't read all though all of them I tried to at least read the executive summaries. We are running out of time – by the time the governor gets the final report there will be 9 years left until 2030 which is the next important target date in Executive Order #3. I'm wondering if each committee / sub-committee can list their top two or three priorities considering likely hood of being accomplished and greatest impact towards the goals. What should Connecticut be doing in 2021 to have the greatest impact?

Rick Newton
Mystic
Town of Stonington – Climate Change Task Force (volunteer – chair) [but comments are my own]

Letter regarding the Forests Sub-Group Draft Report

The Forests Sub-Group Draft Report is an impressive document that thoroughly reviews many of the threats to Connecticut forests and describes practical responses to these threats. I strongly agree with the emphasis on protecting core forests, establishing networks of connected forests and setting aside larger areas to re-establish old-growth ecosystems dominated by large trees.

There is a major problem with the proposed plan, however. Although preserving biological diversity and the resilience of forests is emphasized, the main thrust of the recommendations is to protect old trees to achieve a higher level of carbon storage. Given the seriousness of the consequences of climate change, this goal makes sense, but not at the cost of seriously impairing the diversity and resilience of Connecticut forests. Both diversity and resilience strongly depend on the status of early successional forest communities. The report correctly emphasizes that one major problem is the "age-simplified" structure of Connecticut forests, with a preponderance of relatively young, closed-canopy forest, and this is illustrated convincingly in Figure 4. However, the text emphasizes the lack of older forests with large trees (page 17), but doesn't mention the very low proportion of regenerating forest less than 20 years old. Numerous species of plants and animals are restricted to this early age class, and they disappear after the forest canopy begins to close after 10 to 20 years of successional change. Not only are these species a major component of overall diversity in forest ecosystems, but they are also crucial for ensuring forest resilience. They facilitate the remarkably rapid recovery of deciduous forests by reducing soil erosion, increasing nitrogen concentrations in the soil and facilitating decomposition. The many species of plants that are restricted to early successional conditions depend on numerous specialized early-successional animals that are important for pollination, seed dispersal and predation of herbivorous insects. Numerous studies show that early successional species have declined steeply in the Northeast during the past few decades. Initially this caused little concern because it was the expected result of the transition from a predominately agricultural landscape to a heavily forested landscape, but now many of these species are extirpated, endangered or threatened. The ecological interconnections within early successional communities are likely to unravel as a result of this loss of diversity, and we don't know how this would affect the recovery of forests following major disturbances.

A key oversight in the report is that it does not thoroughly consider the type and pattern of natural disturbances that drove the evolution of species in the eastern deciduous forest. According to the report, "the predominant oak-hardwood forest type has co-evolved with disturbances that are mostly episodic (e.g. hurricanes, microbursts, tornadoes, droughts)…". That is true of the current forest, but it doesn't adequately explain why the oak-hickory forest canopy is dominated by "sun-loving long-lived canopy trees (ash, oak, hickory and pine)" (page 16). Storms and droughts are among the few natural disturbances that haven't been effectively suppressed by people during the past century, so we need to explain why there has been a severe decline in regeneration in oaks and other shade-intolerant tree species. Numerous studies in both North America and Europe show that oak regeneration and herbaceous diversity

are favored by periodic, low-intensity ground fires (Askins 2014, *Saving the World's Deciduous Forests*, Yale University Press, pp. 87-89; Hanberry et al. 2020; *Forest Ecology and Management* 472, doi.org/10.1016/j.foreco.2020.118256). Ground fires, which were frequent both before and after European colonization, have been successfully suppressed during the past hundred years. Although it may not be practical to manage forests in most parts of Connecticut with prescribed burning, we can't depend on windstorms and droughts to replace ground fires and other types of suppressed natural disturbances that once resulted in oak-dominated woodlands. This will require active management. The report supports active forest management to increase age class diversity (page 19), which is consistent with this conclusion, but then stipulates that we should "[g]reatly reduce clear-cutting of mature forests as a habitat management practice benefiting young forest species"(page 28). I agree that exceptionally old forests stands that are beginning to develop old-growth characteristics should not be cut down to create young forest habitat, but in many cases it makes sense to clear a patch inside less mature closed-canopy woodland to increase the amount of regenerating forest. This can be achieved through sustainable forestry but in some cases active management specifically for young forest species is warranted. This would help sustain a diversity of early successional specialists and sun-loving tree species, both of which are important for ensuring the resilience of forests following disturbances. Resilience in the aftermath of disturbances will be increasingly important as disturbances become more frequent and severe as a result of climate change. Carbon sequestration is not the only important factor we need to consider when responding to climate change.

Robert Askins
Professor Emeritus of Biology
Connecticut College

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Forum

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 10:01 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Robert Stein <rsteinfam@hotmail.com>
**Sent:** Monday, October 19, 2020 6:52 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** GC3 Forum



First I want to thank you for taking on this critical challenge. My main comment is that most of the analysis and recommendations are **adult-centric**, (probably not a word but you get my point). It seems to me that we have to include the education of our children, starting in the elementary grades, on this important topic. After all, it is the children, who are exposed to the injustices of environmental justice failing today, and it is these young people who will hopefully lead our way to a more just and equitable environmental future. So should we not include developing curricula for all grades to ensure that our youth is positioned to lead in the future.

Robin Stein

Special Assistant to the Mayor, Stamford (Former Chair of the Siting Council)

# Subject: GC3 Comments

**Sara Holmes** <sgdodson@everyactioncustom.com>
to DEEP ClimateChange

Mon, Oct 19, 11:48 AM (12 days ago)





Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Sara Holmes
7 School Ln  Chester, CT 06412-1312
sgdodson@hotmail.com

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Governor?s Council on Climate Change: No new fracked gas plant; We want 100% clean energy

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 9:31 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: Sara Holmes (sgdodson@hotmail.com) Sent You a Personal Message <automail@knowwho.com>
Sent: Monday, October 19, 2020 12:19 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: Governor?s Council on Climate Change: No new fracked gas plant; We want 100% clean energy

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Governor's Council on Climate Change,

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
- Stop the 650 megawatt Killingly gas plant from being built and halt future fossil fuel power plants from our state.
- Set a goal of 100% clean and renewable zero-emission electricity, transportation and buildings that centers equity and creates good jobs.

Thank you for the opportunity to comment.

Sincerely,

Sara Holmes
7 School Lane
06412, CT 06412
sgdodson@hotmail.com
(860) 322-4118

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Nature - Therapeutic Mindful Outdoors

2 messages

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 9:23 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI, not sure this is a GC3 comment.

-----Original Message-----
From: sean weir <seanweir123@gmail.com>
Sent: Monday, October 19, 2020 5:54 AM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Cc: sean weir <seanweir123@gmail.com>; Mindful Responder <MindfulResponder@gmail.com>; adifferentkindofwarrior@gmail.com
Subject: Nature - Therapeutic Mindful Outdoors

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

DEEP Climate Change CT ,
Mindful Responder - Alistair Sweeney and Sean Weir gave the privilege to share the practices of Mindful Yoga Therapy and Therapeutic Yoga and Meditation Nature Practices to assist Veterans Responders Recovery and Underserved Communities I would like to invite you to view MindfulResponder.org Please feel free to connect anytime with any questions suggestions Respectfully

Sean Weir
Mindful Responder

2038878209

SeanWeir123@gmail.com

MindfulResponder.org

Sent from my iPhone

**French, Rebecca** <Rebecca.French@ct.gov> Tue, Oct 20, 2020 at 9:59 AM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>, "Shub, Alec" <alec.shub@uconn.edu>

*Message sent from a system outside of UConn.*

I think we should file it since it was sent to the email address during the public review period.
[Quoted text hidden]

# Subject: GC3 Comments

**Shannon Houston** <shanhou3@everyactioncustom.com>
to DEEP ClimateChange

Mon, Oct 19, 10:55 AM (12 days ago)





Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to five actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.
5. Ensure that the renewable energy industry, particularly solar and wind, is able to access any business stimulus / loan / grant support programs that are created to help businesses through the Covid-19 crisis.

Thank you again for the opportunity to submit comments.

Sincerely,
Shannon Houston
49 Bell St  Middletown, CT 06457-1507
shanhou3@gmail.com

# Subject: GC3 Comments

**Shayla Peterson** <shaylaleigh180@everyactioncustom.com>
to DEEP ClimateChange

Mon, Oct 19, 8:50 AM (12 days ago)





Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Shayla Peterson
576 Central Ave  New Haven, CT 06515-2151
shaylaleigh180@gmail.com

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Governor?s Council on Climate Change: No new fracked gas plant; We want 100% clean energy

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 10:04 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: Shelley Jerige (shelleyjerige@yahoo.com) Sent You a Personal Message <automail@knowwho.com>
Sent: Monday, October 19, 2020 11:31 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: Governor?s Council on Climate Change: No new fracked gas plant; We want 100% clean energy

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Governor's Council on Climate Change,

I want future generations to inherit a thriving planet with as much plant and animal diversity as possible. I have always believed that it is important to think globally and act locally.

There is no time to wait when it comes to addressing climate change. Connecticut must quickly and equitably transition from fossil fuels to clean and renewable energy. That includes stopping the construction of an unnecessary fracked gas power plant in Killingly. It also includes setting ambitious goals for clean and renewable energy.

Please add the following recommendations to the GC3 reports:
- Stop the 650 megawatt Killingly gas plant from being built and halt future fossil fuel power plants from our state.
- Set a goal of 100% clean and renewable zero-emission electricity, transportation and buildings that centers equity and creates good jobs.

Thank you for the opportunity to comment.

Sincerely,

Shelley Jerige
621 Breakneck Hill Road
Middlebury, CT 06763
shelleyjerige@yahoo.com
(860) 483-6445

This message was sent by KnowWho, as a service provider, on behalf of an individual associated with Sierra Club. If you need more information, please contact Lillian Miller at Sierra Club at core.help@sierraclub.org or (415) 977-5500.

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Alec Shub <alec.shub@uconn.edu>

# FW: Input: Connecticut Governor's Council on Climate Change, prepared by the Public Health and Safety Work Group in September 2020.

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 9:59 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Skye Wheeler <wheeles@hrw.org>
**Sent:** Monday, October 19, 2020 5:04 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Input: Connecticut Governor's Council on Climate Change, prepared by the Public Health and Safety Work Group in September 2020.



Dear Sir, Madam,

Many thanks for inviting input to your draft Report to the **Connecticut Governor's Council on Climate Change, prepared by the Public Health and Safety Work Group in September 2020.**

My name is Skye and I am a senior researcher in the women's rights division of Human Rights Watch, an international human rights organization working in around 50 countries including the US. I am working on an advocacy-research project on the negative impacts of increasing temperatures in the US and specifically the impact on pregnancy health and pregnancy outcomes, through a reproductive justice lens.

We were very glad to see that you included concerns about pregnancy health and heat in your analysis, most specifically:

***P19 Pregnant women are vulnerable as preterm birth, low birth weight and infant mortality has been associated with extreme heat.***

… as well as including pregnancy many times as one in a list of vulnerable people, for example to vector borne diseases, extreme weather events and mental health. In our review of heat advisories, heat emergency plans and climate change plans we've found that most cities and localities do not include pregnant people. So thank you so much for including this!

- I was hoping you might consider using a more intersectional approach in how you address pregnant people as a population of concern, so rather than giving the impression that the risk is the same for all pregnant people, note

how some populations for example women of color because of historical marginalization may face greater risk. (See JAMA review on this: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7303808/)

- Similarly I was hoping you might consider noting that we are in the midst of a maternal health crisis – and this emerging threat to our worsening rates of preterm birth needs to be addressed. As you know rates of adverse birth outcomes are twice as bad for Black women than white women – this is also a reproductive justice priority and any way we can try to address these severe inequities should be seized.

- I was hoping you might also consider including the risk heat presents to pregnant people, separate from the risk of adverse birth outcomes. Pregnant people are more vulnerable to heat stress than healthy non-pregnant people but pregnant people usually not included in at-risk lists. A recent working paper from Stanford university, for example, has found the pregnant people are more likely to be hospitalized after extreme heat, and that the effect is greater for Black mothers than white mothers. That heat at work is a concern for pregnant people has been acknowledged by OSHA and NIOSH. People who have heat illnesses can be more at risk for injuries from accidents as well as long term and short term impacts of heat illness itself. Low income job holders may be at more risk of heat exposure and may also find it harder to know about or negotiate for pregnancy accommodations, even if provided under Connecticut law.

- You might consider including pregnant workers in your p21 section/table on heat at work, as per NIOSH/OSHA in the bullet above.

- Might you consider including pregnant people specifically in your section/table "on evidence-based standards for local heat and air quality response plans" on p23 – as you know pregnancy and air pollution is also a critical issue. While other communities and populations tend to be automatically includes in such efforts, pregnant people are OFTEN NOT included and few cities do active outreach to pregnant people and clinics and/or include reproductive justice groups and birth workers etc. in their outreach and education levels.

- You might again include pregnant people in your section/table on "policies to protect low-income residents and renters, particularly those in government supported housing, from indoor heat exposure" on p27. Unlike older people and young children pregnant people are not considered a vulnerable group in state LIHEAP plans. Again while other populations are automatically included, pregnant people often are not and so it may be worthwhile explicitly mentioning them here.

- I was hoping you might also be able to include the vulnerability to heat of infants. Infants especially, but also young children as you mention, are also high risk for heat illness, and even death. (See the attached for two papers on this, California and Philadelphia)

***I've attached here an excel sheet with some of the review studies, studies on heat and maternal health (mostly focused on preterm birth, low birth weight and still birth) and some of the places, including EPA, CDC and the US federal Global Change Program National Assessment 4 where concerns about heat and pregnancy health have been explicitly raised***.

Many thanks for considering these suggestions, please let me know if you need formal input from my organization. Because of the elections our review process is extremely overstretched, and I was keen to make your deadline for input, but I can send in additional materials if helpful.

Skye

Emergencies Researcher

Women’s Rights Division

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Skype skye.wheeler

wheeles@hrw.org

**Studies on pregnancy and heat.xlsx**
59K

| Study name | DATE | Authors | Publisher Journal |
|---|---|---|---|
| **Review Studies** | | | |
| Heat Exposure and Maternal Health in the Face of Climate Cha | Jul-17 | Leeann Kueh | International Jourr |
| High Environmental Temperature and Preterm Birth: A review | Mar-13 | Mary Carolar | Midwifery |
| Systematic Review on Adverse Birth Outcomes of Climate Char | Apr-17 | Parinaz Pour | Journal of Researcl |
| Association of Air Pollution and Heat With Preterm Birth, Low I | Jun-20 | Bruce Bekkar | JAMA |
| Temperature exposure during pregnancy and birth outcomes: | Jun-17 | Yunquan Zha | Environmental Poll |
| (Science journalism) Taking the Heat: Potential Fetal Health Eff | Oct-19 | Lindsey Konk | Environmental Hea |
| **Studies: adverse birth outcomes esp. preterm birth, low birth weight and still birth** | | | |
| Extreme Heat and Risk of Early Delivery Among Preterm and T | May-14 | Auger, Natha | Epidemiology |
| Environmental extreme temperature and daily preterm birth ir | Jan-17 | Danial Moha | Environmental Hea |
| Ambient Temperature and Early Delivery of Singleton Pregnan | Mar-17 | Sandie Ha, D | Environmental Hea |
| Climate Change and fetal health: The impacts of exposure to e | Jan-16 | Nicole S.Ngo | Environmental Res |
| The impact of heat exposure on reduced gestational age in pre | Jul-19 | Ashley Ward | International Jourr |
| High ambient temperature and the risk of preterm delivery. | Nov-10 | Rupa Basu, B | American Journal c |
| Heat and air pollution exposure as triggers of delivery: A surviv | Mar-16 | Patrizia Schif | Environment Interi |
| Exposure to elevated temperatures and risk of preterm birth ir | Oct-14 | Ana M.Viced | Environmental Res |
| Climate Extreme and the Length of Gestation | Oct-11 | Payam Dadv | Environmental Hea |
| An association between the heat-humidity index and preterm | Jul-97 | S Lajinian, S I | American Journal c |
| The relation of gestation length to short-term heat stress. | Jul-99 | K R Porter, S | American Journal c |
| Extreme heat episodes and risk of preterm birth in California, 2 | Feb-20 | Sindana D.Ila | Environment Interi |
| (Linked research to abv) Temperature and term low birth weig | May-18 | Basu R, Rau I | American Journal c |

| | | | |
|---|---|---|---|
| Temperature and Term Low Birth Weight in California | Nov-18 | Rupa Basu, R | American Journal c |
| The impact of high ambient temperatures on delivery timing a | Dec-19 | Alan Barreca | Nature Climate Ch |
| What to Expect When It Gets Hotter: The Impacts of Prenatal E | Revised Jan 2 | Jiyoon Kim, A | National BX of Eco |
| Ambient temperature and preterm birth: A retrospective study | May-19 | Shengzhi Sur | Environment Inter |
| Using Satellite Based Spatiotemporal Resolved Air Temperatur | Oct-17 | Itai Kloog , St | Environmental Hea |
| The Impact of High Apparent Temperature on Spontaneous Pre | Feb-17 | Lyndsay A Av | Environmental Hea |
| Ambient temperature as a trigger of preterm delivery in a tem | Dec-16 | Bianca Cox, A | Journal of Epi and |
| The Relationship Between Apparent Temperature and Daily Nu | Jul-15 | Tarik Benma | Maternal and Child |
| An epidemiological assessment of the effect of ambient tempe | Jul-05 | Zheng X, Zha | Journal of Thermal |
| Preterm birth and ambient temperature: Strong association du | Dec-18 | Qiong Zhong | Journal of Thermal |
| Temporal change in the impacts of ambient temperature on pr | Sep-18 | ShanshanLi[a] | Science of the Tota |
| Exploring associations of maternal exposure to ambient tempe | Dec-18 | Shenghui Li [1] | BMC Pregnancy Ch |
| Associations between ambient air temperature, low birth weig | Nov-18 | Itai Kloog [1], | Environmental Hea |
| Birth weight and environmental heat load: a between-populati | Nov-02 | Jonathan C K | American Journal F |
| Is ambient heat exposure levels associated with miscarriage or | Mar-18 | Benedict Asa | Int Journal Biomet |
| The association between ambient temperature and the risk of | Feb-18 | Tongjun Guo | Sci Total Environ |
| Epidemiology and environmental factors in preterm labour | Oct-07 | Deirdre Mur | Clinical Ob and Gyn |
| Potential Climate Change Health Risks from Increases in Heat V | Feb-17 | Gulcan Cil, A | Risk Analysis |
| Climate Change and Birth Weight | May-09 | Olivier Desch | American Economi |
| Heat Waves and Health Outcomes in Alabama (USA): The Impc | Feb-14 | Shia T. Kent, | Enviro Health Pers |
| Examining the effects of ambient temperature on pre-term bir | Feb-17 | Mathew S, M | Int Journal of Envir |
| Ambient temperature and air quality in relation to small for ge | May-17 | SandieHa Ye | Environmental Res |

Studies: Congenital Heart Defects

| | | | |
|---|---|---|---|
| Risk of Congenital Heart Defects after Ambient Heat Exposure | Jan-17 | Nathalie Aug | Environmental Hea |
| Ambient temperature and congenital heart defects | Aug-13 | K. Agay-Shay | Human Reproducti |
| Projected Changes in Maternal Heat Exposure During Early Pre | Feb-19 | Wangjian Zh | Jour of the Americ |
| **Studies: Neural Tube Defects** | | | |
| Elevated ambient temperatures and risk of neural tube defects | Feb-17 | Nathalie Aug | Occup Environ Me |
| **Studies: Cataract** | | | |
| A Population-Based Case–Control Study of Extreme Summer T | Oct-12 | Alissa R. Van | Environmental Hea |
| **Studies: Infant Death from heat** | | | |
| A Case-Crossover Study of Temperature and Infant Mortality ir | Jul-15 | Rupa Basu D | Pediatric and Perin |
| High Ambient Temperature and Infant Mortality in Philadelphi | Feb-20 | Leah H Schin | American Journal c |
| **Studies: Life long impact on health of heat exposure in utero** | | | |
| Relationship between season of birth, temperature exposure, | Dec-17 | Adam Isen, | PNAS |
| Prenatal exposure to ambient temperature variation increases | Jun-18 | Chan Lu , Yuf | Ecotoxicology and |
| Does maternal exposure during pregnancy to higher ambient t | Dec-16 | Fernandez N | Journal of Pediatri |
| Maternal exposure to ambient air temperature during pregnar | Oct-17 | Miao Y, Shen | Journal of Thermal |
| **Related - non epi studies** | | | |
| The effect of short-term heat stress on uterine contractility, fe | Jan-90 | Kalevi Vaha-I | Euro Journo Ob an |
| Thermal Environment and Human Birth Weight | Feb-20 | Jonathan CK | Journal of Theo |
| Heat and pregnancy-related emergencies: Risk of placental ab | Feb-18 | SiyiHe[a] Tom I | Environment Inter |
| Heat stress and fetal risk. Environmental limits for exercise and | Jul-19 | Nicholas Rav | BRJ Sports Med |
| Association between temperature and maternal stress during | Oct-17 | Yanfen Lin , \ | Environ Res |
| Climate Change and the Practice of Medicine Essentials for Res | Sep-20 | Philipsborn, I | Academic Medicin |
| **US government inclusion heat and pregnancy health** | | | |

| | | | |
|---|---|---|---|
| Extreme Heat Guidebook | Oct-16 | | CDC EPA |
| EPA Heat island website | NA | | EPA |
| Occupational Safety and Health Administration (OSHA)/Nation | NA | | OSHA NIOSH |
| OSHA NIOSH repro health website | NA | | OSHA NIOSH |
| National Climate Assessment 4 | 2018 | | U.S. Global Change |
| The Impacts of Climate Change on Human Health in the United | 2016 | | U.S. Global Change |
| NIEHS webpage with climate change library | | | |
| North Carolina | 2014 | Melissa Tinli | North Carolina clim |
| New York State BRACE report | Jun-15 | NYSDOH | New York State De |
| Oregon Climate and Health Profile Report | 2014 | | Oregon Health Aut |

## International Heat and Pregnancy Health UN etc.

| | | | |
|---|---|---|---|
| Managing Heat in Agricultural Work | 2018 | | Food and Agricultu |
| The Heatwave Guide for Cities | ? | | International Fede |
| Website on heat | ? | | World Health Orga |

## Useful scientific or other webpages/media articles on studies

| | | | |
|---|---|---|---|
| Ecowatch | discusses various studies c | | news story |
| Ecowatch | discusses various studies c | | news story |
| Stanford University | NA | NA | webpage |
| Harvard TH Chan School of Public Health | NA | NA | webpage |
| Identifying Vulnerable Subpopulations for Climate Change Hea | 2009 | | Jour of Occu and E |
| University of California Program on Reproductive Health and th | NA | NA | webpage |
| FIGO (International Federation of Ob Gyns) | NA | NA | webpage |

Other useful webpages

NIEHS webpage climate change and health studies https://tools.niehs.nih.gov/cchhl/

Other studies/meterology and birth outcomes
https://tools.niehs.nih.gov/cchhl/index.cfm/detail/15193
https://tools.niehs.nih.gov/cchhl/index.cfm/detail/14124
https://tools.niehs.nih.gov/cchhl/index.cfm/detail/12524 SGA -

https://tools.niehs.nih.gov/cchhl/index.cfm/detail/12086
https://tools.niehs.nih.gov/cchhl/index.cfm/detail/12857
https://tools.niehs.nih.gov/cchhl/index.cfm/detail/13196
https://tools.niehs.nih.gov/cchhl/index.cfm/detail/11797
https://tools.niehs.nih.gov/cchhl/index.cfm/detail/11168
https://tools.niehs.nih.gov/cchhl/index.cfm/detail/11539
https://tools.niehs.nih.gov/cchhl/index.cfm/detail/10007
https://tools.niehs.nih.gov/cchhl/index.cfm/detail/5105
https://tools.niehs.nih.gov/cchhl/index.cfm/detail/9386
https://tools.niehs.nih.gov/cchhl/index.cfm/detail/1906
https://tools.niehs.nih.gov/cchhl/index.cfm/detail/2050
https://tools.niehs.nih.gov/cchhl/index.cfm/detail/2249

https://iopscience.iop.org/article/10.1088/1748-9326/abb8a3/pdf
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7503599/
https://academic.oup.com/aje/article/183/10/894/1739797

Conclusions or key findings

Climate change will increasingly affect the health of vulnerable populations, including maternal and fetal he

FINDINGS: in this review, the weight of evidence supported an association between high environmental tem

Approximately all studies have reported a significant relationship between exposure variable and intended

In this systematic review of 57 of 68 studies including a total of 32 798 152 births, there was a statistically s

Seasonal patterns of birth outcomes have been observed worldwide, and there was increasing evidence tha

Several epidemiological studies over the past five years have reported associations between high temperatu

Maximum temperatures reached at least 32°C during the preceding week for 19,829 births (9.0%). Relative

Researchers found an increased risk of Pre-term Birth (PTB) at both very hot and very cold temperatures esp

Compared with mild temperature (10–90th percentile), exposure to hot or cold during weeks 1–7 increased

We find exposure to an extra day where average temperature <25 °F and >85 °F during pregnancy is associa

Research on the impact of heat on pregnant women has focused largely on outcomes following extreme ter

With temperatures expected to increase because of climate change, it is essential to study the health outco

We found, consistently in Rome and Barcelona, an increased risk of delivery for a unit increase in MAT, PM1

Risk of preterm birth increased up to 20% when maximum apparent temperature exceeded the 90th percer

Results: We included data from 7,585 pregnant women in our analysis. We estimated a 5-day reduction in a

RESULTS: The rate of preterm labor increased consistently from 1.23% to 3.00% as the heat-humidity index

OBJECTIVES: This study examined the association between gestation length and heat exposure during the su

The study found that while the baseline rate of preterm birth was around 7 percent of all pregnancies, unde

Few investigations have explored temperature and birth outcomes. In a retrospective cohort study, we exar

Apparent temperature during the first month of pregnancy exhibited no significant risk, while the first trime

Evidence suggests that heat exposure increases delivery risk for pregnant women. Acceleration of childbirth

We use temperature variation within narrowly-defined geographic and demographic cells to show that expo

We examined the association between extreme temperature and PTB in the contiguous US. Days of extrem

Ta (air temperature) during pregnancy was associated with lower birth weight and shorter gestational age i

Results: An 11.6% (95% CI: 4.1, 19.7) increase in spontaneous PTD was associated with a 10 °F (5.6 °C) increase in weekly aver

Conclusions Even in a temperate climate, ambient temperature may trigger preterm delivery, suggesting tha

Results We found that apparent temperature was associated with the daily number of births in Montreal, w

It is well known that exposure to thermal stress during pregnancy can lead to an increased incidence of prer

Background: Mounting evidence have linked high temperature with increased incidence of preterm birth (P

Highlights Both low and high temperatures at trimester 3 increase the risk of preterm birth. Both low and hi

Background: Evidence suggests the possible impact of ambient high temperature on fetal growth and birth

Background: The increase in ambient temperatures (Ta) and emissions of greenhouse gases over the last ce

Low birth weight, a major cause of infant morbidity and mortality, is caused by different factors in Western

Abstract It is well established that high ambient heat could cause congenital abnormalities resulting in misca

Background: With the gradual increase of global warming, the impact of extreme temperatures on health ha

NOT READ IN FULL

We investigate the risks presented by heat waves for adverse health conditions for babies and expectant m

Using individual-level data on more than 37.1 million births, we find that exposure to extreme hot temperat

Our results suggest that previous findings of associations between heat waves and adverse health outcomes

Preterm birth (born before 37 completed weeks of gestation) is one of the leading causes of death among c

Compared to mild temperature, cold exposure during trimester 2 [RR: 1.21 (1.05–1.38)], trimester 3 [RR: 1.1

Extreme heat exposure during the first trimester may be associated with noncritical heart defects, especiall

Significant associations were found between maternal exposure during pregnancy to higher ambient tempe

More intense and longer-lasting heat events are expected in the United States as a consequence of climate change. This study

Elevated ambient temperatures may be weakly associated with risk of neural tube defects during tube closu

Among 6,422 cases and 59,328 controls that shared at least 1 week of the critical period in summer, a 5-deg

(12,356 infant deaths) For all-cause mortality, excess risk was 4.4% (95% confidence interval −0.3, 9.2) per 5.6°C increase for

Results: Risk of infant mortality increased by 22.4% (95% confidence interval [CI] = 5.0%, 42.6%) for every 1

Recent work has demonstrated how exposure to extreme temperatures influences contemporaneous healt

Background: Common cold is a frequent upper respiratory tract infection, but the role of ambient temperat

**Introduction:** The association between ambient temperature that the mother is exposed to during pregnan

BACKGROUND: Pneumonia has been widely recognized as the leading cause of death in children

The effects of short-term, moderate heat stress (20 min, 70°C) on uterine contractility, fetal heart rate and

Human birth weight is known to be influenced by several factors, including maternal energy supply,

Outdoor heat increases the risk of preterm birth and stillbirth, but the association with placental abruption

**Objective:** Pregnant women are advised to avoid heat stress (eg, excessive exercise and/or heat exposure)

**Background:** Maternal psychological stress during pregnancy has essentially been conceptualized as a terat

Climate change poses unprecedented risks to health and welfare, particularly that of children, the elderly, p

Pregnant people included as an at-risk population
Pregnant people included as an at-risk population
Pregnant people included as an at-risk population
If your job causes your body temperature to become higher than 39°C (102.2°F), you may suffer from heat e
High temperatures in the summer are conclusively linked to an increased risk of a range of illnesses and dea
Climate-related exposures may lead to adverse pregnancy and newborn health outcomes, including spontar

Moreover, recent research has demonstrated that extreme summer temperatures and heat stress are posit
Some populations are more vulnerable to each of these climate and health impacts than others, whether du
HEAT-RELATED ILLNESS Morbidity: Examples: heat rash, heat cramps, heat exhaustion, heat syncope (faintir

Heat stress may increase the risk that pregnant females will give birth prematurely or to babies with birth d
Pregnant women are more likely to go into early labour in the week following a heatwave. This risk goes up
However, some populations are more exposed to, more or physiologically or socio-economically vulnerable

Heatwaves have always been a part of summer weather in most of the United States. However, because of
Climate change can be expected to have differential effects on different subpopulations. Biological sensitivit
Pregnant women and children are among the most vulnerable to the effects of climate change and air pollu
Heat and the risk to reproductive health and human development: Adverse obstetric outcomes impacted by extreme weathe

Link

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5580557/pdf/ijerph-14-00853.pdf

https://www.researchgate.net/publication/235894487_High_environmental_temperature_and_pretern

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4468458/

https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2767260?utm_source=For_The_Media

https://pubmed.ncbi.nlm.nih.gov/28284544/

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6910775/

https://journals.lww.com/epidem/fulltext/2014/05000/Extreme_Heat_and_Risk_of_Early_Delivery_Am

https://environhealthprevmed.biomedcentral.com/articles/10.1186/s12199-018-0760-x

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5332199/pdf/EHP97.pdf

https://www.sciencedirect.com/science/article/abs/pii/S0013935115301444?via%3Dihub

https://link.springer.com/article/10.1007/s00484-019-01773-3

https://academic.oup.com/aje/article/172/10/1108/90774

https://www.sciencedirect.com/science/article/pii/S0160412015301173?via%3Dihub

https://www.sciencedirect.com/science/article/abs/pii/S0013935114002527?via%3Dihub

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3230440/

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1380898/

https://pubmed.ncbi.nlm.nih.gov/10394322/

https://www.sciencedirect.com/science/article/pii/S016041201933377X

https://tools.niehs.nih.gov/cchhl/index.cfm/detail/16432

https://pubmed.ncbi.nlm.nih.gov/29901701/

https://www.nature.com/a https://theconversation.com/pregnant-women-have-a-higher-risk-of-deliver

https://www.nber.org/pape https://fsi. Includes on maternal health direct impacts

https://www.sciencedirect.com/science/article/pii/S0160412018324486

https://ehp.niehs.nih.gov/doi/10.1289/ehp.1308075

https://pubmed.ncbi.nlm.nih.gov/28143601/

https://jech.bmj.com/content/70/12/1191

https://link.springer.com/article/10.1007/s10995-015-1794-y

https://tools.niehs.nih.gov/cchhl/index.cfm/detail/15904

https://www.sciencedirect.com/science/article/abs/pii/S030645651830358 9?via%3Dihub

https://doi.org/10.1016/j.scitotenv.2018.03.385Get rights and content

https://bmcpregnancychildbirth.biomedcentral.com/articles/10.1186/s12884-018-2100-y

https://pubmed.ncbi.nlm.nih.gov/30413171/

https://www.ncbi.nlm.nih.gov/pubmed/12365039

https://pubmed.ncbi.nlm.nih.gov/28748383/

https://pubmed.ncbi.nlm.nih.gov/28918275/

https://www.sciencedirect.com/science/article/abs/pii/S1521693407000430?via%3Dihub

https://pubmed.ncbi.nlm.nih.gov/28230268/

https://www.aeaweb.org/articles?id=10.1257/aer.99.2.211

https://ehp.niehs.nih.gov/doi/full/10.1289/ehp.1307262

https://www.mdpi.com/1660-4601/14/2/147

https://www.sciencedirect.com/science/article/abs/pii/S001393511630733 2?via%3Dihub

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5226695/pdf/EHP171.pdf

https://academic.oup.com/humrep/article/28/8/2289/661327

https://www.ahajournals.org/doi/epub/10.1161/JAHA.118.010995

https://pubmed.ncbi.nlm.nih.gov/27881468/

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3491926/

https://onlinelibrary.wiley.com/doi/abs/10.1111/ppe.12204

https://pubmed.ncbi.nlm.nih.gov/31855483/

https://www.pnas.org/content/114/51/13447

https://pubmed.ncbi.nlm.nih.gov/29476971/

https://pubmed.ncbi.nlm.nih.gov/27567375/

https://www.sciencedirect.com/science/article/abs/pii/S0306456517303029?via%3Dihub

https://www.ejog.org/article/0028-2243(91)90200-5/pdf

https://www.sciencedirect

https://www.sciencedirect.com/science/article/pii/S0160412017316860?via%3Dihub

https://pubmed.ncbi.nlm.nih.gov/29496695/

https://pubmed.ncbi.nlm.nih.gov/28689033/

https://journals.lww.com/academicmedicine/Abstract/9000/Climate_Change_and_the_Practice_of_Me

https://www.cdc.gov/climateandhealth/pubs/extreme-heat-guidebook.pdf

https://www.osha.gov/Publications/osha-niosh-heat-illness-infosheet.pdf
https://www.cdc.gov/niosh/topics/repro/heat.htm
th, particularly among older adults, pregnant women, and children. … Compared to the higher scenario (I
https://health2016.globalchange.gov/low/ClimateHealth2016_09_Populations_small.pdf

https://epi.dph.ncdhhs.gov/oee/climate/ncclimateandhumandevelopment_013014.pdf
https://www.health.ny.gov/environmental/weather/docs/climatehealthprofile6-2015.pdf
https://www.oregon.gov/oha/ph/HealthyEnvironments/climatechange/Documents/oregon-climate-and

http://www.fao.org/3/i9179en/I9179EN.pdf
https://www.climatecentre.org/downloads/files/IFRCGeneva/RCCC%20Heatwave%20Guide%202019%2
https://www.who.int/globalchange/publications/heat-and-health/en/

https://www.ecowatch.com/extreme-heat-pregnancy-risk-2645358488.html?rebelltitem=3#rebelltitem
https://www.ecowatch.com/pregnancy-climate-early-deliveries-2641504515.html?rebelltitem=2#rebell
https://fsi.stanford.edu/news/global-warming-and-extreme-heat-hurting-pregnant-women
https://www.hsph.harvard.edu/c-change/subtopics/climate-change-and-pregnancy-preterm-birth/
https://journals.lww.com/joem/Abstract/2009/01000/Identifying_Vulnerable_Subpopulations_for_Clim
https://prheucsf.blog/2020/04/22/how-climate-change-and-air-pollution-affect-pregnancy-and-human-
https://www.figo.org/news/statement-climate-crisis-and-health

n_birth_A_review_of_the_evidence

&utm_medium=referral&utm_campaign=ftm_links&utm_term=061820

ong.4.aspx

ring-early-on-unseasonably-hot-days-126822

dicine_.97003.aspx

RCP8.5), 1,400 premature deaths from extreme temperatures could be avoided in the Northeast each year by

-health-profile-report.pdf

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development/

' 2090 if global greenhouse gas emissions are consistent with the lower scenario (RCP4.5), resulting in $21 billi

ion in annual savings (in 2015 dollars).

# Subject: GC3 Comments

**Suzanne Huminski** <huminski.suzie@everyactioncustom.com> Mon, Oct 19, 3:06 PM (12 days ago)
to DEEP ClimateChange



Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. First and foremost, I want to express that climate change response is critically important to our safety and viability as a state, now and in the future. I appreciate CT's leadership creating a plan for addressing climate change, and for drastically reducting carbon in the atmosphere and ocean.

I agree with many of the recommendations in the reports, but I want to draw specific attention to four actions Connecticut can and should take now. It is ESSENTIAL that CT's strategy avoids construction, such as the Killingly plant, that will ensure we're burning fossil fuels for another 40 years. I concur with the recommendations of the CTLCV:

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.
Very Sincerely,

Sincerely,

# Subject: GC3 Comments

**Tim Reiss** <tjreiss@everyactioncustom.com>
to DEEP ClimateChange

Mon, Oct 19, 8:49 AM (12 days ago)





Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.
5. Ensure all new and existing residential and commercial buildings are weatherized and meet critical guidelines for net zero proving good paying jobs

Thank you again for the opportunity to submit comments.

Sincerely,
Mr. Tim Reiss
50 Smith Rd  Avon, CT 06001-3129
tjreiss@yahoo.com

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 9:56 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: tinamiz@everyactioncustom.com <tinamiz@everyactioncustom.com>
Sent: Monday, October 19, 2020 3:40 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Tina Mizhir
110 Spruce St  Greenwich, CT 06830-5918
tinamiz@yahoo.com

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 draft report comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 9:26 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: pipman77-news@everyactioncustom.com <pipman77-news@everyactioncustom.com>
Sent: Monday, October 19, 2020 9:48 AM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 draft report comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Climate Change Bureau CT DEEP Climate Change Bureau,

Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals.

I particularly support these recommendations, and urge their inclusion in the final reports:

- Strengthen alignment between the state's decision-making and its greenhouse gas reduction goals. All regulatory decisions should be evaluated for consistency with meeting Global Warming Solutions Act targets.

- Move climate adaptation and resiliency measures—like nature-based solutions, forest and wetland protection, urban green infrastructure and tree planting, and making low/moderate income housing energy efficient and healthy—from demonstration project scale to widespread adoption and protection.

- Support robust, equitable state funding and financing (leveraged and matched by federal and local sources) for emissions reduction and adaptation programs. This is a large ($150-600 million/year) investment. Promising sources include:
  a) adopting the Transportation & Climate Initiative (up to $250 m/yr) and increasing the petroleum gross profits tax (~$100 m/yr). Connecticut can help ensure robust TCI implementation that drives down emissions while reinvesting auction proceeds in other high-impact and equitable programs;
  b) increasing or re-directing state bonding (up to $70 m/yr);
  c) adopting the Maryland "flush tax" model (up to $75 m/yr).

- Reduce stormwater pollution and flooding, and help municipalities afford green infrastructure and resiliency investments, by passing statewide enabling legislation for stormwater authorities.

- Target future building projects to already-developed areas, and prioritize the conservation and preservation of naturally-resilient coastal marsh, dunes, and forests.

- Develop and fund a community engagement strategy to inform the 2021 GC3 process and implementation, including grants for community-based NGOs partners and ensuring environmental justice perspectives are integral to the process.

The reports could be made even stronger. Please consider these additions and modifications to build the ambitious climate mitigation, resilience, and justice plan Connecticut needs:

- Emphasize the importance and urgency of strong climate mitigation action, by:
  a) highlighting the current and projected impacts of climate change in Connecticut, including health and economic impacts;
  b) identifying the greenhouse gas reduction potential of suggested projects;
  c) prioritizing, among the many valuable ideas in the reports, the highest-impact polices that will be most effective in driving down emissions and transitioning to a carbon-free economy.

- Eliminate, not just “phase down,” biomass as an eligible resource in the Renewable Portfolio Standard (RPS). If we are to achieve our climate goals, we can’t keep subsidizing dirty energy sources.

- Add dams to the proposed statewide GIS database of culverts, flood gates, tide gates, and other water control structures, and create a dynamic list that prioritizes structures for replacement, removal, and/or modification—including identifying dams that are vulnerable to our changing climate, and ensuring culverts can handle 100-year floods and allow migratory fish to pass.

- Encourage municipalities to adopt green infrastructure as a first-choice solution to flooding and stormwater pollution.

Together, this suite of policies can reduce Connecticut’s contribution to climate change and help our region adapt to the changes that are already occurring—while protecting public health, generating good jobs, and protecting vulnerable communities from storms, flooding, and air pollution.

Thank you for your consideration.

Sincerely,
Mr. Wayne Pipke
41 Fern St  Rocky Hill, CT 06067-2014
pipman77-news@yahoo.com

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Feedback from Public Forum

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 10:01 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** French, Rebecca <Rebecca.French@ct.gov>
**Sent:** Monday, October 19, 2020 6:11 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Cc:** 'James Finch' <JFinch@branford-ct.gov>
**Subject:** FW: Feedback from Public Forum

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**From:** James Finch <JFinch@branford-ct.gov>
**Sent:** Monday, October 19, 2020 5:41 PM
**To:** French, Rebecca <Rebecca.French@ct.gov>
**Cc:** deep.climatechange@ct.gov.
**Subject:** Feedback from Public Forum

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Rebecca: (Sorry I called you Rachel)

Below is my feed back

I write as a follow up to the recent webinar in which the draft report developed by the Financing Resilience and Adaptation Group shared their draft report. My limited understanding is that pursuant to an Executive Order the group was charged with recommending proposals for funding sources and financing mechanisms to advance investment in climate resilience and adaptation.

In response to the invitation for comment I provide the following proposal:

**Background:**

In 2019 Public Act No. 19-77: “An Act Authorizing Municipal Climate Change and Coastal Resiliency Reserve Funds” was signed into law. This law was created based on a belief that future exposures and costs associated with climate change represent a long term liability, and the prudent approach, therefore, is to begin the process of funding and investing assets today to address this liability. Municipalities could make annual appropriations into the fund and invest the assets using a long term investment strategy. This approach seeks to match the assets to the liabilities while providing an added funding source to supplement more conventional methods such as bonding and grants. As an example the legislation permits a 50% equity allocation. Historically a portfolio consisting of 50% in equities and 50% in bonds resulted in an annual return of 8.4% (based on results of a 1926-2017 Vanguard Group Study). While past history does not guarantee future returns, it is worth noting that an 8.4% return could grow $1 million invested today to $11.2 million over a thirty year time period.

**Challenges to Communities:**

Communities looking to create and invest funds for the purpose of funding adaptive infrastructure face significant challenges as many municipalities find their resources constrained by rising labor costs, pension and debt service costs and a declining property tax base. Alternatively communities with stronger balance sheets may be inclined to create Coastal Resilient Reserve Funds however the administrative tasks of establishing the fund, hiring investment managers and managing the act of rebalancing the portfolio to comply with the statute when assets are bought and redeemed presents additional challenges.

**Proposal and Thoughts for a Solution:**

In 1972 the State Treasurer created the Short Term Investment Fund (STIF) as an investment vehicle for the state and political subdivisions to invest their cash reserves. The fund provided daily access to participant’s balances while managing the underlying investments and reporting needs.

My recommendation is for the State Treasurer to replicate the overwhelming success of the STIF fund by using this model to create an investment pool for Coastal Resiliency Funds. The portfolio could be managed by the Treasurer in accordance with the investment parameters outlined in PA 19-77. In doing so the State could potentially absorb the costs of managing the fund and provide a vehicle for all municipalities and political subdivisions to participate. While this may be initially deemed to benefit wealthier communities, (Similar to STIF) less wealthy towns and cities would be encouraged to participate with smaller balances. This approach could be adopted by other states which in turn could provide favorable consideration when determining the ESG ratings (Environmental, Social and Governance) ratings of the State and the political subdivisions.

Thank you for considering this recommendation and perhaps finding a space for it in the final report. As always free to contact me with any questions, comments or clarifications.

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Alec Shub <alec.shub@uconn.edu>

# FW: EHHI Comment on the GC3 Science and Technology Working Group Draft Report

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 10:02 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Patricia Taylor <ptaylor.ehhi@gmail.com>
**Sent:** Monday, October 19, 2020 8:48 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** EHHI Comment on the GC3 Science and Technology Working Group Draft Report



This comment for the GC3 Science and Technology Working Group by Environment and Human Health, Inc. (EHHI) is submitted as part of the public review process for the working group reports developed as ordered by Governor Ned Lamont in Executive Order 3.

**1)** EHHI is **in support** of this report' recommendation **for real-time monitoring of water quality conditions**. EHHI **recommends** adding the description that ***water testing should include the identification of pollutants such as industrial chemicals, PFAS, and lawn care and tree care chemicals including insecticides, fungicides, and herbicides. The findings should be required to be reported to the public.*** EHHI also **recommends** the addition of ***local health directors*** to the list of implementation entities in this section of the report.

See pages 27, 28/46 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_ScienceTech_draft_report_public_comment_092220.pdf

> **Recommendations:**
> • Advance the State's capacity for **real-time monitoring of water quality conditions** through a robust in-situ observational network. [add ***[add Water testing should include the identification of pollutants such as industrial chemicals, PFAS, and lawn care and tree care chemicals including insecticides, fungicides, and herbicides. The findings should be required to be reported to the public.]***

and

> **Implementation Entities** - NOAA (NCCOS and NWS), NowCOAST, NERACOOS, LISCOS, EPA, USGS, Academic Institutions, DEEP, Department of Agriculture, Department of Public Health, **[add local health directors,]** municipalities, NGOs

**2)** EHHI is in **strong support** of the recommendation to **Remove Biomass Facilities from list of Class 1 Renewable Energy Sources in the CT Renewable Portfolio Standard (RPS)** ***because emissions from burning wood are harmful to human health and may add to harmful air quality.*** EHHI also **strongly supports** the description of the climate challenges addressed in this recommendation because it includes public health information about the harm to health of burning wood. EHHI **recommends** the addition of a **caution** that ***burning wood for fuel increases fine particle pollution, which is harmful to human health, and contributes to harmful air quality.***

See the title and recommended implementation action description on page 36/46 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_ScienceTech_draft_report_public_comment_092220.pdf

> **Remove Biomass Facilities from list of Class 1 Renewable Energy Sources**

and

> **Climate challenges addressed** - Biomass energy, **particularly wood biomass**, emits more CO2/Btu than coal, and most biomass fuels are not renewable on the time scales that matter for meeting the Paris Agreement goals. It is critical to prevent sources of CO2 emissions to limit global warming. Burning biomass fuel also releases toxins and particulates damaging to public health. **[add Burning wood for fuel increases fine particle pollution, which is harmful to human health, and contributes to harmful air quality.]**

**3)** EHHI is **in support** of this report's recommendation to establish a Program for Research, Planning, and Education of Climate Change Impacts on Health, Ecosystems, Biodiversity, Water, Food, and Soil. EHHI **recommends** that implementation entities for this program should include ***local health directors***.

See the title and recommended implementation action description on page 40/46 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_ScienceTech_draft_report_public_comment_092220.pdf

> **Establish a Program for Research, Planning, and Education of Climate Change Impacts on Health, Ecosystems, Biodiversity, Water, Food, and Soil.**

and

> **Implementation Entities** - Connecticut Institute for Resilience and Climate Adaptation, Department of Energy and Environmental Protection, Department of Public Health, Department of Education, Green Bank, Sustainable CT, Connecticut Agricultural Experiment Station, Yale/University of Connecticut and higher education institutions, environmental-health NGOs and professional associations, Coalition of Northeastern Governors **[add, and local health directors.]**

**4)** To the recommendation of this report for a program to disseminate the public health risks and adaptation from climate change that will educate across state and local government departments, EHHI **recommends** that implementation entities for this program should include ***local health directors***.

See page 41/46 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_ScienceTech_draft_report_public_comment_092220.pdf

> **Implementation Entities** - Department of Public Health, state and local government departments, **[add local health directors,]** Sustainable CT, Yale University, University of Connecticut, Connecticut State Universities and other private/public universities, state health-environmental NGOs and professional societies, state media network, Coalition of Northeastern Governors, regional and national alliances on climate change and health.

Thank you for the opportunity to comment on this report.

Patricia Taylor, Director of the Plastics and Waste Project for EHHI.

October 19, 2020

--

**Patricia Taylor**

**Director of the Plastics And Waste Project**

**Environment and Human Health, Inc.**

**www.ehhi.org/plastics.php**

**Telephone: (203) 227-4100**

**Mobile: (203) 856-3544**

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**Alec Shub <alec.shub@uconn.edu>**

# FW: EHHI Comment on the GC3 Equity and Environmental Justice Working Group Draft Report

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 10:02 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

---

**From:** Patricia Taylor <ptaylor.ehhi@gmail.com>
**Sent:** Monday, October 19, 2020 8:58 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** EHHI Comment on the GC3 Equity and Environmental Justice Working Group Draft Report



This comment for the GC3 Equity and Environmental Justice Working Group by Environment and Human Health, Inc. (EHHI) is submitted as part of the public review process for the working group reports developed as ordered by Governor Ned Lamont in Executive Order 3.

**EHHI is in support of Governor Lamont's requirement that the GC3 analyze both climate mitigation progress and climate change adaptation through an equity lens.**

The strong rationale for viewing climate change through an equity lens may be found in the Equity and Environmental Justice Working Group Draft Report on page 7/61 at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_Equity_EJ_draft_report_public_comment_092220.pdf

> **How does equity relate to climate change?**
> Climate change poses the greatest threat to those communities that are the least responsible – particularly BIPOC communities and low-income populations. These communities already experience disparities in health outcomes, inequities in living conditions, and a profound lack of political power. Such disparities place low-income communities and many communities of color at greater risk and limit their capacity to adapt. Conversely, those who have contributed the most to climate change are better positioned to protect themselves from its impacts. These inequities are the result of historical injustices rooted in race, class, and political representation here in Connecticut and across the country. As the effects of climate change mount, so does the urgency of addressing this challenge.

Thank you for the opportunity to comment on this report.

Patricia Taylor, Director of the Plastics and Waste Project for EHHI.

October 19, 2020

--

**Patricia Taylor**

**Director of the Plastics And Waste Project**

**Environment and Human Health, Inc.**

**www.ehhi.org/plastics.php**

**Telephone: (203) 227-4100**

**Mobile: (203) 856-3544**

**ptaylor.ehhi@gmail.com**

Housatonic Valley Association

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Cornwall Bridge, CT 06754
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PO Box 496
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hvatoday.org

October 19, 2020

**PUBLIC COMMENT**

Draft Working Group Reports: Governor's Council on Climate Change (GC3)

The Housatonic Valley Association (HVA) is grateful for the opportunity to express our strong support for the outstanding work of the several sub groups of the Governor's Council on Climate Change (GC3). These reports present a roadmap for Connecticut to take **meaningful climate action**, while there is still time, and if we collectively have the vision and will to implement and follow their recommendations.

The old 2011 Climate Change Preparedness Plan still contains some useful data, but it assumes global temperature increase limits and emissions thresholds that fall far short of current projections. Consequently, a number of its goals are neither aggressive enough nor specific enough to make a meaningful difference in the time that remains for us to act. Moreover, we now recognize the impressive capacity of Connecticut's forests to **store aboveground carbon**, the national significance of vast **climate corridors** of **connected core forest habitat** running from Long Island Sound to Canada on either side of the State, and the importance for **Green House Gas (GHG) mitigation** of establishing **extensive natural area forest preserves** on state lands. Protecting and sustaining these resources, along with headwaters streams, riparian corridors, old growth habitats and large street trees, should be a centerpiece of Connecticut's climate strategy going forward.

We especially wish to highlight and endorse some of the **boldest strategic recommendations** of the Forests and Rivers Sub Groups of the Working and Natural Lands Working Group. Comprising thorough assessments of the climate resilience, adaptation and mitigation potential of these vital natural resources, these reports also recommend critically important goals and policy initiatives that our ongoing climate crisis demands - and soon - if we are to avoid its worst projected impacts in our State.

* **Keep Forests as Forests** (no net loss of statewide forest cover);
* **Permanently Protect at least 50% of Connecticut's medium and large core forests**;
* Establish extensive **Natural Area Core Forest Preserves** on state lands (70%);
* **Fund DEEP's R&NH Trust Fund** and **OSWA** grants to land trusts, municipalities and water companies **each at $25 Million** annually;
* **Create and fund a coordinated state program to:**
  - **employ and mainstream stream nature-based solutions** to increase river resilience
  - **identify and remove in-stream barriers stream connectivity**
* **Prioritize the protection** of **headwater streams**, **riparian vegetation**, **old growth forest**, **core forests**, **wildlife linkage areas and large street trees.**

And to these we would add:

* **Do no harm**. Management decisions should be timely and guided by sound science. GHG mitigation policies should ensure that gains are not offset by poorly sited solar and wind installations that convert forestland and remove stored carbon, or timber sales on state land of trees that are far more valuable for carbon storage as living trees than the generally low revenues realized from the sale of logs (and associated leakage of the state's stored carbon).

The most significant and important recommendations in the Forest subgroup's report are in its mitigation and funding sections, and these should be adopted by the Governor as state policy:

**- Keeping Forests as Forests.** Connecticut should seek to maintain and even expand forest cover while preventing further loss. New England is one of just 50 **Global safety net tier one climate stabilization areas**. In Connecticut, our trees in Connecticut, our forests carbon dense, and tree communities species rich. These forests remove and store tremendous amounts of carbon. A critical finding of the Forests subgroup report reveals that out of 65 counties across New England, the woodlands of Tolland County are ranked 1st, Fairfield 3rd and Litchfield 4th for above ground carbon storage per acre. They do an outstanding and cost effective job without requiring further manipulation, but they are vulnerable to aggressive pruning, inappropriate tree clearing and fragmentation, and unnecessary "tinkering" in the name of bioengineered climate solutions.

**- Permanently Protect at least 50% of Connecticut's medium and large Core Forests.** We wholeheartedly endorse the recommendation **to permanently protect 50% of the core forests in Connecticut** >250 acres in size, and to afford this goal the same **statutory mandate** as Connecticut's 21% overall land protection goal. This would increase the current protected status of core forests from approximately 1/3 of this resource to ½. This is exactly the kind of bold thinking that we need, and in line with HVA's Follow the Forest initiative which sets the same goal for core forest protection within the Housatonic Watershed.

Mitigation as it pertains to forests involves maximizing carbon storage and sequestration in forest ecosystems to alleviate potential adverse effects of climate change. The best way to do this is to protect our larger trees and older woodlands, especially core forests greater than 250 acres in size. Older trees store far more carbon than younger forests (which sequester faster but contain less). Connecticut's core forests have been long recognized as critical habitats worthy of additional safeguards and protections. Core forests in Connecticut overwhelmingly occur in upland habitats, and many of these contain the source water for public drinking water reservoirs and headwater streams that ensure clean, fresh water is provided downstream. We need to buffer our core forests with more forest land, and can anticipate larger openings (and associated young forest habitat) within the core from future severe wind events. We also need to connect them, in recognition of the climate corridors they represent for species moving between southern New England and Canada in response to warming conditions.

**- Establish extensive Natural Area Core Forest Preserves on state lands**

In the eastern United States, **legally protected national park and wilderness forests** are more species rich and **store more carbon** compared to adjacent forests that are open to management. Legally protected preserves are incredibly important as scientific controls if we are to understand the outcomes and success of managing for forest resilience within working forests.

Connecticut already has a **natural area preserve designation** for minimally managed habitats on state lands. We stand by the Forest group's recommendation to designate **extensive Natural Area Core Forest Preserves** on 70% of this resource - cores >250 acres in size – where it occurs wholly or in part on state lands. These core forest areas would be identified using UCONNs Forest Fragmentation model, with the goal to keep them intact and growing older, larger trees. They could be used for passive recreation but would not have timber harvests or salvage logging, both of which remove core forest habitat and its stored carbon. Forestry activities could still take place on other state lands, including 30% of its core forest lands, though the **social cost of carbon** should be factored into bids for timber contracts on public conservation lands. Forestry will likewise continue on private lands, where more service foresters will be needed and state foresters could be redeployed.

**- We must Fund DEEP's R&NH Trust Fund** and **OSWA grants** at robust levels that can meet the climate challenge. DEEP's own data (Tomasso and Silver; 2015) demonstrates that paying for forest land protection is highly competitive as a GHG mitigation practice. This must be a budgetary priority for our State. Connecticut annually leaves millions of federal dollars unspent or on the table because it lacks state matching funds. DEEP's **Recreation & Natural Heritage Trust** fund is chronically underfunded, and further depleted to cover due diligence and closing costs in addition to the purchase price of conservation lands. The highly popular **Open Space Watershed and Land Acquisition (OSWA)** grant program had 35 municipal, land trust and /or water company applicants in 2020 requesting $26 million for land protection projects with just $9.5 million available. Without serious investment in land protection, we will further degrade the carbon storage capacity of Connecticut's woodlands with development and fragmentation by default.

We applaud the call for **$25 million annually in appropriations both for DEEP's R&NH Trust Fund and OSWA**. It should be more, but this would be a good minimum level to start. DEEP will also require a substantial increase in its land protection and recreational lands management capacity to manage the increase in deal flow and protected acreage that these conservation funds will produce. We endorse the call for a **threefold increase in DEEP's project management and stewardship resources** for these purposes.

**- We must establish and fund a coordinated state-wide effort to restore and maintain freshwater resiliency**, including large-scale nature-based development strategies to reduce polluted runoff into waterways; identification and reduction of illicit discharges into stormwater systems; and removal of barriers to stream connectivity. As warmer and wetter conditions persist and increase, so too will polluted runoff, costly flooding behind in-stream blockages, and severe loss of fish and wildlife habitat and migration routes. The current pace of watershed planning, or in-stream barrier identification/removal/replacement simply will not keep pace with the predicated rate of climate change. We must invest now in restoring river resiliency, and protecting it through the mainstream use of common-sense, nature-based solutions within riparian corridors and around headwater streams.

**- Prioritize the protection** of **headwater streams**, **riparian vegetation**, **old growth forest**, **core forests**, **wildlife linkage areas and large street trees**. Connecticut risks losing a substantial and increasing portion of its species richness and biodiversity under every climate scenario, and conservation and protection offer the best chance to mitigate these losses. Preventing habitat loss and fragmentation and maintaining wildlife corridors and linkages must be a statewide priority. DEEP's upcoming revision of **Connecticut's Green Plan** should **prioritize protection of Core Forests** as part of a new 50% statewide core forest conservation goal, and incentivize its partners by favoring such projects in the OSWA criteria. **DEEP should likewise emphasize the protection of headwaters streams** (often co-occurring within core forests) and the essential **wildlife linkages** between them highlighted in numerous studies including work by TNC and HVA. **Old Growth Forests, Riparian forests and large street trees** have significant GHG mitigation value in addition to their numerous social, water quality and habitat benefits.

**- Do No Harm.** While action is needed now, it should be guided by sound science. When co-benefits conflict – clearing core forest land to increase solar production, for example - Connecticut should favor the carbon storage value of our intact forests. Research into resilience enhancement in response to various forest management scenarios should be rigorous, cautious, and have strong controls in the state's expanded natural area core forest preserves where no such management will take place. It should not be sufficient for state foresters and land managers to conduct timber harvests for resilience enhancement without strong scientific procedures in place, ideally in partnership with academic institutions.

Nor should the specific conservation interests of the state and its land trust partners – including HVA – prevent the protection of intact core forest lands from being our highest land protection priority for climate mitigation. It should be possible to manage for early successional habitats, for example, without further perforating or fragmenting core forests on conservation lands. We all need to get behind this objective, without which our individual conservation mandates and priorities will suffer.

**Nothing less than bold leadership and ambitious statewide action to meet significant conservation targets and benchmarks will suffice.** We urge the Governor to do so, and stand ready to assist as a willing private partner in these efforts.

Tm Abbott, HVA
Regional Land Conservation Director

Lynn Werner, HVA
Executive Director

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 1:18 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: koepfer@everyactioncustom.com <koepfer@everyactioncustom.com>
Sent: Tuesday, October 20, 2020 1:15 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Mrs. Adelheid Koepfer
35 Whiffle Tree Rd  Wallingford, CT 06492-2861 koepfer@gmx.net

October 20, 2020

I am writing to submit my feedback on the GC3 Equity and Environmental Justice Working Group Report dated September 21, 2020.

Overall, I am impressed with the consideration given to equity and environmental justice in the GC3 process so far, and I think many of the conclusions and guidelines offered in the working group's report are sound.

My critique and hopefully constructive criticism follow.

**Use of language**

- "**Communities**" - this word is too closely associated with specific geographies, and what I notice is that is how it is being used, when you are really referring to socioeconomic factors that cross both rural and urban landscapes
- "**Affordable**" - better to use specific indicators, such as "household energy burden" or similar. The concept of relative wealth is key to concepts of cost of living etc in a state like Connecticut with such drastic wealth disparities.
- "**Economic justice communities**" - noting that this language is used by US EPA, CT has an opportunity here to establish a better, people-centered term or a more descriptive term that reflects the intent of this equity work. I think I recognize that this an attempt at uplifting, people-centered language, but in this case I think the working group wants to hold the GC3 process and stakeholders accountable to ensuring environmental justice, not speaking as if it already exists. In this usage, trying to lump together many factors that contribute to climate vulnerability, or the cumulative impacts of historical and ongoing environmental racism, undermines the call for equity and justice. The term "environmentally overburdened communities" on p. 13 is a better example.
- **Specifically naming George Floyd** - while the lynching of George Floyd in May 2020 was one spark point in this new civil rights movement, it diminishes the case of Breonna Taylor, lynched in March 2020, and the many, many other individuals, including Black trans women, who have been lynched and murdered this year alone. Better to refer to it as the New Civil Rights Movement, the Black Lives Matter Movement, or similar, in

acknowledgement of the civil response that has been continuous since the murder of Trayvon Martin in 2012 or the lynching of Michael Brown in 2014.

The words “**racism**” or “**white supremacy**”, and “**poverty**” do not appear in this report in the context of factors contributing to the vulnerabilities exacerbated by climate change. It is essential to specifically name the systemic phenomena that make people vulnerable to direct and follow-on impacts of climatic phenomena.

This report should specifically name **women** as a vulnerable group. Gender is highly correlated to the socioeconomic  and health impacts of climate change. As one factor of identity, gender must be named as a priority intersectional demographic that this report and the broader state initiative seeks to address and ultimately protect.

- See https://www.undp.org/content/undp/en/home/librarypage/womens-empowerment/gender-and-climate-change.html
- And https://www.iisd.org/articles/gender-climate-change

Furthermore, **poverty** must also be specifically named as perhaps the most important socioeconomic contributor to climate-based vulnerability. Specific numbers could be sussed out in local plans, as the concept of relative wealth is highly relevant across the state, and within local jurisdictions. However, naming poverty, as in the severe lack of resources and liquidity, also addresses many other intersecting demographics that face multiple climate impacts. All other socioeconomic vulnerabilities are compounded by poverty, and it should not be assumed to be addressed and yet remain unsaid.

**General** - screening language for being people-centered, both specifying responsible actors, as well as uplifting the abilities, capacities, lived experience and expertise of climate-vulnerable communities. In particular, avoiding use of the passive voice.

**Tech-agnostic**

I advise being technology-agnostic in proposals, until the RFP level. There is much excitement about emerging and technologies already available on the

market. I note that most of these technologies are utterly inaccessible to renters and other low-income residents. Furthermore, as technology evolves, current applications will become obsolete, so there is a risk of getting specific products named in policy documents, rather than naming a functional area to address through the most appropriate means. Also noting the concept of measures like energy efficiency and energy conservation, which are accessible to everyone, regardless of income or home ownership.

**Critique of community engagement guidelines**

Not only accessibility in languages other than English, or in accessible languages including ASL and Braille, all GC3-related language should take into consideration **education and literacy levels**. More than just calling for a common vocabulary and defining terms (which are key, and I applaud the efforts on this), the EEJ group should consider guidelines around setting a standard reading level that print materials and meetings use - as in the marketing adage, if you can't explain it to a child, you don't understand it yourself. Avoiding being patronizing, but choosing a 6th grade reading level would go far in engagement.

Guidelines addressing **code switching** - both in presenting information, and in collecting information and feedback from residents. Literacy, education level, and vernacular English must be considered and respected. Participants' use of AAVE or Spanglish for example should not prejudice experts, officials, or organizers in understanding residents' intent, meaning, or information offered. This will require some training and guidance.

While the EEJ group's report acknowledges the challenge of safely engaging community during a global **pandemic**, and the limitations of digital-only outreach, this evaluation should go further to ensure involvement and accessibility even after public health conditions have normalized. As the report notes, residents' time and resources are limited, yet the report still includes too much emphasis on digital means of communication (email, websites, web conferencing).

- Radio PSAs, call-in shows, and interviews should be part of the outreach plan.
- Bus siding, bus stop ads, grocery cart ad placements, and direct mail inserts are widely distributed examples of print outreach.

- SMS messaging is often overlooked in outreach plans targeting low-income populations in the US - yet the adoption of mobile phones (feature phones as well as smart phones) makes this an affordable and accessible communication tool.

The EEJ group report notes several ideas for engaging residents, and choosing **representatives** of the various demographic groups considered to be environmentally vulnerable. Without an embedded understanding of grassroots level issues and politics, I do caution the EEJ group on relying on established community organizations, local politicians, or other known “leaders”. At best, this could lead to tokenization. Politics is at play even at the neighborhood and grassroots level, relying on nominations or referrals means some voices will be excluded. I would encourage the EEJ to develop guidelines for the GC3 engagement process that borrow from radical organizing and democratic confederalism, such as the assembly model, directly elected representatives, and rotating representative roles.

**Active vs. Passive information dissemination**: While the EEJ group report does spend time on ideas and guidelines for outreach, there is also a passivity to many of these methods, and this is typical of our local civic engagement processes. To prioritize equity and justice, the process must be more proactive in getting laypeople engaged and addressing all the barriers to access and involvement that the report acknowledges. Merely providing a url for people to review documents is not enough - and is exclusionary in communities where technology and broadband access is limited. The assembly model is germane here, or other models of local discussions and working groups.

Utilizing **public libraries** as a community information and engagement resource: as noted above, rather than solely relying on web-based communications, the GC3 process should make use of public libraries as a free, accessible institution that could greatly aid the education, outreach, and ongoing engagement processes necessary to the stated equity goals of the statewide initiative. In addition to digital sources, print copies of all materials could be provided in a sort of **resource kit** to libraries, with signage and press materials for library staff to be able to connect residents to the information and engagement process, with ongoing updates as new materials are produced.

General **communications design** notes:

- Use high-contrast colors - black on white is best.
- Use bigger fonts than normal (consider nothing smaller than 12 pt.)
- Avoid trendy color schemes that detract from legibility.
- Do create an attractive, relevant, branding and identity suite to distinguish the GC3's communications and aid organization of materials by theme/subject matter, action items, etc.

**Critique of the proposed mapping tool**

In general, I question the ethics of a process that focuses on parsing every granular way that poverty makes people vulnerable to environmental impacts and climate change. This reflects the materialist, technocentric view of policymaking that has been prevalent for too long. I note the emphasis on geographic communities, rather than a more nuanced view of poverty, socioeconomic factors, and **intersectional identities that cut across city lines**. I have mentioned gender, which cuts across all other social factors; the report does mention **renters vs. homeowners**, and this dynamic is *key* to climate resiliency.

Particularly as rents, availability, and job opportunities fluctuate over time, pinning data or projects to geographic locales will quickly become **outdated** - poverty forces housing- and job-insecurity onto people. The EEJ report notes updates every 2 years. We should not rely on historical trends to predict stability - especially as we are considering the unpredictable acceleration of climate change impacts, and having experienced a global pandemic this year with far-reaching socioeconomic effects.

**Additional data sources** to include:

- **Anonymized health data** including domestic violence services- as in Flint, Michigan, patterns of health conditions will reveal connections to climate vulnerabilities and environmental risks
- **Anonymized crime data** - patterns of property crimes and non-violent crimes can indicate issues of resource use or resource gaps. For example, areas with repeated illegal dumping can indicate barriers to proper waste disposal like fees or service availability; and indicate a need for community education on toxins and public health.

- **Anonymized student data from schools** - patterns of discipline, learning disabilities and mental health diagnoses, physical disabilities, attendance, free lunch, can reveal a range of socioeconomic indicators tied to climate vulnerability.
- **Property tax data/DMV data** - indicates vehicle types and usage, homeownership rates, property types, which can reveal patterns that indicate climate change vulnerabilities.
- **Historical data, including municipal archives** - historical buildings/sites and their uses, building permits and inspection info, land deeds, etc. will reveal patterns of land use, extraction of minerals, geological disruption (building or leveling slopes), storage/dumping of materials etc. that remain as risks to current and future residents.

All the above data sets will also reveal compounded, cumulative effects of historical environmental racism, political- and economic disenfranchisement relevant to climate resiliency and capacities to adapt to climate change.

In addition to a mapping and data tool that must be meaningful to layman users i.e. residents, EEJ working group should consider developing (a set of) tools for policy makers, decision makers, and implementers that would **screen for impact**. This would operate under the principle that if the project/strategy in question is benefitting the most vulnerable, then everyone benefits, and vice versa. These assessment guidelines and questions that might result in a traffic light result (green: go, yellow: reconsider, red: do not go) based on determining potential harms of new proposals.

Related, focusing on **upstream risk factors**: Rather than focusing on parsing every granular way that poverty makes people vulnerable to environmental impacts and climate change, there should also be a data and mapping tool that looks at upstream sources for those vulnerabilities, including polluting industries, diesel transportation routes, commuting patterns, business effluent (air, water, and solid waste), hardscaping and built structures that create heat sinks and storm runoff, fuel and other pipelines, ports and shipping, etc. Appendix B mentions waste management and existing polluters - this needs a more integrated emphasis into looking at environmental justice.

**Transparency and Representation**

It would be radical and refreshing to provide racial, household income, and other socioeconomic characteristics of the EEJ group membership, and in fact all of the working groups. This could be aggregated and anonymized, and would not only be in the spirit of transparency and equity, but would also show solidarity to the community members who will no doubt be asked (probably multiple times) for their personal and demographic information throughout the GC3 outreach process. This would go far to normalizing discussions of intersecting identities, access to power and agency, and issues of risk and vulnerability. This would also go far to helping GC3 official members to deeply relate to these issues and reframe how they approach their work with an equity and justice mindset.

I hope this has been useful, and I look forward to the progress of the GC3 with urgency and justice in all deliberations.

Allie McConnell
West Hartford, CT

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**Alec Shub <alec.shub@uconn.edu>**

# FW: protecting nature

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 8:33 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Maymi, Alyssa (2022) <alyssa.maymi@trincoll.edu>
**Sent:** Tuesday, October 20, 2020 11:53 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** protecting nature

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Hello,

I believe we should protect the outdoors in our neighborhoods and communities, and we should show our appreciation for the earth we live in by taking care of it together!

Best,

Alyssa Maymi

UCONN
UNIVERSITY OF CONNECTICUT

**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 8:23 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: alopez6@everyactioncustom.com <alopez6@everyactioncustom.com>
Sent: Tuesday, October 20, 2020 2:55 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. They present a tremendous opportunity to establish Connecticut as a national leader in the fight against climate change. But we need to take bold action quickly.

The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I want to highlight four actions Connecticut can take now to drastically reduce climate disaster:

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focus on equity and create good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals. Enacting Community Choice Aggregation (CCA) community power might be one approach.
4. Invest in natural climate solutions such as forest, river, wetland, and roadside conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Andrew Lopez
286 Montauk Ave  New London, CT 06320-4722 alopez6@conncoll.edu

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Written feed back on GC3 Forests Sub Group Draft 9-10-2020

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 8:25 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: BARBARA DAVID <bdavidia@aol.com>
Sent: Tuesday, October 20, 2020 4:18 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: Written feed back on GC3 Forests Sub Group Draft 9-10-2020

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

What a spectacular document! This Sub Group on Forests has REALLY done its job. The legislature should read the report carefully and DO something, even if they cannot do it all…….

Forests are CRUCIAL to slowing down the pace of change of our Climate. I want to pick out a couple of things that seem most important to start on.
1. STOP doing harm: stop conversion of our forests, Adopt the NNFL (no net forest loss) policy as this document recommends. Now!
2. Respond BOLDLY and urgently to the excellent suggestions proposed in this document.
3. Improve the forest resiliency. CT Forests sequester the most carbon density of any in New England: they are the oldest, have the highest annual net growth in forest bio-mass. Keeping them healthy and alive can go far to control the already occurring change in climate.
4. Re-establish the CCC, (Civilian Conservation Corps) as a "tree-planting army". There are such job opportunities here, giving young people skills for their future, and fulfilling the great need for trained arborists. Young people love to climb trees. Imagine inviting them to do it for a living!
5. We must put a value on the eco-system services of forests and have policies that incentivize forest owners to conserve their forests. They should be paid NOT to cut trees down, as they are in Costa Rica. It works……

There is more that can be said, but I will let the report stand for itself. It is so thorough, so worth reading, so worth adopting every idea in it.
Bravo to the Forest Sub-Committee for all the work that went into this draft,

Thank-you,
Barbara David, 344 Joshuatown Road, Lyme, CT 06371-3000

UCONN
UNIVERSITY OF CONNECTICUT

**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect our planet

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 8:33 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Benjamin Parsnips <benismercurial@gmail.com>
**Sent:** Tuesday, October 20, 2020 11:45 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect our planet

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

The message is simple. We as a state need to protect our forests, ecosystems, and the health of our citizens. We must work to combat climate change with the most progressive solutions in mind. I'm calling on the GC3 to direct pathways to a 100% clean energy grid by 2030, not 2040, in accordance with the Intergovernmental Panel on Climate Change's warming deadline. We must take progressive action as a state to work with the energy resources we know to be available. In order to save our planet, the GC3 must have the most relevant climate data available so that it does not have to reconvene as temperatures rise. 2030 is the globally accepted date that we must keep warming below 1.5 degrees celsius or irreparable damage will be done to our planet, making it uninhabitable for all. Connecticut land must be protected from unsafe industrial development, we need at least 21% of the state protected from development. It is important we implement policies of proforestation, and allow forests to prosper without logging, and to develop themselves in perpetuity, because science shows the value of old forests. Aged forests are the greatest proven form of carbon sequestration right now. Aged forests are a stable habitat for the species that live amongst them. Aged forests are stronger against blight and invasive species. The logging plan for Massacoe State Forest is an example of poor forest management; it is excessive and unnecessary to log that prosperous land. There is value in the research of proforestation that CT DEEP must legitimately explore. I cannot express this enough, protect our forests in perpetuity to keep them as strong as possible; no timber profit is worth the damage that could've been done to Massacoe State Forest. I voice my support for proforestation. If we are to log forests in favor of man-shaped ones, we will lose endangered species and destroy their habitats, we will lose valuable ecosystems that may never prosper again. We need a strategic landscape plan for a balance among research, responsible resource production, and sufficient and connected nature preserves to protect our headwaters, special habitats, core forests, old-growth, and corridors. CT must support community solar power initiatives. Solar power is the future of home energy, assuming we all want a safe planet to live on, we must utilize the CT green bank and all our available resources to incentivise solar use for all. The Killingly Energy Center is an absolute disaster, its construction must be stopped.The Killingly Energy Center would create almost 7% more carbon dioxide emissions in the state of Connecticut, according to Environmental Protection Agency figures. It would also leak Methane, CH4, a gas that creates tropospheric ozone, which is unhealthy and harmful to the air we breathe. According to CT Sierra, CT methane pipeline is already in need of repair, with 4.3 leaks per road mile of methane pipeline in Hartford alone. Fracked gas plants are also a danger to the earthquake safety of New England, creating shallow, sometimes high volume, earthquakes. Methane Gas is also a dangerous water pollutant, this must be considered, given water is essential to our health, and so much of Long Island Sound is becoming polluted. The energy that the Killingly Center would produce is not needed to meet state energy standards. In an article from May 2017 by Max Greene of the Conservation Law Foundation, Greene states: “Just two

months ago, ISO New England held its annual Forward Capacity Auction, which ensures that there's enough power-generating capacity to meet the region's energy needs three years from now (meaning, power suppliers bid this year to supply energy to the grid in 2020.)
The auction's results: No new large power plants are needed to meet our region's projected energy needs in 2020." The megawattage from the Killingly Energy Center can easily be directed into CT DEEP's offshore wind farm, which hasn't reached the full capacity allowed by the CT legislature. I encourage CT DEEP to use this option, deny the Killingly Energy Center any further permits, and instead direct the energy into an energy resource it is essential we invest in as a state. If we were to add 650 megawatts to the offshore wind farm, we would not exceed the legislature approved 2000 megawatts and we would be creating more essential energy for a resource that we desperately need: Safe, Clean Energy. This is right in line with your Connecticut Energy initiative. I'm calling on CT DEEP to create Climate Justice Education programs for CT students, to educate children on the climate crisis and why it is essential we act swiftly and efficiently. Education programs are something CT DEEP is capable of, if you can hold a forum, you can educate children in the same way. Your policies will be affecting them for the next 10 years, it is essential you educate them in the value of climate protection. Stop subsidizing Biomass! Biomass is extremely harmful to the planet. It creates 60% more carbon emissions than burning coal. It is not carbon neutral when saplings are incapable of absorbing the emissions, and it is damaging to forest ecosystems everywhere. It will displace tons of species and pollute the air we breathe. Natural Gas is not the future of Connecticut energy. We must come up with a plan to phase out all existing fossil fuel infrastructure over the 10 years. Make a plan, not a plant; this is essential, not optional. The message is simple: If we are to save the planet from becoming damaged and uninhabitable, we must address the climate crisis to the fullest extent. I voice my support for the most progressive climate policy available because it will save our children. People's health and safety are in your hands. Make the right decisions. Follow the science outlined in this Email. Do what is JUST for your planet.

-Benjamin Mercury Parsons 10/20/2020

CONNECTICUT
PROFESSIONAL TIMBER
PRODUCERS ASSOCIATION

*The Voice of the Connecticut Forest Products Industry*

The Connecticut Professional Timber Producers Association has deep concerns regarding the findings of the Forests Sub-Group – Governor's Council on Climate Change (F-GC3). We want to thank all of those that have taken the time and energy to look heavily into this most important subject but we feel that the overall message of *No-Net-Loss* and *proforestation* leads the State of CT away from the decades of sound forest management practices and principles that have been implemented throughout our State.

The proforestation movement's purpose is to grow existing forest to their ecological potential (Old Growth Forests). This movement is emotionally based and lacks the scientific background to support its findings. This is not the answer to climate change. The concept of multiple-use has been the guiding principle for managing the woodlands of CT for many decades and the results of this management principle have been working.

Carbon storage and sequestration should be considered as an additional element of multiple-use forest management in Connecticut. This along with water, recreation, wildlife, and timber, being equally considered, constitutes sound management principles. Old growth forests are large carbon sinks but no longer capture or sequester large amounts of carbon. Second growth forest can sequester an enormous amount of carbon along with the vast amounts of carbon that is being stored within the forest soils and root systems. If we want to reduce our impact of CO2 emissions than we should maintain a diversified forest structure with various age classes throughout our forest ecosystems.

The idea of creating more passive management acreage for the benefit of carbon sequestration is flawed. The State of CT actively manages a small percentage of their lands already. Limiting this percentage even more would be detrimental to the forest products community that depends on this resource for jobs and the feeding of their families. Creating incentives for the wealthy to embrace passive management creates disparity amongst those that are not as financially well off. Implementing policy that restricts the individual rights of property owners from making decisions based on their needs is draconian in nature.

The F-GC3 sub group has formulated a plan for lowering our carbon footprint with respects to the future management of CT's forest both public and private. Much of this plan will be funded by bonding, increase of fees, conveyance fees, development fees, carbon tax and an increase in the CT general sales tax. All of this amounts to higher costs of living and a financial burden on the tax payers of CT.

Forests are increasingly seen in policy circles as a critical part of the solution to climate change, and that's certainly the case for Connecticut, where the carbon absorbed by our forests and stored in trees, soils and harvested wood products will be essential for reaching our state's legislated goal of 45% reduction of greenhouse gas emissions by 2030. The reality is that the State of CT has already been doing a great job of managing our forests both publicly and

privately. We have good policies in place already, such as the PA490 Program, that emphasizes the continuous protection of maintaining a forested landscape. There are hundreds of non-profits and land trust organizations actively acquiring development rights and land purchases throughout our State. Additionally, the State created the Forest Practices Act in 1991 which requires licensed forest practitioners to continuously educate themselves regarding the quality of forest practices within our State. This high standard maintained within our licensed forest practitioners results in ongoing educational learning opportunities. We are the *boots-on-the-ground* workforce actively managing and protecting this resource for generations to come. Let's not try to fix what doesn't appear to be broken.

The Connecticut Professional Timber Producers Association would be more than willing to offer advice or be consulted with regarding the future management of our forest resource. A policy of this importance and long-lasting management implications should have representation from within the industry.

Sincerely,

Brennan Sheahan

Brennan Sheahan – President

Connecticut Professional Timber Producers Association

**To**: **The Forests Sub-Group, Working and Natural Lands Working Group**
**Governor's Council on Climate Change**

**From: Carol E. Youell, Certified CT Forester**
**(3180 Hebron Ave., Glastonbury, CT)**

**Date: October 20, 2020**

**Re: Comments on the GC3 Forests Sub-Group Draft Report 2020**

I sincerely appreciate the opportunity to comment on this important draft report. It is obvious that a great deal of work went into its preparation. I would like to thank the Forests Sub-Group for their significant efforts. My comments are offered in a spirit of cooperation, not confrontation. If it at all possible, I and many of my peers, would like to have the opportunity to review and comment on any Forests Sub-Group updates to the original draft report before it goes public. Thank you.

I am a natural resources professional with over 40 years of experience working in Connecticut. I have worked in the public, private and nonprofit sectors, mostly focused on forest resources and water quality. In my last position I oversaw the management of more than 25,000 acres of water supply watershed forests. I received my BS in Natural Resources from UCONN and my Master's of Forest Science degree from the Yale School of Forestry and Environmental Studies (now known as the Yale School of the Environment). I am also a CT Certified Forester.

**My comments are as follows:**

**1. Managing forests for resilience and multiple uses is paramount in this era of climate change.** Resilience is achieved through active forest management using sound silvicultural practices based on science. Foresters must be able to monitor and implement practices to address changing conditions due to increases in forest insects, diseases, wind and rain storms, ice events, droughts, invasive species, browsing, etc., in order to maintain a sustainable resource to ensure a multitude of uses and benefits that the public needs and expects. We depend on our forests to provide a source of clean water, wildlife habitat, forest products, carbon storage, recreational opportunities, scientific study, aesthetic beauty, among others benefits.

My experience as a Watershed forester for a major water utility in Connecticut has clearly shown me that using proven forest management practices and tools, along with careful observations and an open mind, can result in more resilient, sustainable and healthy forest ecosystems. **(See the Appendix.)**

Foresters in Connecticut have been conducting multiple use management for many decades now, using proven silvicultural practices. Foresters must earn a Connecticut "certification" to practice commercial forestry in this state. This certification signifies that these professionals have reached

a basic level of achievement, knowledge and experience in order to understand and apply recognized forestry practices to properly manage the resource, as well as possess a basic knowledge of forest science and a multitude of other disciplines (including geology, ecology, soils, pathology, entomology, wildlife management, hydrology, statistics, and GIS among others.) This certification also requires continuing education to maintain one's certification.

**It is unfortunate that the Forests Sub-Group did not have more representation from CT certified foresters with significant on-the-ground professional experience. These are the people who have made important observations overtime as to what works and what doesn't, as well as having had the experience of confronting many significant challenges. These professionals have had the opportunity to actually see the results of their work. We need to hear more from them. This cannot be overstated. What role do CT Certified Foresters play in the context of this report and its recommendations?**

**2. Foresters need all available scientific management tools to address the dynamic changes that are occurring and will continue to occur in our forests.** Flexibility, adaptability, monitoring and education are key to future forest management decisions and healthy forests. There are many unknowns associated with climate change. It is difficult to predict the future. (Hindsight is always 20-20.) Our forest ecosystems are dynamic and complex in Connecticut. Forest carbon science is in its infancy and research is on-going. We need to learn more about the role forest ecosystems play in carbon sequestration and storage. *What about the role of forest soils? This was not addressed in the report.* With that in mind, it is essential to keep an open mind regarding forest management activities and practices on state and private lands.

**3. The term "proforestation" as referred to in the report, WILL NOT create healthy, "resilient" forests, which is a stated goal of the Forests Sub-Group. The professional Society of American Foresters does not recognize the word "proforestation" as a forestry term or a silvicultural practice (personal communication). The term is new to professional foresters in Connecticut as well.** "Proforestation" is defined in the draft report as: "natural forest growth in areas protected from timber harvesting", e.g., "protected reserves."

***A careful review of the science does not show that forests are more diverse, more resilient, or store more carbon over the long term when timber harvesting is excluded.*** Models suggesting otherwise assume the complete absence of disturbance and ignore the substitution benefits of durable wood products. Permanent restrictions on harvesting will limit our ability to protect forests, due to the dynamic nature of forest conditions, especially with a changing climate.

**Therefore the word "proforestation" should NOT be referred to at all in any of the Sub-groups' reports. Its use only adds to confusion and controversy, as the term is not supported by sound science.**

**4. The draft report recommends having long harvest rotations and growing large diameter trees to increase carbon storage (referred to as "*mitigation-focused forest management.*". However, long rotations and large trees are beneficial for carbon storage only if resilience of a forest is high.** The extent of large tree mortality in 2017-2018 across eastern Connecticut suggests that we may have prolonged rotation length too much for optimal carbon sequestration on many Connecticut forests. Other ways to improve forest management include: controlling invasive species, controlling excessively-high deer populations, reducing excessive use of forest roads, increasing structural diversity within stands and across the landscape, thinning stands to maintain vigor of the healthiest trees, establishing and releasing advance regeneration, favoring species best-adapted to climate change, and preventing widespread loss of timber suitable for durable wood products. **(See the Appendix.)**

Recent research published in ***Nature*** suggests mature forests are limited in their ability to absorb "extra" carbon as atmospheric carbon dioxide concentrations increase. Dr. John Drake assistant professor at SUNY College of Environmental Science and Forestry indicated that "the limited capacity of mature trees to respond suggests the need for a diversity of age classes of trees (younger trees sequester, older trees store carbon) and species, including species that may be better adapted to future climate conditions." (SUNY College of Environmental Science and Forestry, *"Don't look to mature forests to soak up carbon dioxide emissions: Results of Australian study may have impact on New York state carbon neutrality goals*.")

**5. The draft report repeatedly cites the need for more *protection/preservation* of Connecticut's forestland using a variety of terms that are confusing and undefined (such as passive management, reserve areas, unmanaged forest reserve, permanently protected core forests, core forest natural area preserves, etc.).**

First, the Forests Sub-Group must come to a consensus/agreement on the chosen wording and the terminology must be consistent throughout the report. Secondly, the definitions of their terms should be provided in the report. Thirdly, consideration should be given to reevaluating the forest protection related recommendations given the extent to which state lands are already managed and protected, and the reported fact that there is very little active management occurring on private forest lands in Connecticut. CT DEEP Forestry and the UCONN Cooperative Extension System should be consulted on these matters.

**6. The term "intact forest" is also misleading and confusing and needs to be defined.** The term was originally used to describe large intact forest blocks where anthropogenic forces were not a major influence, such as is in tropical rainforests. This term/concept has been expanded in its application and often applied to working forests. Clarification is needed if the term is to be used at all.

**7. Considerable public outreach, education (at all levels) and funding will be needed to successfully implement practices that support climate change mitigation goals.**

## Conclusion

I would urge the Forests Sub-Group to take advantage of the wealth of forestry and natural resources knowledge, research and experience we have here in Connecticut.

We are so fortunate to have dedicated and experienced foresters, biologists, ecologists, researchers and other professionals working right here! These include forestry and natural resource professionals from the CT DEEP, the University of Connecticut, Yale School of the Environment, Connecticut Agricultural Experiment Station, USDA Natural Resources Conservation Service, as well as private sector foresters, and many others.

I hope that the final report will reflect the level of expertise available and will serve to bring us together in addressing the important climate change issues that affect our forests now and in the future. This is an important document and deserves our time and attention. I am willing to assist in this effort.

Thank you very much for the opportunity to comment.

Sincerely,

Carol Youell
CT Certified Forester

# APPENDIX TO COMMENTS

(from CarolYouell)

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**Managing Public Water Supply Watershed Forestlands in Connecticut**

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In the next section, I would like to share with you some examples of forest management practices that have been conducted in Connecticut based on my experience as a Watershed forester.

-The first is an example of the extent to which forests can be affected by deer over-browsing and how a wildlife management program can help.

-The second is an example of an effort to restore a forested buffer that had been impacted by the Hemlock Woolly Adelgid insect and storm damage.

-The third explains typical forest management practices and desired results.

## Watershed Forests

Forests are the most desirable land use for protecting drinking water supplies:

- Provide a natural filtration system
- Buffer reservoirs from pollutants
- Intercept runoff, moderate stream flows, stabilize soils
- Reduce the amount and cost of water treatment needed
- Provide a host of multiple uses, clean water, wood products, wildlife habitat, recreation & carbon storage.

***Green Infrastructure***

## Management Challenges

- Deer/moose browsing of forest regeneration
- Invasive species control
- Forest insects and diseases: death/decline of hemlock, ash, white oak & others
- Climate change
- Recreational impacts

## High Deer Populations…

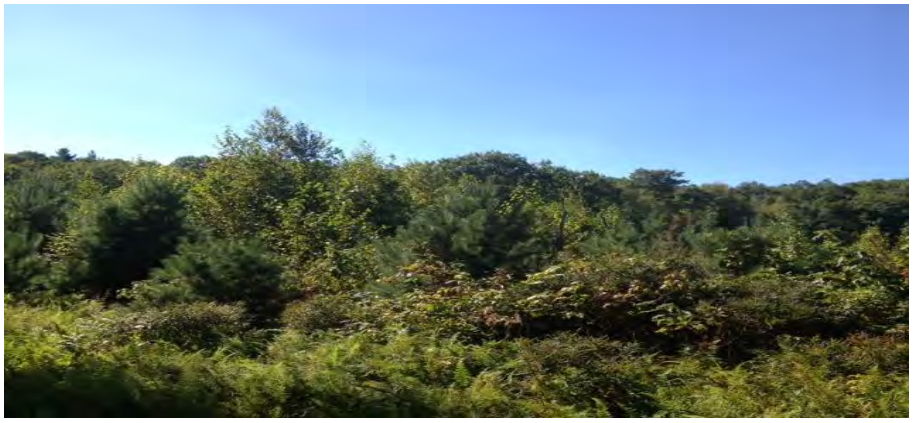
- Destroy native plant communities
- Prevent tree regeneration and growth
- Eliminate the forest understory
- Encourage invasive species
- Increase the risk of soil erosion and runoff, causing water quality degradation
- Reduce biodiversity and affects long-term forest health

**2006**

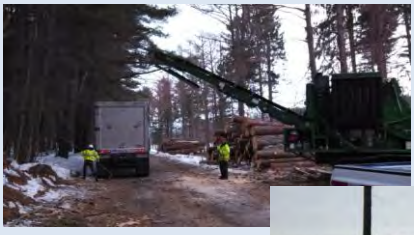
**2008**

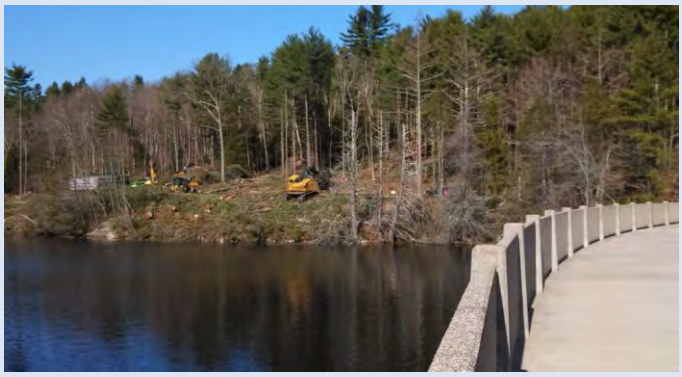
A harvest operation was conducted in this forest to remove hemlock trees infested with the Hemlock Woolly Adelgid insect. The forest did not naturally regenerate. The area appeared to be heavily browsed by deer. **A small fenced exclosure was installed in 2006 to keep deer out. The 2008 photo shows the results of the experiment: Outside of the fence - bare ground; inside the fence - trees are growing!**

**Management Program**: A cooperative Wildlife Management Program in the form of a controlled deer hunt was administered by CT DEEP in accordance with CT hunting laws and regulations, as well as other special watershed protections. **Goal: Restore the balance between deer populations and sustainable forests that protect water quality. Results: Photo taken in 2013 (below) shows an abundance of tree growth to the point where the fence is no longer visible!**

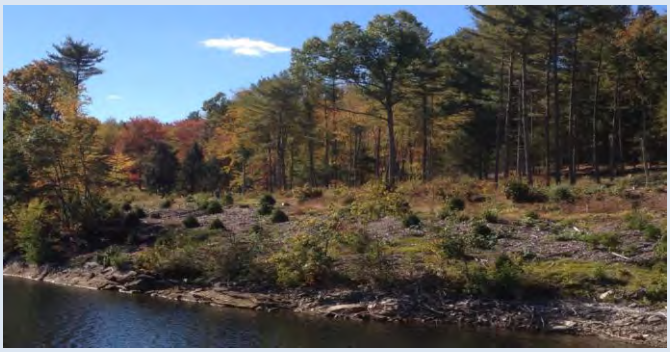


**Hemlock Woolly Adelgid insect infestation and storm damaged trees near reservoir - Salvage harvest and restoration.** Harvest followed strict tree removal conditions, adherence to proper maintenance and storage of equipment, and implementation of best management practices (BMP's) for soil erosion and sediment control. Planted nearly 1000 conifer seedlings in riparian areas.





**Restoration of Reservoir Buffer**



## Healthy forests are achieved through active management

**The Shelterwood silvicultural system is one system used to regenerate the forest -- a series of harvests over time that gradually open up the forest canopy to provide more sunlight to the forest floor, which promotes the growth of new trees under the shelter of the remaining ones.**

**Goal: Promote a continuous cycle of healthy, diverse forest cover over time. One with a diversity of species, sizes, and ages. A healthy forest is more resilient and better able to withstand disturbances. This reduces the risk that a single catastrophic event such as a hurricane, insect or disease infestation will destroy the entire forest and degrade soils, water and other benefits.**

Result: Healthy, resilient forest with a diversity of species, size classes and ages. Managed for multiple uses, including carbon sequestration and storage.

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UNIVERSITY OF CONNECTICUT

**Alec Shub <alec.shub@uconn.edu>**

# FW: Please protect CT forestlands

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 8:30 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

---

**From:** Armistead, Chelsea E. (2018) <chelsea.armistead@trincoll.edu>
**Sent:** Tuesday, October 20, 2020 9:35 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Please protect CT forestlands



To whom this may concern,

I'm a lifelong resident of CT, a single mom of one and a student pursuing a doctorate in public health.

I'm writing to express my strong support for nature preserves and to share a draft version of a public survey. Please see attached. My son and I love the natural environment and believe it is critical for the health and well-being of all Connecticut residents.

In 2018, I was part of a team that mobilized an anonymous customized survey to gather information on public opinions about public and private forests. The survey included more than 2000 people who care about the forests in Southern New England. The results are clear that the public supports forests on public and on private land. But the public wants nature preserves. They want nature protected for everyone.

Please protect our public land as nature preserves.

Thank you for your consideration,

Chelsea Armistead

**Shortened SNE Forests Survey.pdf**
1196K

# Southern New England Forests:

## *Public Values and New Opportunities*

Chelsea Armistead

# We wanted to investigate:

- Does the public appreciate forests' many values?
- Does the public support similar or different values for public vs. private forests? What are the priorities?
- With new science and new challenges, how can public forests best serve the public - now and in the future?

# Survey Introduction

“A forest is the natural state for most of New England. The majority of forestland in Southern New England is owned privately (over 70%). We need forests to survive. They stabilize the climate, clean our air and water, sequester carbon and protecting the biodiversity of life on Earth. Public money (taxes) and private money (donations) subsidize forest management, conservation and other activities.”

***The goal of this survey is to better understand your priorities for and knowledge of public and private forests.***

# Method

- Public opinion poll developed during 2018-2019 with interdisciplinary science and expertise (climate, ecology, policy, forestry, health, social science, etc)
- Initial pool of 6,500 responded to screening question: “Do you care about forests in Southern New England?”
- High response rate and level of engagement
- Final contract for >2,000 participants (2038); IRB approved
    - responses collected in two separate batches one week apart
- Each unique response was validated with their registered 12 digit mturks ID - opportunity for resurveying this same pool
- Within-survey attention assessed and confirmed (100%)

# Demographics

- Gender (all respondents):
  - Male - 43.77%
  - **Female - 55.89%**
  - Prefer not to say > 1%

- CT respondents identified as having live, work, or have visited CT made up **15.88%** of all responses.

Image: https://pngio.com/images/png-a159978.html

# Demographics: Age

| Age | Percent |
|---|---|
| Under 18 | 0% |
| 18-30 | 21.16% |
| **30-45** | **46.28%** |
| 45-60 | 23.36% |
| 60 or older | 9.21% |

Participants' median income was $40,000-$59,999 (lower than the Connecticut's median income of $78,833 for a family of 2)

https://uwc.211ct.org/wp-content/uploads/wp-post-to-pdf-enhanced-cache/1/connecticut-state-median-income-2013.pdf

# Greatest concerns in CT

| | |
|---|---|
| Damage to **water quality** (wetlands, vernal pools) | 76.67% |
| **Logging** and associated use of herbicides and pesticides | 68.33% |
| Accumulated disturbance due to **human intervention** | 64.17% |
| Habitat fragmentation | 50.83% |

Surprisingly, personal risks (poison ivy, ticks) were the lowest category at 17.50%.

# Strong support for PUBLIC funding on PRIVATE forestland:

| High biodiversity and carbon sequestration | |
|---|---|
| Strongly support | 67.29 % |
| Do not support | 5.08% |

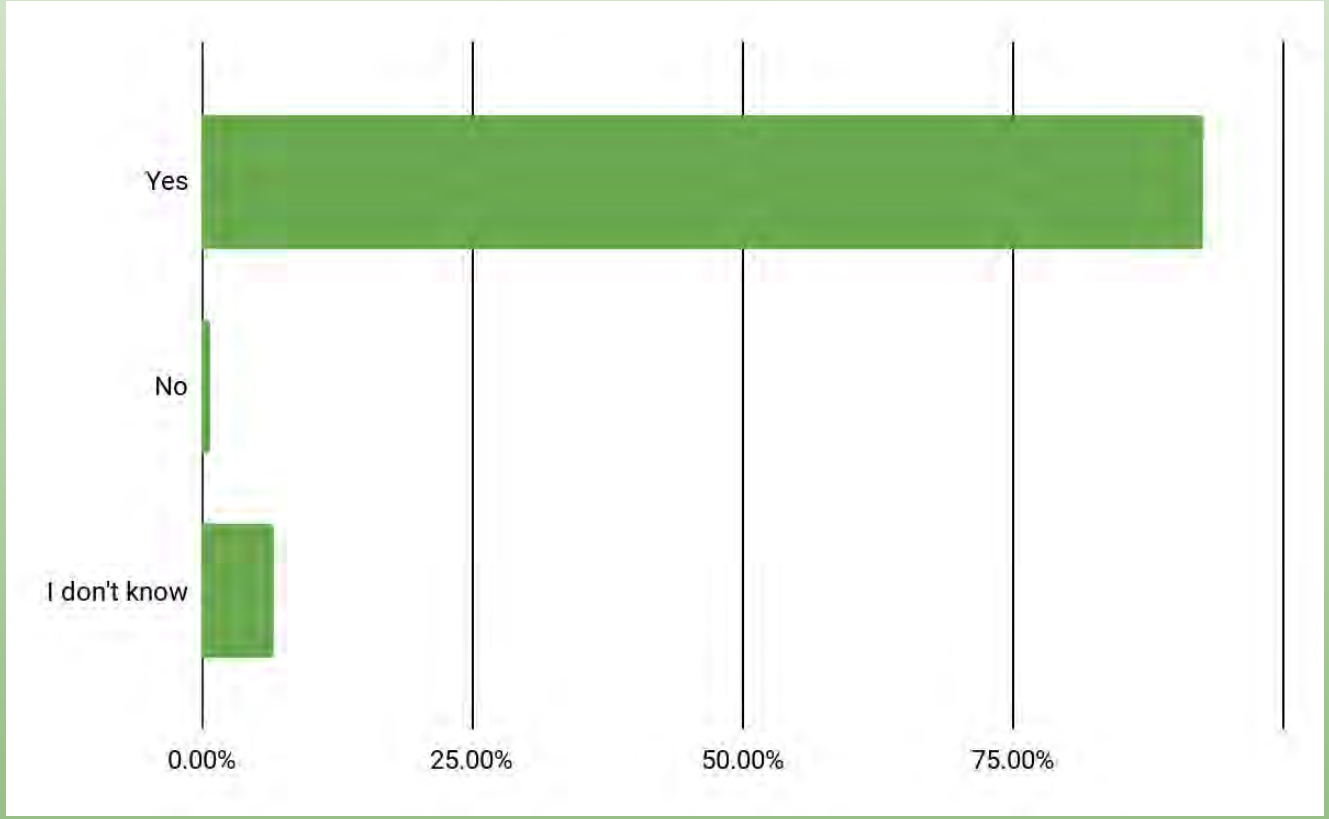
| Protect clean water and reduce flooding | |
|---|---|
| Strongly support | 87.32% |
| Do not support | 2.07% |

# Level of support for PUBLIC funding on PRIVATE forestland:

| Careful management of invasive species | |
|---|---|
| Strongly support | 71.98% |
| Do not support | 4.05% |

| Recreation, nature study, tourism | |
|---|---|
| Strongly support | 69.41% |
| Do not support | 6.22% |

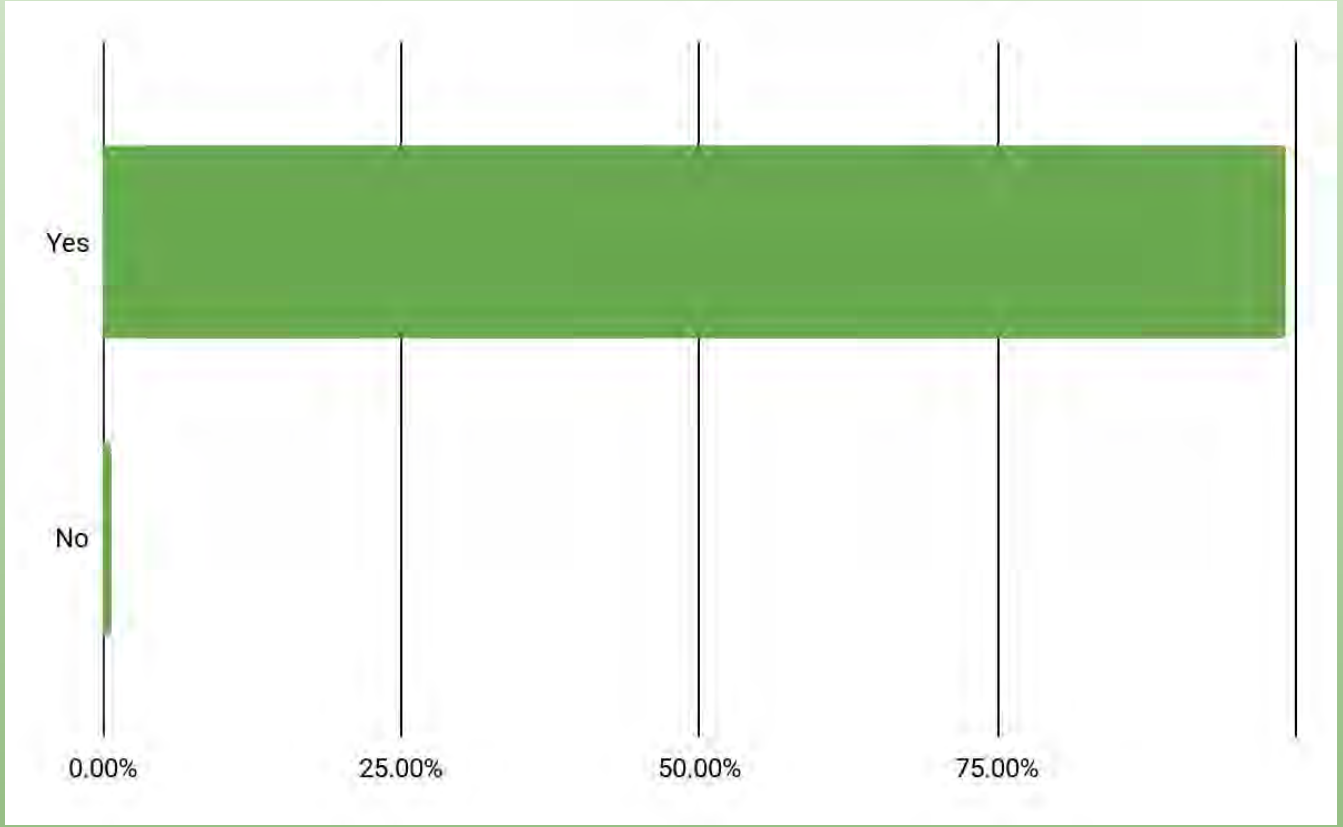
Do you think that **PUBLIC** forestland should be prioritized as a nature preserve?



# Importance of access to natural forests for:

| | Very important | Not Important |
|---|---|---|
| Personal interest/reasons | 70.83% | 5% |
| Everyone should have a natural forest nearby | 55.83% | 5% |
| Scientists, educators and children need nature study | 84.17% | 0% |

# Do you support legal protection for old-growth forest?



Private forest owner - what are the hopes for the future:

- 89% hope it remains as a natural forest
- 75% hope to achieve maximum carbon sequestration to fight climate crisis
- 55% do not prioritize wood production/other resources
- 30% hope it can be used for scientific research
- 9% would let next owners decide what to do

No differences among the three SNE states . . .

# Forest protection:

- Nature preserves and old-growth forests are **very** important to people who care about Southern New England forests!
- They assume 20% of the landscape is strongly protected and want >40% protected.
- Over 99% support legal protection for old-growth.


“Save the children. Save the trees. Teach the children to save the trees.”
“Having access to natural forests and vegetation is very important for both physical and mental well-being.”
“Clean environments support all communities.
“Southern New England has some gorgeous woodlands and everyone should be able to enjoy them. They should be protected!”

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UNIVERSITY OF CONNECTICUT

**Alec Shub <alec.shub@uconn.edu>**

# FW: Draft Mitigation Report Public Comment

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 10:04 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Chris D'Antonio <cdantonio@live.com>
**Sent:** Tuesday, October 20, 2020 12:09 AM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Draft Mitigation Report Public Comment

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Hi there,

The draft report was very thorough and admittedly I am no expert in any of the specific subjects, but I do just want to make a point to emphasize some details that are in fact included and express my concern for their importance. The push to ZEVs is great, but it's an inevitable technological transition. I'm not saying we shouldn't put effort into making it happen sooner rather than later, but it's all too easy to see "Zero Emissions Vehicle" and think it's the silver bullet. It's not.

We need to especially focus on the things that aren't going to happen naturally: transportation equity, decreasing reliance on single-passenger cars, making streets safer for all users, etc. Not to mention, transportation does not happen in a bubble. It's all good and well to suggest that we strive for all these things, but land use is a critical piece of the puzzle that can't be overlooked.

Transit-oriented development is mentioned, as it should be, and I want to tip my hat to that key piece. But I also want to add that there's a ton of room for improvement in land use laws and equity and Desegregate Connecticut (https://www.desegregatect.org/platform) has that covered. We need more affordable housing, more housing in general, and more dense housing - include the missing middle. All this is key to promoting a society that is not entirely dependent on privately owned cars which work mainly in the favor of the well-off at the expense of the most vulnerable and least privileged citizens. EVs can't solve that. Building more roads and lanes can't solve that. We need to shift focus on the human part of transportation – all the technology in the world means nothing when pedestrians and cyclists are second-rate citizens, how easily killed or maimed by drivers who treat driving as a right and not a privilege.

I'll say again, transportation does not exist in a bubble and for every carrot leading people away from single occupancy cars, we need to very strongly consider also adding sticks. Consider automated enforcement of driving infractions and stricter punishments. If somebody cannot safely follow the rules of the road, they should not retain their privilege at the expense of society. Ride hailing (Uber/Lyft) are anything but a silver bullet, but it's important to recognize that they are available as options to privately owned vehicles and drivers with temporarily suspended licenses are not fish out of water.

Sincerely,

Chris D’Antonio

Enfield, CT

Housatonic Valley Association

150 Kent Road
PO Box 28
Cornwall Bridge, CT 06754
T: (860) 672-6678

14 Main Street
PO Box 496
Stockbridge, MA 01262
T: (413) 298-7024

37 Furnace Bank Road
PO Box 315
Wassaic, NY 12592
T: (845) 442-1039

hvatoday.org

October 21, 2020

Via email: deep.climatechange@ct.gov
Connecticut Department of Energy and Environmental Protection
Office of Climate Planning
79 Elm Street
Hartford, CT 06106-5127

Re: Governor's Council on Climate Change (GC3) Draft Working Group Reports

To the Esteemed Members of the GC3 Council,

Thank you for the opportunity to comment on the Governor's Council on Climate Change (GC3) draft Working Group Reports. As Director of the Litchfield Hills Greenprint Collaborative (Greenprint) I commend the Governor and the Department of Energy and Environmental Protection (DEEP) on this robust process to position our State as a leader in the challenge to mitigate and adapt to climate change.

The Greenprint is a Regional Conservation Partnership active throughout a 29-town region of Northwest Connecticut. Its network of 34 partners include local and regional land trusts and conservation organizations as well as the Northwest Hills Council of Governments. Greenprint's collaborative regional conservation strategy has incorporated the Follow the Forest multistate initiative to protect core forests and the natural areas connecting them. Greenprint's partners are responsible for the care and stewardship of existing and newly protected land within their communities, and for managing public access to protected lands for outdoor recreation and appreciation of nature. The Working Group Reports deeply resonate with and impact our work.

We strongly support a great many of the recommendations and goals included in the draft reports while highlighting herein some of the bold recommendations of the Working and Natural Lands Working Group, as well as those of the Science and Technology Working Group.

1. We must ***prioritize the capacity of Connecticut's forests*** to mitigate climate change through carbon storage and sequestration. Proforestation (growing existing natural forests) has recently been recognized as the most powerful, low cost, and immediate mitigation opportunity with multiple immediate co-benefits and proven long-term resilience to the stresses of climate change; New England's forests have been specifically identified as part of the "Global Safety Net" needed to stabilize the climate. Connecticut's forests are critical within this Safety Net due to their considerable capacity to store aboveground carbon and their situation within climate corridors of connected core forest habitat running from Long Island Sound to Canada on either side of the State. We must:

    - ***Keep Forest as Forests***. Commit to *no net loss in statewide forest cover* and the permanent protection of *at least 50%* of Connecticut's medium (>250 ac.) and large (>500 ac.) core forests by 2040.

    - ***Establish Extensive Natural Area Forest Preserves*** on existing and new state conservation lands. Establish criteria and processes for protective designation to prioritize proforestation and ensure old-growth forest and remnants are protected.

- ***Increase land protection funding*** from all available sources, including annual bond authorizations of at least $25 million for DEEP's Recreation and Natural Heritage Trust Fund and $25 million for the Open Space and Watershed Land Acquisition (OSWA) program.

- ***Encourage land stewardship behaviors that support ecosystem services.*** Provide funding and policy incentives to encourage carbon storage and sequestration, reduction of habitat fragmentation and protection of vulnerable habitats, and increased connectivity among other natural climate solutions, on non-state lands including through the purchase of easements.

- ***Action must start right now***. We should not wait on final reports to act where the science is already sound. Land conservation organizations including those in the Greenprint plan to protect land and natural resources in perpetuity. We appreciate the long-term effort needed to effectively meet the challenges posed by our rapidly changing climate, but also the immediacy of the need to respond in accordance with proven science. The bold recommendations above can and should be implemented immediately.

2. We must be ***guided by science, and do no harm***. GHG mitigation policies in particular should ensure that gains are not offset by (i) poorly sited solar and wind installations that convert forestland and remove stored carbon, or (ii) timber sales on state lands that are far more valuable for their carbon storage as living trees than the generally low value that the state generates from the sale of logs (and associated leakage of stored carbon from the state).

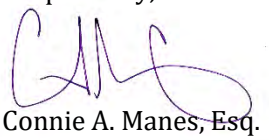
3. We must ***support research and education***. Provide funding to target areas where research is still needed to discover, monitor, and develop the science needed to adequately and rapidly mitigate climate change. Augment, accelerate and formalize a broad program of positive education and cultural change across all sectors of state government, municipalities, NGOs, and public schools.

We appreciate the cross-sector nature of many of the Working Groups' recommendations and recognize the possibilities in coordinating work around the recommendations. Community nonprofits can effectively partner at the municipal and state levels.

Greenprint partners can help by protecting and responsibly stewarding conservation land, including that expressly protected as natural area forest preserves. We can look broadly at land use planning taking into account the large landscape while using community knowledge and connections to work locally. We can provide needed education to the broad public and to the youth who will inherit our climate and carry on our mitigation and adaptive strategies. We can provide access to protected lands for scientific research needed to inform ongoing and future policy decisions. And we can provide all people with the benefits of outdoor recreation and experiences in nature.

Thank you once again for your leadership in this significant work, and for providing this opportunity to present comments on the recommendations. We look forward to assisting in their implementation.

Respectfully,



Connie A. Manes, Esq.

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect Our Forests

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 12:37 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: Daniel Piano <pfam12@comcast.net>
Sent: Tuesday, October 20, 2020 12:24 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: Protect Our Forests

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

We need to protect nature, all species, for us now and for the future. Why are we exporting and burning our public forests ... and at the same time asking people to subsidize solar panels to help with climate change? Treat our public forests as natural preserves. Protect our forests.

Sent from my iPhone

UCONN
UNIVERSITY OF CONNECTICUT

**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Public Review Period - Public Comment

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 12:47 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI, from Rep. Michel. Maybe we should respond directly, in addition to/instead of the blanket thank you at the close of the comment period?

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**From:** Rep. Michel, David <David.Michel@cga.ct.gov>
**Sent:** Tuesday, October 20, 2020 12:27 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** GC3 Public Review Period - Public Comment

These past several months have seen large parts of the planet engulfed by unusually severe weather. Wild brush fires lighting the sky orange on the West Coast, while fires destroy unique ecosystems in Australia and Brazil. 2020 has brought us more frequent hurricanes and superstorms in patterns that resemble what used to be “once in a lifetime” occurrences. The recent storm outages we’ve experienced in Connecticut are not unlike what we encountered following Superstorm Sandy and the 2011 blizzard. We’ve known for a while now that systemic climate change is underway, and we are experiencing its impacts.

The complexity of climate change goes beyond unusual storms and severe brush fires. The COVID-19 pandemic is a result, in part, of our relationship to nature. And while COVID hasn’t set wildlife and land on fire, it has set on fire existing problems of structural racism and inequality. The impacts of the pandemic disproportionately impact the poor and people of color. And of the many lessons we are learning from this experience we have come to recognize how fragile our social welfare system is, and that environmental justice is also racial justice, economic justice, and social justice.

All of this has been created by and can be solved by us.

Just as there is an intersection of race, class, and gender there is an intersectional nature to our own biodiversity. Our lands and oceans are being affected from warming temperatures as a result of human activities and man-made emissions. CO2 and methane and other pollution heat up our atmosphere, and without the marine ecosystems in our oceans, just like the trees on land, that are responsible for oxygen production and carbon absorption, the temperature would dramatically go up. Our oceans are the climate regulators and its biodiversity is keeping us alive.

The whales, keystone species, are continuing to disappear, threatened by pollution of all sorts. As this happens, the less we are protected from the devastating impacts of climate change. The whales are the gardeners of the seas and maintain the phytoplankton that absorbs carbon, that produces 60-80 percent of the oxygen in the air we breathe and that is the food for the zooplankton (baby fish and crustaceans).

It is important to see the links that hold our planet together.

We must challenge the economic and political ways in which we extract, create and distribute energy. Our emerging market for environmentally friendly, renewable energy: wind, solar, and water can break our dependence on fossil fuels, but cannot come at the cost of its own environmental destruction. With green jobs and technology, come green practices and priorities. Building in a way that is safe to our environment and without the extraction of resources and people that currently result in income inequality and social ills.

We are experiencing the largest expansion of offshore wind technology in the nation in the waters in front of New England. The state is moving forward with a new fracked gas plant in Killingly. These decisions will have environmental consequences. It's our responsibility to ask what those are and hold our leaders and each other accountable for reducing or eliminating that risk.

As we are in the midst of a presidential election, now is the time to see what policies harm our environment on the federal level and ask our leaders what we can do differently and better. Subsidies to oil and gas industries that promote fracking, shale fracking, and offshore drilling have come at a huge environmental cost. Subsidies to animal agriculture, one of the most cruel industries, produces significant pollution in our air and soil and is in part responsible for oceanic dead zones. Subsidies to heavy gear industrial fishing have participated primarily in the loss of 90 percent of fish in our oceans. With the subsidies we pay these industries, we can support clean plant agriculture, ensure the small fishermen get paid to retrieve trash and make a living with the reusing of that trash. We can feed and support every household affected by the pandemic and provide universal health care for every person in America. It's simply a matter of choosing our priorities.

Connecticut has proven itself as a role model for the nation. We can set the standard when it comes to environmentalism. Living in a clean and protected environment means serving those most suffering from our environmental degradation and its resulting economic inequality. We can and must be the change we seek.

David Michel

State representative for Stamford's South End, Shippan and downtown.

# Subject: GC3 Comments

**Dennis Tulimieri** <dennis.jr@everyactioncustom.com>
to DEEP ClimateChange

Tue, Oct 20, 8:53 AM (11 days ago)





Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Dennis Tulimieri
8 Cambridge Ct E  Old Saybrook, CT 06475-2601
dennis.jr@tulimieri.com

To Whom It May Concern:

I am writing to you as a Connecticut citizen, dedicated natural resource professional, forest recreationalist, and conservation advocate. It is with the utmost concern and respect for our State's precious forest resources that I submit the following comments:

The statements and recommendations made by the Science and Technology Working Group of the Governor's Council on Climate Change regarding forests are inappropriate, illegitimate, and partisan, and they must not be included in the final reporting.

The Governor's Council on Climate Change consists of 9 Working Groups, separated in order to provide specialized recommendations specific to the various relevant topics. Due to the complex and variable nature of Working and Natural Lands as topic area, this working group was further divided into several sub-groups to better allow for the application of the appropriate expertise. The inclusion of subject matter which is most relevant and applicable to one working group or sub-group within the reporting and recommendations of another is inappropriate and unjustifiable. However, the Science and Technology working group draft report has done just that – it places a substantial emphasis on forests and makes many recommendations regarding forests. Information about and recommendations regarding forests belong within the Forests Sub-Group of the Working and Natural Lands Working Group and not within the Science and Technology Working Group.

The information contained within the draft report of the Science and Technology Working Group regarding forests is not true. The recommendations made therein regarding forests are counterproductive to the goals of the Governor's Council on Climate Change. There are many statements made without documented scientific backing, and when there are references provided to justify statements, those references do not actually support the statements. This is particularly concerning given the working group's task of representing science and technology. The recommendations regarding forests are based on opinions, guesses, improper assumptions, and repeated ignorance of relevant externalities. If these recommendations were impartially and fairly considered, they would certainly not be included

in the report because they would result in negative outcomes and would worsen the negative impacts of climate change in Connecticut.

The inclusion of information about and recommendations regarding forests in the draft report of the Science and Technology Working Group is an undeniable attempt to advance the partisan agenda of a special interest group. Co-chair Masino is the second of three authors on the published paper which invented the term "proforestation." This paper was published in the perspectives section of a scientific journal, to make sure that the readers of said journal clearly understand that this paper represents the opinions of the authors and not science. The term "proforestation" does not appear in any other peer-reviewed publications. The first author of this opinion piece, W. Moomaw, presented his opinions about forests to the working group on May 6, 2020. The third author of the paper, E. Faison, added his opinions about forests into the Forests Sub-Group's otherwise science-based reporting. The opinion piece which invented the term "proforestation" is consistently referenced in the aforementioned sub-group reports as though it represents scientific reporting. This follows the pervasive trend of using false information, misrepresenting legitimate scientific reporting, misusing and conflating terminology, and applying logical fallacies to push a partisan agenda aimed at stopping forest management at all costs. The Governor's Council on Climate Change must not be dominated by partisan special interest groups. Opinions must not be included in the final reporting unless they are properly identified as such and not labeled as science or fact.

I would like to thank the members of the Science and Technology Working Group for their time and effort to put together this report. Please do not hesitate to reach out to me with any questions or concerns. Thank you for reading and considering my comments.

Frank Cervo
Old Saybrook, CT
Connecticut Certified Forest Practitioner #1252
Master of Forestry, Yale University
Bachelor of Science, University of Connecticut
frankcervo@gmail.com
631-487-4834

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Feedback Submission

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 8:28 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

---

**From:** Heather Eversdyke <hadamseversdyke@sbcglobal.net>
**Sent:** Tuesday, October 20, 2020 8:42 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** GC3 Feedback Submission

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Good Evening,

I am reaching out to submit feedback for the Governor's Council on Climate Change (GC3). I am grateful for the unique opportunity that Connecticut has to set a precedent for climate change strategy. As this initiative is not happening in any other state, we have the responsibility to lead by example to secure the protection of clean water and connected ecosystems.

Twenty-one percent of the state needs to be protected from development. We also need to prioritize a strategic landscape plan for a balance among: research, resource production, and nature preserves to protect our headwaters, special habitats, core-forests, and old-growth. Additionally, biomass must be demoted from its "Class I" tier of renewable subsidies, as it is not carbon neutral.

Most importantly, we must protect nature wherever possible.

Kindly,

**Heather Eversdyke**

*hadamseversdyke@sbcglobal.net*

Home: (860) 431-5093

Cell: (860) 712-8278

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 9:58 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI correction to earlier comments.

-----Original Message-----
From: hbarres@everyactioncustom.com <hbarres@everyactioncustom.com>
Sent: Monday, October 19, 2020 4:05 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Rebecca French,

Rebecca French
DEEP

Correction. This morning I sent you a brief description of our RTT program to reforest the tropics to sequester CO2. I wrote that we were sequestering 40,000 tonnes of CO2 annually. That was a typo mistake on my part. The number refers to the total number of tonnes of CO2 we have sequestered so far in 56 of our older plantations. Another 33 plantations are still too young to have sequestered significant amounts to be reported.

My apologies.

Herster Barres

Sincerely,
Dr. Herster Barres
5 Holmes St Apt 5 Mystic, CT 06355-2628
hbarres@reforestthetropics.org

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 9:28 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: hbarres@everyactioncustom.com <hbarres@everyactioncustom.com>
Sent: Monday, October 19, 2020 10:53 AM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Rebecca French,

CT DEEP Climate Change Program, 19 Oct, 2020.

The challenge of climate change will require the management of our CO2 emissions. Among the most economical options that should be considered is the use of new forests to sequester CO2 for the long-term, if not indefinitely.

Reforest the Tropics, a CT non-profit, has been working in Costa Rica for over 50 years to develop and apply new models of reforestation of farm pastures to offset U.S. CO2 emissions. We were approved as a UNFCCC-sanctioned R&D Program in 1995 by the U.S. government, although funding was not provided. Since then, we have raised over $4 million to develop and deploy new designs of mixed-species stands towards beginning to meet our needs. We have established 89 projects sponsored by U.S. emitters on 13 farms in Costa Rica that are now sequestering more than 40,000 metric tonnes of CO2 annually. And this number is increasing as more recently established forests begin to mature. The 331 hectares of RTT forests should sequester well over 200,000 tonnes at the end of the each first 25-yr contract.

Our model is focusing on meeting the following goals: efficient, long-term (100-yr) sequestration of 40 tonnes/ha /yr, farmer income from an initial grant provided by the U.S. sponsor and from the sales of thinnings (partial harvests) replacing income received from cattle on the same pasture, increasing the biodiversity of the RTT forests and its biome through the use of mixtures of tree species and other food sources for wildlife.

Our forests are measured annually to document the sequestration of CO2, our goal being 40 tonnes of CO2/hectare annually and 1,000 tonnes at age 50. One of our early research plots has reached over 2,000 tonnes/ha in 50 years.

Research involves adjusting the management of the forests and their mixtures to meet our goals in recognition of the goal of meeting the need of the same farmers to replace the income from the cattle we displace. His/her willing participation is essential for our expansion to the thousands of hectares for a significant program.

Our oldest research forests in this R & D program are over 50 years of age. While it would seem more appropriate to invest in forest projects in CT, our state probably does not have sufficient open land to reforest to be significant. Pastures in the tropics are available at a large scale if funding is available and the research continues. Our latest and largest project is 100 hectares for a Massachusetts business.

Our economic model involves a series of successive 4, 25-yr contracts between RTT and each farmer. All of our forests have these contracts. We estimate our cost to be under $20/tonne of sequestered CO2. The annual measurement of sample plots document the sequestration of CO2. Forests can be visited and independently measured. Our model has been reviewed by a third party.

On-going research is a necessary element as the program progresses and various parts of our positive results are appearing. Case histories are available. These show the growth and sequestration rates as the forest begins to grow. Our oldest formal offset forests are over 20 years of age, still under management and approaching the signing of the second 25-yr contract.

Current sponsors include the Yale School of the Environment, the Mohegan Casino, The CT Municipal Electrical Energy Cooperative (CMEEC), The New England Bio Laboratory, The Superior Nut Co. in Cambridge, MA, schools, families, and social groups.

Contact us for more information and participation in our program.

Dr. Herster Barres
Founder of RTT, Director of Research
Tel 860-912-7706
HBarres@reforestthetropics.org.
Website Reforestthetropics.org

Sincerely,
Dr. Herster Barres
5 Holmes St Apt 5 Mystic, CT 06355-2628
hbarres@reforestthetropics.org

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Mon, Oct 19, 2020 at 6:16 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: hdbirdsall@everyactioncustom.com <hdbirdsall@everyactioncustom.com>
Sent: Friday, October 16, 2020 10:14 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to three actions Connecticut can take now to drastically reduce climate disaster.
1. Recognize and act on the fact that just as climate change is relevant to every content area in public education, so is public education relevant to every aspect of climate mitigation strategizing. Yet education is mentioned only in Leticia Colon de Mejias's working group report. It needs to be everywhere.
2. The colonialist/ fossil capitalism that got us into this mess needs to be addressed and called to account, and alternative, mutual aid, circular sharing economies need to become the norm if our civilization on this planet is to survive.
3. Tropical Reforestation must be a critical part of any plan for carbon sequestration even in Connecticut, because time is short, and it could be a vehicle for restoring failed tropical economies as well as the rights of indigenous peoples and their integral role in environmental stewardship.

Sincerely,
Mr. Hugh Birdsall
15 South Pkwy Clinton, CT 06413-2352
hdbirdsall@aol.com

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Alec Shub <alec.shub@uconn.edu>

# FW: Comment on the Forests report

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 8:24 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Jack Swatt <jswattchestnut@gmail.com>
**Sent:** Tuesday, October 20, 2020 3:18 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Comment on the Forests report



I agree that climate change is an important issue and applaud the work that the Governor's Council has done to find solutions to combat this global problem. I am concerned, however, after reading the Forests Report, that some of the strategies proposed in curtailing forest management may have a deleterious effect on the health of the forest ecosystems in CT, and a disastrous effect on species at risk of becoming extirpated from the state. It has widely been written that a healthy forest ecosystem has areas of varying forest age to benefit many species that only inhabit forest of a particular age. An example of such is the Ruffed Grouse which depends on young forest to nest and raise its young, and is undergoing serious decline in Connecticut since the mid-80s. Another species which was almost declared endangered is the New England Cottontail.

Since 2007 the state of Connecticut has been performing habitat management , including clearing of trees, to help bring back this young forest specialist. The limitations to creating new young forest set forth in the Forest Report will make all the efforts to save this species worthless.

While doing the American Chestnut Foundation's work to conserve and restore the American chestnut, we have found that areas undergoing habitat management by clear cutting have become areas of greatest potential for finding flowering and nut producing surviving American chestnuts. American chestnut is currently surviving as understory sprouts waiting to undergo rapid growth once there is a disturbance to their surrounding area. In areas of natural or man-made disturbance they will grow fast enough to be able to flower and reproduce before the chestnut blight kills their stems and reduces them back to sprouts. As we continue to search for scientific as well as traditional breeding applications to develop a tree that can survive the blight, recently clear cut areas of forest, such as areas within Nehantic State Forest, Naugatuck State Forest, and Wyantenock State Froest have provided us with surviving nut producing American chestnut trees to help conserve the genetic diversity of the species. The reduction in habitat management by not using clear cutting will negatively affect our work to conserve and restore this keystone species.

Sincerely,

Jack Swatt

President

CT Chapter of The American Chestnut Foundation

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 12:35 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: edjeanmd@everyactioncustom.com <edjeanmd@everyactioncustom.com>
Sent: Tuesday, October 20, 2020 10:20 AM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Rebecca French,

One DOT practice works directly against the State of CT's stated goals of working to mitigate climate change: the practice of cutting down large swaths of trees on highway median strips and maintaining them as mowed, grassy lawn. Obviously, in some cases, certain trees pose a hazard to motorists during storms and something must be done, but in many cases, many more trees are being removed than necessary for safety. Trees, especially large trees, are vital for carbon capture and storage. In areas where trees must be removed for the safety of motorists, the state should maintain the areas as natural meadow for pollinators and wildlife, rather than wasting money and generating greenhouse gases by mowing grassy lawn. And in areas that must be kept treeless, the state could install solar panels to generate electricity.

I also agree with the following goals promoted by the CT League of Conservation Voters:

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Jean Darlington
191 Lakeshore Dr  New Hartford, CT 06057-4123 edjeanmd@yahoo.com

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 10:06 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: Culpjs@everyactioncustom.com <Culpjs@everyactioncustom.com>
Sent: Tuesday, October 20, 2020 6:24 AM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Jeffrey Culp
6 Rainbow Ct  Quaker Hill, CT 06375-1341 Culpjs@gmail.com

Comments Regarding the GC3 Science and Technology Draft Report

By Gerard Milne

October 20, 2020

Governor's Council on Climate Change

By way of introduction, I have 40 years of experience in managing thousands of acres of Connecticut's public lands for multiple uses, including sustainable wood production, diverse wildlife habitat, and compatible outdoor recreation. I have seen numerous instances where a managed forest was more resilient than an unmanaged one. For example, a white pine grove that had been thinned of weevil-damaged trees had no damage from an April snowstorm, while a nearby stand of pines was full of broken tops, because the heavy wet snow split the weeviled, forked trees in half.

As I write this letter, I am sitting on a wooden chair, seated at a wooden table, supported by a wooden floor, surrounded by a wood-framed house. The house was built in the 1860s, proving the durability of wood and its potential for long term carbon storage.

I have many concerns about the draft report of the Science and Technology Sub-Group.

One issue is the lack of transparency. None of the members of the Sub-Group or their affiliations are listed in the report, unlike those of the other Sub-Groups.

Another problem is that the recording, presentation slides, and minutes of the Public Forum for the Science and Technology Draft Report were not posted until today, only 24 hours before final comments are due.

In the draft report, the recommendation to "prioritize proforestation on public lands" should be removed. Proforestation is merely an opinion, not a scientific consensus. In fact, an article describing it was co-authored by the Chair of the Science and Technology Sub-Group in the "Perspectives" section of a journal.

Public lands provide a reliable, sustainably managed source for Connecticut's wood needs because most private woodland owners are not interested in timber harvesting, and the average privately-owned woodlot in Connecticut is too small for a commercial harvest[1].

Proforestation ignores the value of storing carbon in durable forest products. Connecticut should try to supply as much of its wood needs as possible by using sustainable forestry; "Growing What We Need, Where We Live". Our forests produce wood for lumber, flooring, furniture, pallets, and railroad ties.

The draft report mentions the need for better public transportation. Trains would certainly be part of that equation. The Railway Tie Association (www.rta.org) states that there are 3,249 ties per mile of track. Railroad ties can be an overlooked segment of our local forest products industry, but they are quite important because they provide a market for lower grade hardwoods. Private woodland owners need these markets to provide revenue to offset their costs of owning land, such as taxes and maintenance. It benefits everybody if landowners can hold onto their forestland. Forest management provides that opportunity.

Many Connecticut sawmills produce railroad ties. Our sustainably managed forests can provide the raw material for improved transportation in Connecticut while also providing local jobs, a win-win situation.

Proforestation doesn't account for the benefits of using wood to substitute for more carbon intensive products. Many studies document that one of the key carbon sequestration benefits of active forest management is the substitution of products made from wood for those made from steel, aluminum, or concrete.[2]

Active forest management is the best way to ensure that oak remains a part of our woodlands. Well planned harvests that consider timing of acorn production, soils, and sunlight requirements will regenerate oaks, ensuring their presence in the next forest.

Oak seedlings after a harvest at American Legion State Forest, 2020.

I urge that the discussion of Proforestation be removed from this report, and that the Science and Technology Sub-Group allow the Forests Sub-Group to deal with the issues of forests.

Sincerely,

Gerard Milne


1. Tyrrell, M. report by Yale University's Global Institute of Sustainable Forestry. 2015. Understanding Connecticut Woodland Owners: A Report on the Attitudes, Values and Challenges of Connecticut's Family Woodland Owners.

2. Southern New England Forest Management in an Era of Climate Change (May 2020). https://nesaf.org/about-us/divisions-chapters/yankee-division/

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 8:28 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: jamari2019@everyactioncustom.com <jamari2019@everyactioncustom.com>
Sent: Tuesday, October 20, 2020 7:56 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Rebecca French,

Thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports.

I'd like to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster and mitigate climate change.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

As a young student who is passionate about the environment, I'd like to know that my future—and the future of my family and friends—will be one with clean air, thriving ecosystems, and people who care about the environment. The first step to achieving a clean and green future is to acknowledge issues of climate change and take action—as the GC3 has begun to do. I look forward to seeing how the council will further tackle and mitigate issues in climate change in equitable and intelligent ways.

Thank you again for the opportunity to submit comments.

Sincerely,
Jill Amari

5151 Park Ave  Fairfield, CT 06825-1090
jamari2019@cchsraider.net

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 10:04 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: mrj527@everyactioncustom.com <mrj527@everyactioncustom.com>
Sent: Tuesday, October 20, 2020 5:14 AM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

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4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Mr. Josh Judson
16 View St  Manchester, CT 06040-4306
mrj527@yahoo.com

# Subject: GC3 draft report comments

**Josh Judson** <mrj527@everyactioncustom.com>
to DEEP ClimateChange

Tue, Oct 20, 5:19 AM (11 days ago)





Dear Climate Change Bureau CT DEEP Climate Change Bureau,

Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals.

I particularly support these recommendations, and urge their inclusion in the final reports:

- Strengthen alignment between the state's decision-making and its greenhouse gas reduction goals. All regulatory decisions should be evaluated for consistency with meeting Global Warming Solutions Act targets.

- Move climate adaptation and resiliency measures—like nature-based solutions, forest and wetland protection, urban green infrastructure and tree planting, and making low/moderate income housing energy efficient and healthy—from demonstration project scale to widespread adoption and protection.

- Support robust, equitable state funding and financing (leveraged and matched by federal and local sources) for emissions reduction and adaptation programs. This is a large ($150-600 million/year) investment. Promising sources include:
  a) adopting the Transportation & Climate Initiative (up to $250 m/yr) and increasing the petroleum gross profits tax (~$100 m/yr). Connecticut can help ensure robust TCI implementation that drives down emissions while reinvesting auction proceeds in other high-impact and equitable programs;
  b) increasing or re-directing state bonding (up to $70 m/yr);

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 draft report comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 10:06 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: kathy1219@everyactioncustom.com <kathy1219@everyactioncustom.com>
Sent: Tuesday, October 20, 2020 8:29 AM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 draft report comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Climate Change Bureau CT DEEP Climate Change Bureau,

Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals.

I particularly support these recommendations, and urge their inclusion in the final reports:

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- Move climate adaptation and resiliency measures—like nature-based solutions, forest and wetland protection, urban green infrastructure and tree planting, and making low/moderate income housing energy efficient and healthy—from demonstration project scale to widespread adoption and protection.

- Support robust, equitable state funding and financing (leveraged and matched by federal and local sources) for emissions reduction and adaptation programs. This is a large ($150-600 million/year) investment. Promising sources include:
  a) adopting the Transportation & Climate Initiative (up to $250 m/yr) and increasing the petroleum gross profits tax (~$100 m/yr). Connecticut can help ensure robust TCI implementation that drives down emissions while reinvesting auction proceeds in other high-impact and equitable programs;
  b) increasing or re-directing state bonding (up to $70 m/yr);
  c) adopting the Maryland "flush tax" model (up to $75 m/yr).

- Reduce stormwater pollution and flooding, and help municipalities afford green infrastructure and resiliency investments, by passing statewide enabling legislation for stormwater authorities.

- Target future building projects to already-developed areas, and prioritize the conservation and preservation of naturally-resilient coastal marsh, dunes, and forests.

- Develop and fund a community engagement strategy to inform the 2021 GC3 process and implementation, including grants for community-based NGOs partners and ensuring environmental justice perspectives are integral to the process.

The reports could be made even stronger. Please consider these additions and modifications to build the ambitious climate mitigation, resilience, and justice plan Connecticut needs:

- Emphasize the importance and urgency of strong climate mitigation action, by:
  a) highlighting the current and projected impacts of climate change in Connecticut, including health and economic impacts;
  b) identifying the greenhouse gas reduction potential of suggested projects;
  c) prioritizing, among the many valuable ideas in the reports, the highest-impact polices that will be most effective in driving down emissions and transitioning to a carbon-free economy.

- Eliminate, not just “phase down,” biomass as an eligible resource in the Renewable Portfolio Standard (RPS). If we are to achieve our climate goals, we can’t keep subsidizing dirty energy sources.

- Add dams to the proposed statewide GIS database of culverts, flood gates, tide gates, and other water control structures, and create a dynamic list that prioritizes structures for replacement, removal, and/or modification—including identifying dams that are vulnerable to our changing climate, and ensuring culverts can handle 100-year floods and allow migratory fish to pass.

- Encourage municipalities to adopt green infrastructure as a first-choice solution to flooding and stormwater pollution.

Together, this suite of policies can reduce Connecticut’s contribution to climate change and help our region adapt to the changes that are already occurring—while protecting public health, generating good jobs, and protecting vulnerable communities from storms, flooding, and air pollution.

Thank you for your consideration.

Sincerely,
Ms. Katherine Peng
2 Club Pkwy  Branford, CT 06405-5626
kathy1219@gmail.com

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 8:29 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: lisalnewell@everyactioncustom.com <lisalnewell@everyactioncustom.com>
Sent: Tuesday, October 20, 2020 8:53 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports.

We need to protect nature, and in particular FORESTS, wherever possible! Healthy, intact forests are one of the most effective means of mitigating climate change. It is essential that we protect not only as many forests as possible, but networks of nature - corridors of interconnected, undisturbed lands that support healthy ecosystems and biodiversity, and protect clean air and water.

We need to drastically increase the percentage of our natural lands that are protected from development. In doing so we protect and enhance our human health by protecting the natural ecosystems.

Please protect our forests; our future literally depends on in.

Sincerely,
Lisa Newell
243 E Hill Rd Canton, CT 06019-2120
lisalnewell@outlook.com

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 8:25 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: lkhappe@everyactioncustom.com <lkhappe@everyactioncustom.com>
Sent: Tuesday, October 20, 2020 3:52 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities. It is a win-win to address the need to reduce our fossil fuel emissions and create permanent jobs for the future.

2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant. It is entirely redundant and lacks the necessary foresight concerning the growing demand for use of renewal energy sources. If constructed, it will have a negative impact on the air quality of the surrounding community.

3. Reform or replace the ISO-New England market system to take into account our clean energy goals. In order to achieve the goals of reducing emissions and increasing efficiency, the limitations of our current system needs to be addressed.

4. Invest in natural climate solutions such as forest, river, and wetland conservation. The climate crisis can only be resolved with a multi-prong approach. Conservation must go hand in hand with a shift away from reliance on fossil fuels. The quality of our lives will be enhanced with protection of natural climate solutions.

Thank you again for the opportunity to submit comments.

Sincerely,

Ms. Lois Happe
10 C Sycamore Dr  Storrs Mansfield, CT 06268-2100 lkhappe@yahoo.com

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Alec Shub <alec.shub@uconn.edu>

# FW: Forests Sub-Group Draft Report

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 8:33 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

**From:** Margaret Miner <margaret.miner@charter.net>
**Sent:** Tuesday, October 20, 2020 11:15 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Cc:** Eric Hammerling <ehammerling@ctwoodlands.org>; Masino, Susan A. <Susan.Masino@trincoll.edu>; alicea <alicea@riversalliance.org>
**Subject:** Forests Sub-Group Draft Report



## FORESTS SUB-GROUP DRAFT REPORT

## For The Governor's Council on Climate Change

## Public Comment from Margaret Miner

## This sub-group has den outstanding, informative work. Keep this document at hand. It deserves wide distribution.

## In working on the protection of state waters for Rivers Alliance of Connecticut, I am one of many who have become intensely concerned that our natural waters are increasingly being degraded by loss of their best protection, forested land and native fields. Upland forests and wetlands serve to protect the headwaters of our rivers and streams. Buffers of forest, shrubs, and other vegetation can (or could) keep rivers healthy all the way to the Sound.

**Forests and trees are also the best protectors of our air and atmosphere by removing and storing greenhouse carbon gas. This function is essential to maintaining (or recovering) a habitable planet. Here follow a few specific comments**

***When timbering or other removal of trees is under consideration, the burden should be on the tree remover to demonstrate the public benefit of the action.*** **Presently the burden is on conservationists to identify growth that should be saved. This principle regarding burden of proof should be incorporated in all forest policy and planning.**

***Remove biomass from the category of Class I renewable resources.***

**If the goal of GC3 is to reduce greenhouse gases, the state should not encourage cutting *and burning* trees. This not only eliminates the carbon-removal and storage functions of the living tree, it releases the carbon all at once. The concept that this is a form of clean, renewable energy is difficult to defend, and, in my view, not credible. We are not even supposed to burn leaves. One of the many science studies and presentations supporting the commonsense proposal to avoid burning trees in a warming climate was offered in the Forestry Sub-Group by Edward Faison of Highstead.**

**(See Highstead, "New England Conservation Pathways Report", pp 73-80 https://www.wildlandsandwoodlands.org/sites/default/files/Highstead_Pathways_Report.pdf 192 Id., pp. 52-58).**

***Set bold conservation goals.*** **Certain targets in the report could reasonably be more ambitious. For example, the recommended state policy of No Net Loss of Forests might suggest to some that status quo practices are acceptable. For example, all level of government have a policy of No Net Loss of Wetlands. That's not working.**

***Plan to implement the Report's recommendations, with special attention to the revenue options and use of tax incentives including a carbon tax*** **(widely recognized as the most effective means to reduce carbon emissions).**

**Thank you for your attention and your very hard work.**

**Margaret Miner**

**South Street, Roxbury, CT**

203-788-5161

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Comment on GC3 working group draft reports

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 8:29 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

---

**From:** Mark Bradford <mark.bradford.yale@gmail.com>
**Sent:** Tuesday, October 20, 2020 8:52 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Cc:** Martin, Christopher <Christopher.Martin@ct.gov>; O'donnell, James <james.odonnell@uconn.edu>; Masino, Susan A. <Susan.Masino@trincoll.edu>; Eric Hammerling <ehammerling@ctwoodlands.org>; Mark Bradford <mark.bradford@yale.edu>; Dykes, Katie <Katie.Dykes@ct.gov>; Hart, Marybeth <Marybeth.Hart@ct.gov>; Jacobson, Rick <Rick.Jacobson@ct.gov>
**Subject:** Comment on GC3 working group draft reports



Please find attached a letter that is a response from faculty of The Forest School at The Yale School of the Environment regarding the GC3 draft reports. Please submit this letter to both the Science and Technology working group and the Forests sub-group of Working and Natural Lands.

I have taken the liberty of cc'ing Chairs of both working groups on this email (James O'Donnell, Susan Masino, Eric Hammerling and Christopher Martin; the latter also given his role as DEEP State Forester), as well as DEEP Commissioner Katie Dykes given her role as Chair of the full Governor's Council on Climate Change.

We are happy to engage further with the working groups to discuss our concerns about proforestation, and perhaps more importantly the need for ongoing management of the State's forests to ensure their long-term health and provision of multiple services.

Sincerely,

Mark Bradford on behalf of all signatories to the attached letter

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**Mark A. Bradford**, Ph.D.
*Professor, Soils and Ecosystem Ecology*
+1-203-436-9148 (tel.)
mark.bradford@yale.edu

Pronouns: he/him/his

**Yale School of the Environment**

The Forest School
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For mailing address, office, lab and twitter details, please visit: bradfordlab.yale.edu/lab-profiles

**Final_The Forest School GC3 Response.pdf**
167K

Yale SCHOOL OF THE ENVIRONMENT
*The Forest School*

MARSH HALL
360 Prospect Street
New Haven CT 06511 USA
T +1 203 432-5117
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October 19, 2020

Governor's Council on Climate Change,

We are a group of leading research and teaching faculty based at The Forest School at The Yale School of the Environment with internationally-recognized expertise in forest ecology, environmental management and justice, carbon management, and carbon cycle science. We are writing to urge you to **oppose** draft recommendations of the GC3 Forests Working Sub-Group and the GC3 Science and Technology Working Group which call to prohibit timber harvesting on Connecticut's state forestlands.

**Banning timber harvesting on state forestlands is not in the interest of the State of Connecticut.** Each forest has unique circumstances and the amount of timber harvesting in each forest needs to be determined based upon site-specific and changing conditions through time. Active forest management through silviculture serves to promote forest health, increase growth rates of forests, maintain diverse wildlife habitat, and reduce impacts from disturbance such as fire. As part of carbon management, we should want to harvest forests into the future to maximize the amount of carbon forests can draw out of the atmosphere [1]. An outright ban on timber harvesting could turn our forest assets into liabilities and limit our state's ability to steward these important natural resources.

Connecticut has long been a leader in forest conservation. The science of forest management (i.e. silviculture) has been developed and studied here for over 100 years. The silvicultural systems now in place have allowed both public and private forests in our region to function naturally and thrive while supporting renewable resource needs and clean water [2, 3]. Connecticut's state forests did not recover from the destructive agricultural practices of the 1700 and 1800s and the extraction period of the early 1900's through "benign neglect [4]". **Forest conservation in Connecticut is a story of active conservation of forests, working lands, and shared leadership among the state, foresters, and forest scientists [5-7]**. That story is something we can learn much from today as we plan for the future of Connecticut's forests.

We consider ourselves privileged to live, educate, and practice in a region where the science of silviculture has been developed to allow foresters to regenerate forests naturally, grow resilient mature forests, maintain habitat diversity, provide clean drinking water, and contribute to human renewable resource needs [2, 8-13]. The work of forestry professionals to conduct multiple-use forest management should be supported with policy because it is supported by science. However, forest management is under attack in our state and hence, so is the health and sustainability of our forestlands and the many ecosystem services they provide.

*Proforestation*, on which the working group recommendations are based, is a recent political movement that aims to prevent forest management in the United States under the assumption that excluding humans from forests will serve as a climate change mitigation tool [4, 14, 15]. It also omits important aspects of forest carbon science [16]. It appears to be premised on a single opinion article published in an academic journal last year [14]. The reality is that forest carbon science is complex [17]. **Excluding silviculture from Connecticut's forests could result in them sequestering less atmospheric carbon over time, due to future losses from catastrophic disturbances (such as windstorms, invasive species, and fire) and lack of carbon benefits derived from forest products**.

We lack a clear scientific answer to major questions related to forest carbon. These include:

- How do forest carbon dynamics change with forest succession, species composition, climate, and site characteristics? **Disturbance events make future forest carbon dynamics, and the longevity**

**of carbon stored in today's forests, unpredictable** [16, 18-23]. These events, which release vast amounts of forest carbon, are predicted to increase with climate change [24]. Appropriate and even optimized forest management can mitigate the risk of disturbance and reduce forest carbon lost in those events [25, 26].

- What is the lifecycle of carbon in forest soils and how does this relate to disturbance, climate, species composition, forest succession, and human activity [18, 22, 27-32]?
- Under what circumstances might unmanaged forests store more carbon than managed forests, and how do time and natural disturbances factor in to this comparison?
- How do methane emissions from forests differ between sites, species composition, and age structure [33-35]?
- What are the climate implications of multiple-use forest management which includes harvested forest products, compared to proforestation? **Storage of carbon in forests and/or wood products are climate mitigation components, and wood can also serve as a fossil fuel reduction mechanism** [1, 16, 36-38]. System level forest carbon accounting is complex and dynamic which highlights a need for comprehensive, and product specific, wood life cycle analyses and comparisons with non-renewable alternatives and market forces [39]. Woody biomass generated in forest management activities can bring additional climate benefits by either storing carbon in forest products [37] and/or replacing fossil-based counterparts [40]. **Proforestation does not account for system level carbon dynamics related to forest products and misleads us to conclude that its adoption would be the most carbon positive of all forest policy choices.**

Given such questions, proforestation is an undemonstrated, unwise approach as a climate solution while active management provides a suite of approaches that can be tailored to find solutions to known and emerging threats to forest carbon storage and health. The proforestation movement misleads us to believe that people are not part of natural forests, a belief based on a dichotomy of nature and culture that has been shown to promote environmental degradation instead of conservation [41]. Indeed, for thousands of years before European colonists arrived, Indigenous peoples stewarded and actively managed Connecticut's forests, through prescribed fire and harvesting of wood for a variety of uses. This active management by people still influences the forests we see today. The myth of a "pristine" unmanaged forest being the natural state of Connecticut's forests is just not accurate or necessarily desirable for carbon sequestration, biodiversity, or other ecosystem services. Active forest management has been crucial through time for ensuring that our forests are healthy and resilient while meeting society's needs.

What the proforestation movement gets right is that poor land management can decimate the biodiversity and ecosystem services of forests. Just as sound management has conserved our contemporary forest after a period of destructive agriculture in the 18$^{th}$ and 19$^{th}$ centuries, we now need to rely on ongoing management to steward these forests through multiple threats, including more frequent and intense weather events such as droughts and storms, and losses due to invasive pathogens. These increasing threats reflect the fact that Connecticut's forests are human influenced, they have been for millennia and this is even more true today due to climate and other environmental changes. **Keeping forests healthy and growing under conditions of multiplying and intensifying threats will require the ongoing human intervention that management offers.** Management allows us to maintain growing forests, and growing forests sequester carbon.

Silviculture enables us to facilitate successional trajectories that will make forests more resilient to ongoing and emerging threats from global change, while supporting rural livelihoods and sustaining biodiversity. The science of silviculture in Connecticut is **not** about cutting primary forests, planting

monocultures, or other such extractive practices which deliver only short-term gain. **Outdated caricatures of forestry professionals are detrimental and threaten the resiliency of our state's forests**. Silviculture is about sustaining healthy forestlands, which involves anticipating and responding to disturbances that threaten long-term forest health, through science- and practice-informed strategies.

**There are also broader issues at play here relating to sustainable rural economies and environmental justice and responsibility.** For example, 'preservation' of a wealthy society's resources leads to greater exploitation of forest resources in places where less regulation and scientific knowledge exist to ensure sustainable management. This concept has been described as the illusion of preservation [42]. We are loath to be drawn into the nuances of these arguments, but suffice to say that meeting energy and wood demands must involve globally-coordinated initiatives with consideration to the differences between biogenic carbon emissions and fossilized carbon emissions [17, 37, 43, 44]. In Connecticut, we have restored our state forestland through management which can continue to maintain - and even enhance - the carbon, other environmental, and rural community benefits of our forestlands. Exporting demands for forest products to regions without our rich scientific and practitioner expertise is damaging to both our state and the planet. Connecticut needs to support the DEEP Forestry Division by providing them with enough resources to fully, and appropriately, steward our State forestlands.

We end by stating that we are ProForests, ProBiodiversity, ProClimate and ProRuralCommunities. In Connecticut, that necessitates being ProManagement.

Sincerely,

Graeme P. Berlyn, Ph.D.
E. H. Harriman Professor of Anatomy & Physiology of Trees and Forest Management

Mark A. Bradford, Ph.D.
Professor of Soils and Ecosystem Ecology

Michael R. Dove, Ph.D.
Margaret K. Musser Professor of Social Ecology

Marlyse C. Duguid, Ph.D.
Thomas J. Siccama Lecturer of Forest Ecology and Director of Research for Yale Forests

Gary Dunning, M.F.
Executive Director of The Forest School

Eli P. Fenichel, Ph.D.
Knobloch Family Professor of Natural Resource Economics

Bradford S. Gentry, J.D.
Frederick K. Weyerhaeuser Professor in the Practice of Forest Resources Management and Policy

Thomas Graedel, Ph.D.
Professor Emeritus of Industrial Ecology and Chemical Engineering

Timothy G. Gregoire, Ph.D.
J. P. Weyerhaeuser Professor of Forest Management

Xuhui Lee, Ph.D.
Sara Shallenberger Brown Professor of Meteorology

Robert O. Mendelsohn, Ph.D.
Edwin Weyerhaeuser Davis Professor of Forest Policy

Joseph N. Orefice, Ph.D.
Lecturer and Director of Forest & Agricultural Operations for Yale Forests

Barbara Reck, Ph.D.
Senior Research Scientist at the Center for Industrial Ecology

James E. Saiers, Ph.D.
Clifton R. Musser Professor of Hydrology

Gerald Torres, J.D.
Professor of Environmental Justice and Professor of Law

Yuan Yao, Ph.D.
Assistant Professor of Industrial Ecology and Sustainable Systems

*Faculty who were on GC3 Working Groups were not included due to their position on the committees*

*References*


1. Favero, A., R. Mendelsohn, and B. Sohngen, *Using forests for climate mitigation: sequester carbon or produce woody biomass?* Climatic Change, 2017. **144**(2): p. 195-206.
2. Alcott, E., M.S. Ashton, and B.S. Gentry, *Natural and engineered solutions for drinking water supplies: lessons from the northeastern United States and directions for global watershed management*. 2013: CRC Press.
3. Cristan, R., et al., *Effectiveness of forestry best management practices in the United States: Literature review.* Forest Ecology and Management, 2016. **360**: p. 133-151.
4. Moomaw, W., *Why Keeping Mature Forests Intact Is Key to the Climate Fight*, in *YaleEnvironment360*, F. Montaigne, Editor. 2019: YaleEnvironment360.
5. Milne, G.M., *Connecticut Woodlands: A Century's Story of the Connecticut Forest and Park Association*. 1995: Connecticut Forest & Park Assn.
6. Hawes, A.F., *History of Forestry in Connecticut*. 2014: Connecticut Agricultural Experiment Station.
7. Rutkow, E., *American canopy: Trees, forests, and the making of a nation*. 2012: Simon and Schuster.
8. Leak, W.B., et al., *White pine silviculture for timber and wildlife habitat in New England.* Durham, NH: University of New Hampshire Cooperative Extension, 34 p., 2020: p. 1-34.
9. Thom, D. and W.S. Keeton, *Disturbance-based silviculture for habitat diversification: Effects on forest structure, dynamics, and carbon storage.* Forest Ecology and Management, 2020. **469**: p. 118132.
10. Leak, W.B., M. Yamasaki, and R. Holleran, *Silvicultural guide for northern hardwoods in the northeast.* Gen. Tech. Rep. NRS-132. Newtown Square, PA: US Department of Agriculture, Forest Service, Northern Research Station. 46 p., 2014. **132**: p. 1-46.

11. Ward, J.S., *Crop tree release increases growth of mature red oak sawtimber.* Northern Journal of Applied Forestry, 2002. **19**(4): p. 149-154.
12. Oliver, C.D., *The development of northern red oak in mixed stands in central New England.* 1978.
13. Ashton, M.S. and M.J. Kelty, *The practice of silviculture: applied forest ecology*. 2018: John Wiley & Sons.
14. Moomaw, W.R., S.A. Masino, and E.K. Faison, *Intact forests in the United States: Proforestation mitigates climate change and serves the greatest good.* Frontiers in Forests and Global Change, 2019. **2**: p. 27.
15. Smith, D. *Proforestation: Nature's Climate Solution* 2020 [cited 2020 October 13, 2020]; Available from: https://www.dogwoodalliance.org/2020/05/proforestation-natures-climate-solution/.
16. Catanzaro, P. and A. D'Amato, *Forest Carbon an essential natural solution for climate change*. 2019, University of Massachusetts Amherst: MassWoods.org. p. 28.
17. Griscom, B.W., et al., *Natural climate solutions.* Proceedings of the National Academy of Sciences, 2017. **114**(44): p. 11645-11650.
18. Ashton, M.S., et al., *Managing forest carbon in a changing climate*. 2012: Springer Science & Business Media.
19. Goetz, S.J., et al., *Observations and assessment of forest carbon dynamics following disturbance in North America.* Journal of Geophysical Research: Biogeosciences, 2012. **117**(G2).
20. Goward, S.N., et al., *Forest disturbance and North American carbon flux.* Eos, Transactions American Geophysical Union, 2008. **89**(11): p. 105-106.
21. Pedro, M.S., W. Rammer, and R. Seidl, *Tree species diversity mitigates disturbance impacts on the forest carbon cycle.* Oecologia, 2015. **177**(3): p. 619-630.
22. Pugh, T.A., et al., *Understanding the uncertainty in global forest carbon turnover.* Biogeosciences, 2020. **17**(15): p. 3961-3989.
23. Mendelsohn, R., et al., *The ecosystem impacts of severe warming.* American Economic Review, 2016. **106**(5): p. 612-14.
24. Seidl, R., et al., *Forest disturbances under climate change.* Nature climate change, 2017. **7**(6): p. 395-402.
25. Krofcheck, D., et al., *Optimizing Forest Management Stabilizes Carbon Under Projected Climate and Wildfires.* Journal of Geophysical Research: Biogeosciences, 2019. **124**(10): p. 3075-3087.
26. Hashida, Y. and D.J. Lewis, *The intersection between climate adaptation, mitigation, and natural resources: An empirical analysis of forest management.* Journal of the Association of Environmental and Resource Economists, 2019. **6**(5): p. 893-926.
27. Bonhage, A., et al., *Long term anthropogenic enrichment of soil organic matter stocks in forest soils–detecting a legacy of historical charcoal production.* Forest Ecology and Management, 2020. **459**: p. 117814.
28. Tang, J., et al., *Temperature sensitivity of soil carbon*, in *Ecosystem consequences of soil warming*. 2019, Elsevier. p. 175-208.
29. Oldfield, E.E., T.W. Crowther, and M.A. Bradford, *Substrate identity and amount overwhelm temperature effects on soil carbon formation.* Soil Biology and Biochemistry, 2018. **124**: p. 218-226.
30. Crowther, T.W., et al., *Quantifying global soil carbon losses in response to warming.* Nature, 2016. **540**(7631): p. 104-108.
31. Bradford, M.A., et al., *Managing uncertainty in soil carbon feedbacks to climate change.* Nature Climate Change, 2016. **6**(8): p. 751-758.
32. Warren, K.L. and M.S. Ashton, *Change in soil and forest floor carbon after shelterwood harvests in a New England oak-hardwood forest, USA.* International Journal of Forestry Research, 2014. **2014**.

33. Barba, J., et al., *Methane emissions from tree stems: a new frontier in the global carbon cycle.* New Phytologist, 2019. **222**(1): p. 18-28.
34. Saunois, M., et al., *The global methane budget 2000–2017.* Earth System Science Data, 2020. **12**(3): p. 1561-1623.
35. Covey, K.R. and J.P. Megonigal, *Methane production and emissions in trees and forests.* New Phytologist, 2019. **222**(1): p. 35-51.
36. Bergman, R., et al., *The carbon impacts of wood products.* Forest Products Journal, 2014. **64**(7): p. 220-231.
37. Churkina, G., et al., *Buildings as a global carbon sink.* Nature Sustainability, 2020: p. 1-8.
38. Himes, A. and G. Busby, *Wood buildings as a climate solution.* Developments in the Built Environment, 2020: p. 100030.
39. Johnston, C.M. and V.C. Radeloff, *Global mitigation potential of carbon stored in harvested wood products.* Proceedings of the National Academy of Sciences, 2019. **116**(29): p. 14526-14531.
40. Lan, K., et al., *Life Cycle Analysis of Decentralized Preprocessing Systems for Fast Pyrolysis Biorefineries with Blended Feedstocks in the Southeastern United States.* Energy Technology, 2019: p. 1900850.
41. Cronon, W., *The trouble with wilderness: or, getting back to the wrong nature.* Environmental history, 1996. **1**(1): p. 7-28.
42. Berlik, M.M., D.B. Kittredge, and D.R. Foster, *The illusion of preservation: a global environmental argument for the local production of natural resources.* Journal of Biogeography, 2002. **29**(10-11): p. 1557-1568.
43. Anderson, C.M., et al., *Natural climate solutions are not enough.* Science, 2019. **363**(6430): p. 933-934.
44. Fargione, J.E., et al., *Natural climate solutions for the United States.* Science Advances, 2018. **4**(11): p. eaat1869.

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 8:28 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: msl@everyactioncustom.com <msl@everyactioncustom.com>
Sent: Tuesday, October 20, 2020 8:36 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

REMEMBER: THIS IS A COASTAL STATE. CLIMATE CHAOS REPRESENTS AN EXISTENTIAL THREAT. THE EXTINCTION CRISIS REPRESENTS AN EXISTENTIAL THREAT. LISTEN TO US. IT IS ALMOST TOO LATE.

Thank you again for the opportunity to submit comments.

Sincerely,
Mark Lender
155 Shore Rd Clinton, CT 06413-2346
msl@wildlifenetwork.com

UCONN
UNIVERSITY OF CONNECTICUT

**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comment

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 8:33 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Mary Meza <marymeza0414@gmail.com>
**Sent:** Tuesday, October 20, 2020 11:54 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** GC3 Comment

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Hello,

I think it is important to improve urban quality for the benefit of its citizens but also for the environmental health of everyone else. Improving urban quality to me looks like having incentives for homeowners that upgrade their homes with green infrastructure, having more parks and grocery stores accessible to all communities.

UCONN
UNIVERSITY OF CONNECTICUT

Alec Shub <alec.shub@uconn.edu>

# FW: Comments on Mitigation Strategies Draft Report

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 8:25 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Garden Club of New Haven, Inc. <gcnhtreesandpower@gmail.com>
**Sent:** Tuesday, October 20, 2020 5:29 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Comments on Mitigation Strategies Draft Report



The Garden Club of New Haven submits the following comments for your consideration. We list the page number of the content addressed before the comments, in reverse order:

PAGES 68-69:

We appreciate the recognition of the importance of urban and suburban trees to mitigation, adaptation and resiliency on pages 68-69 of the report. To better reflect the content of the section entitled "Promote urban and suburban tree planting," the title should be changed to "Protect and plant trees in urban and suburban areas."

A new paragraph should be added, as follows:

"Priority should be given to protecting and planting trees that are large or will become large. To ensure this, electric and communication wires in suburban and urban communities should be placed underground wherever feasible, and a high priority for planting such trees should be given to those residential areas of cities and suburbs that currently have few or no trees. As large trees die or become hazardous due to disease, pest infestation or damage from storms, trees with similar benefits should be planted. Until such time as undergrounding is done, tree pruning, even within the utility wire zone, should be conducted to protect the structural integrity and strength of the existing large tree. Although it should be possible to plant new eventually large trees in the wire zone by pruning them to grow away from the wires, without undergrounding, "right tree/right place" smaller trees with fewer benefits will probably have to be planted."

PAGE 63: Consistent with the statements on page 6 the first line after the headings should read: "Trees in urban and suburban . . ." In addition, this statement should be revised to include all of the benefits of trees listed on page 69.

PAGE 39: The following should be added: "Undergrounding of electric and communication wires would not only increase their resiliency, but would protect all of the essential benefits of large trees for climate mitigation, adaptation and resiliency described on page 69 of this report, especially in urban and suburban communities.

Respectfully submitted,

Mary-Michelle (Mikey) Hirschoff

Spokesperson on Trees and Power

Garden Club of New Haven

# Subject: GC3 draft report comments

**Melissa Funaro** <m_vantine@everyactioncustom.com>
to DEEP ClimateChange

Tue, Oct 20, 6:15 AM (11 days ago)





Dear Climate Change Bureau CT DEEP Climate Change Bureau,

Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals.

I particularly support these recommendations, and urge their inclusion in the final reports:

- Strengthen alignment between the state's decision-making and its greenhouse gas reduction goals. All regulatory decisions should be evaluated for consistency with meeting Global Warming Solutions Act targets.

- Move climate adaptation and resiliency measures—like nature-based solutions, forest and wetland protection, urban green infrastructure and tree planting, and making low/moderate income housing energy efficient and healthy—from demonstration project scale to widespread adoption and protection.

- Support robust, equitable state funding and financing (leveraged and matched by federal and local sources) for emissions reduction and adaptation programs. This is a large ($150-600 million/year) investment. Promising sources include:
  a) adopting the Transportation & Climate Initiative (up to $250 m/yr) and increasing the petroleum gross profits tax (~$100 m/yr). Connecticut can help ensure robust TCI implementation that drives down emissions while reinvesting auction proceeds in other high-impact and equitable programs;
  b) increasing or re-directing state bonding (up to $70 m/yr);

Eric Hammerling
Executive Director
Connecticut Forest & Parks

October 20, 2020

Dear Eric,

I would like to provide my comments on the G3C-Forest Sub-Group Draft Report.

Page 22, Create Strong Markets for Products and Service with Multiple Benefits. Certainly a good goal. However over the last couple of decades more and more of the timber harvested in southern New England is processed by someone located a significant distance from where it grew. The decline in the number of viable sawmills is alarming. There are essentially no significant amounts of softwoods, white pine and hemlock, sawn in southern New England. It is not likely that we will see anyone make the investment needed to do so, as we have the some of the highest electricity, labor, tax and transportation cost in the country.

Page 24 under "Connecticut's Forest Carbon Sequestration and Future Role in Climate Mitigation"
There is mention of the significant increase in carbon stored in our forest, but fails to make any mention of the role that active forest management has played in our forest being able to store more carbon. The lack of any mention of such is disturbing and in my mind clearly shows the authors lack of an interest in presenting the whole story so to speak, but instead the data is being used to promote the "proforestation" objective. Connecticut DEEP Forestry Division has done a very good job at managing our state forest as they can with the staffing levels that they have. They have by far outshined the job done in MA & RI. I disagree with the idea that we can store more carbon with a hands off "proforestation" approach. This has been tried on the west coast and does not seem to be working all that well for long term storage of carbon.

Page 25 under the "Settled Treescape" it mentions increased size of trees and therefore carbon storage in trees along streets as they have more light and grow faster. I find it interesting that there is no mention of our forest trees being able to do the same thing through proper forest management.

Page 28 under "Short Term (1-5 year) Actions it calls for greatly reducing the clearcutting of mature forest as a habitat management practice benefiting young forest species. Most of Connecticuts forest are mature forest due to past land use and societal needs at the time. It has gotten hard to find a healthy black oak tree here. Most are declining in health due to age, insects and droughts. If we want to have healthy, resilient forest we need more young forest. If we want oak forest there needs to be clearcutting. If we want young forest dependent wildlife species to increase in numbers or in some cases return to our area we need to clearcut.

Page 29 refers to proforestation as an easy way to increase carbon storage, but proforestation fails to recognize societal needs for forest products and the impacts of the use of alternative products will have on carbon release.

Thank you for your consideration.

Michael J. Bartlett
Forest Resources Manager

**From:** Michael Ferrucci, Professional Forester

**To:** Governor's Council on Climate Change, Science and Technology Working Group

**Copy:** Governor's Council on Climate Change, Working and Natural Lands Working Group

**Re:** Draft report on Climate Change, Science and Technology

As a professional forester with 42 years of field experience and two forestry degrees (University of Maine Bachelor of Science in Forestry; Yale University Master of Forestry) I submit my comments on the Draft Science and Technology Subcommittee Report. I provide more details of my credentials at the end of this letter.

I strongly oppose any involvement in forestry issues by the Science and Technology Working Group. These issues are more properly debated in the GC3 Forests Sub-Group of the Working and Natural Lands Working Group, where the full range of expertise in forest science and forest management is available. The forests subgroup is much more likely to provide balanced and realistic forestry recommendations because it has a composition that helps it to understand and digest the implications of the complex and emerging field of forest carbon dynamics and the practical challenges of managing forests here in our state.

As evidence I point to the Science and Technology Working Group's reliance on scientifically questionable citations that ignore the bulk of the science on forest ecology and forest management. The draft report fails to incorporate the appropriate science. Separately, scientists having impressive and appropriate credentials have provided statements to your committee detailing the many problems with your report's forest science underpinnings.

A further problem with your work in this arena is the lack of involvement from the practicing forest managers in this state. While their role in the Forests Subgroup was less than it should have been, the knowledge of field foresters was absent from your working group. Practicing foresters were mostly surprised to learn that your committee was considering forestry issues.

The most important error in your report involves the bias exhibited in favor of the so called "proforestation" approach. Simply put, proforestation is at the heart of an activist campaign intended to limit the practice of multiple-benefit forestry in Connecticut, first on state lands, then on other public lands, and ultimately on private lands. This campaign apparently started in Simsbury and has been expanding its scope and influence far beyond. Several excellent forest management programs of long-standing have been ended on the basis of the unsubstantiated claims of this belief-system.

A small group of anti-multiple-use activists is trying to use the Governor's Climate Change initiative to advance their scientifically-flawed agenda. This small but vocal group has ignored the perils of single-use forestry. Managing forests for one dominant purpose, in this case proforestation's approach to treating forests as carbon warehouses, has a history of failure. This history of failed single-use forestry efforts includes:

- Considering forests as solely a place to obtain wood products, which led to a long period of destructive harvesting that ignored other forest values such as the protection of surface water and the provision of wildlife habitat;
- Considering forests as solely a place to provide recreation, with no management, which can lead to unstable forest insect and disease problems and wildfires;
- Dedicating forests as uncut wildlife preserves, with consequential loss of habitat diversity;
- Considering forest management as being primarily a method to suppress wildfires, which has contributed to the current devastating episode of extremely large and uncharacteristically severe wildfires in the western US; or
- Considering forests as being only for watershed protection, which had led to a serious shortage of forest recreation opportunities and overpopulations of deer on many of Connecticut's water supply areas until this was corrected.

Instead of single-use forestry and its many failures, the modern forestry profession has steadily moved towards a more holistic treatment of the forest. This modern approach considers all of the benefits and resources of the forest, the social demands placed on the forests, and the current conditions of our ever-changing (I'll hence use the word dynamic) forests. When required to address a range of issues and conditions, modern forestry employs harvesting of wood products at certain times. Harvests on our state forests are designed to provide multiple benefits. They typically yield wood products and incorporate measures to improve and maintain critical wildlife habitat elements, through the understanding of forest structures (the types and sizes of trees and other vegetation) which are dynamic. And they also increasingly incorporate new learnings from forest science about the influences of climate change, and of how forests can sequester carbon.

Active forest management is our primary tool to develop forest resilience. Given the uncertainty of future forest conditions, many leading forestry academics and practitioners are shifting emphasis from attaining specific forest conditions (for example, all the trees to be of a certain species or species group, a certain age, or a certain size). Instead the target is a forest that is resilient and able to sustain important values, resources, and outputs under a range of possible conditions. Understanding forests as dynamic systems helps understand the need to consider management approaches that are far more-nuanced that a "single-use" approach.

The Forests Subgroup has a balanced membership to help it to understand the full range of forestry issues. Their final report is likely to include a balanced treatment of forest management opportunities that realistically align with what we know about our dynamic forests.

Managing forests in an era of shifting climate and invasive, exotic plants and forest pathogens will be quite challenging. More so here in Connecticut, where every acre is treasured, where forest infrastructure is expensive to maintain, where using forestry professionals including timber harvesting professionals can be costly, and where markets for forest products are limited. The proforestation approach removes important forestry tools from the manager's toolbox, making this difficult job of managing and sustaining our forests nearly impossible.

Again, I urge you to remove forestry issues from your report, with particular emphasis on removing the unhelpful, divisive, and unproven proforestation recommendations.

**Michael Ferrucci Bio**

mferrucci@iforest.com

26 Commerce Drive, North Branford, CT 06471

203-887-9248 (Office and Cell Phone)

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## General Background

Mike Ferrucci has 42 years of forestry experience. His expertise is in sustainable forest management planning; in certification of forests as sustainably managed; in the application of easements for large-scale working forests, and in the ecology, silviculture, and management of mixed species forests, with an emphasis on regeneration and management of native hardwood species. Mike has conducted or participated in assessments of forest management operations throughout the United States, with field experience in 4 countries and 37 states. Mike has been a member of the Society of American Foresters for over 42 years.

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## Employment History

**Senior Consultant, R.S. Berg and Associates**

October 2014 to Present Time

Principal Duties

1. **SBP, SFI, PEFC and FSC Forestry and Chain of Custody Consultant**

Provide strategic advice, detailed certification programs, training, internal audits, and responses to non-conformances for a range of clients in all sectors of the US forest products industry.

**Managing Partner, Interforest LLC**

January 1, 1996 (incorporation of the company) to Present Time

Principal Duties

1. **Company Management**

Responsible for all aspects of managing the company, including HR/personnel, accounting, marketing, sales, and project management. Hired and supervised three full-time employees, and recruited and assigned more than 20 consultants to various projects.

2. **SFI and FSC Forestry and Chain of Custody Lead Auditor/Consultant**

Trained and experienced as an auditor for the Sustainable Biomass Partnership (SBP), an SFI Lead Auditor for Forest Management, Procurement (Fiber Sourcing), and Chain of Custody, as an FSC Lead Auditor Forest Management and Chain of Custody, as a PEFC Lead Auditor for Chain of Custody, and as a Tree Farm Group Certification Lead Auditor. He is also trained as a

RAB-QSA Lead Auditor (ISO 14001 Environmental Management Systems) and as a Greenhouse Gas Lead Auditor.

Led Sustainable Forest Initiative® (SFI®) certification and precertification reviews throughout the United States. Led or participated in joint SFI and Forest Stewardship Council® (FSC®) certification projects in nearly one dozen states and a joint scoping or precertification gap-analysis project on tribal lands throughout the United States. Co-led the pioneering pilot dual evaluations on two U.S. National Forests. Experienced on all aspects of forest management certification since 2000.

For 12 years (October 2002 through September 2014), working as a contractor through Interforest, served as the part-time SFI Program Manager for NSF – International Strategic Registrations responsible for all aspects of the firm's SFI Certification programs. Developed and managed one of the largest forest and chain of custody certification programs in the U.S.

Conducted Chain of Custody audits for all segments of the forest products industry, including printers, corrugated and box producers, integrated paper companies, paper distributors, solid wood mills, engineered wood products facilities, brokers, and distributors. In audits with pulp mills, corrugated producers, and box plants addressed the issues involving recycled content.

**3. Senior Consultant**

Participated as a consultant and project leader working on integrated teams of experts to help clients reexamine their goals, assess their current strategies to reach their goals, define gaps between current goals and reality, and create pathways to pursue excellence. Projects generally had elements of:

•Resource management strategy development and spatial planning (on the ground);

•Organizational and leadership development (inside the organization); and

•Survey research and public involvement strategies (with important publics)

**<u>Managing Co-Partner, Ferrucci & Walicki LLC</u>**

January 1981 to December 2003 (Also Silent Partner January 2004 to July 1, 2013)

Principal Duties

**1. Company Management**

Responsible (with a partner) for all aspects of managing the company, including HR/personnel, accounting, marketing, sales, and project management. Hired and supervised many full-time employees. Developed an on-going forest management consulting business that still operates.

**2. Field Forester**

Provided forest management services including forest inventory, management planning and the development of silvicultural prescriptions, locating property boundaries, selling forest products

(chiefly sawtimber) and managing forested watersheds for the protection of public drinking water reservoirs. Clients included families, youth and church camps, water and electric utilities, and investors. Most of the work was in Connecticut, with some clients in the adjacent states of Rhode Island, Massachusetts, and New York.

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## Instructor, Yale School of Forestry and Environmental Studies

January 1996 through June 2020

Primary Courses Taught (in order from longest involvement to least involvement):

- Forest Management Operations (18 years)
- Southern Forest Management Field Trip (Led or Co-Led 17 one-week trips)
- Professional Forest Ethics (14+ workshops)
- Yale-TUM (Munich) Field Trips (7 weeks including US, Germany, France, Austria, Slovenia, and Croatia)
- Fall Forest Management Field Trip (2013, 2014, 2015, 2016, 2018, 2019)
- Other (team taught): Forest Management, Private Forestry, and Financial Analysis

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Forests Sub-Group ( Working and Natural Lands )

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 8:24 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Nancy Mancini <tuliptree333@sbcglobal.net>
**Sent:** Tuesday, October 20, 2020 3:39 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Forests Sub-Group ( Working and Natural Lands )



Dear Forest Sub-Group Members,

In the first line of your Summary of Report, it states : "Climate change is an enormous threat to Connecticut's forests and people , and we must respond boldly with urgent action." I couldn't agree more, so I'm not going to list all the impressive benefits of trees or list the perils they face now and in the near future... you know them. The group you have assembled is impressive and the information you have provided in your report is thorough and thoughtful. What is needed now is the backing of our governor to put forth the people and money it would take to implement all of your recommendations in the Forests Draft Report.

A topic I would like to address is : Utility practices, PURA and the roll of the state ( governor ) in preserving and protecting our trees.

The governor has to be first in line to educate the public on the importance of trees to our state, for climate change and in all other aspects. After a storm event , the utility companies are quick to make trees the scapegoat for their unpreparedness. Since so many trees are growing on private land, to scare citizens into thinking trees are the enemy has a devastating effect. Granted, trees are going to come down in storm events and we're going to have more storm events ! The state's focus needs to be on, yes, trees will come down during storms, but they will be cleaned up, power will be restored and then include the importance of the restoration of trees in that conversation. The governor and other state officials need to bring balance to this now lopsided situation. PURA , also has a huge roll to play with utility trimming and cutting practices. Instead of spending millions on extreme trimming, that in reality only make trees more prone to fail and the removal of healthy trees, PURA should implement intelligent practices for the utility companies to

follow and realize and push, that in our present climate, the undergrounding of power lines is the solution. To put a plan in place to bury lines will not only help to preserve the trees we have, but allow young trees to grow to maturity.

I appreciate the time and effort it took to put together such a comprehensive report, my hope is that you will get ALL the support you need to put it into practice and " respond boldly with urgent action. "

Thank you ,

Nancy Mancini

Co-Chair , Branford Forest Commission

**President:**
Jacqueline Frair, Ph D.
jfrair@esf.edu
**President-Elect:**
Megan A. Linske, Ph.D.
Megan.Linske@ct.gov
**Past President:**
Scott C. Williams, Ph.D., CWB®
Scott.Williams@ct.gov
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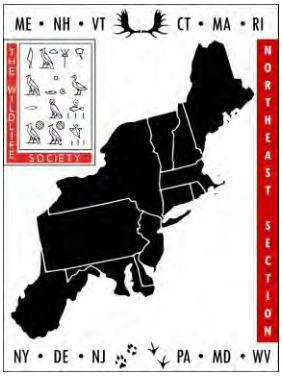
Tammy Colt
tcolt@pa.gov
**Secretary:**
Andrea M. Feldpausch-Parker, Ph.D.
amparker@esf.edu




# Northeast Section
# The Wildlife Society
## http://wildlife.org/ne-section/

19 October 2020

A strategy for carbon sequestration that includes proforestation (allowing forests to mature without harvesting timber) would be a disaster for the majority of wildlife species in Connecticut that require a mosaic of stages of forest succession to meet their foraging, breeding, and brood-rearing needs. New England is among the most heavily forested regions of the United States, and since reforestation has occurred in a post-agricultural setting, all states have witnessed shifts and reductions in numerous wildlife species that cannot thrive in overly mature timber stands. In fact, in all Northeast states including Connecticut, federal funds have been distributed to cooperating private landowners to create young forest habitat through proper forest management to improve the diversity of wildlife species on the landscape. Such programs include the Landowner Incentive Program distributed by the United States Department of the Interior and the current Environmental Quality Incentives Program and former Wildlife Habitat Incentives Program distributed by the United States Department of Agriculture. Clearly, recognition exists at the federal level that mature forest monocultures are the least beneficial habitat for the majority of wildlife species. Not to mention that larger, more mature trees are more prone to being storm thrown, whose stored carbon would then be released back into the ecosystem over time as it decomposes on the forest floor. If that same tree had been harvested prior to being storm thrown, its carbon could still be sequestered in the products produced from it: in timbers or flooring in multiple residences, in a wooden desk, chest of drawers, or cabinets made from it, or in a rocking chair, bed frame, or crib. Harvesting that tree and turning it into lumber more than doubles, perhaps triples the window of time its carbon is sequestered than does allowing it to fall to the forest floor and decompose, while also making more growing space for other younger, vigorous, and resilient trees that are beneficial to numerous wildlife species.

On a personal note, I live in Guilford in an old farmhouse that was built in 1781. The lumber used to construct my house has been sequestering carbon for longer than our country has been in existence; the trees used grew from seed that fell before George Washington was born. To permit large trees to grow, fall, and rot is irresponsible from a wildlife management perspective and totally counter to what the proposed attempts, to extend the length of time that carbon is stored before it is inevitably returned to the system. And doing so in the absence of natural disturbance events is not beneficial to the majority of Connecticut's native wildlife species that drive industries such as bird watching, hunting, hiking, angling, and other passive outdoor recreation activities. Not to mention high wildlife diversity dilutes the presence of tick-borne pathogens that have the very real potential to make numerous Connecticut residents ill.

I would like to share with you the Northeast Section of The Wildlife Society's Position Statement on Managing for Biodiversity in Northeastern Forests which can also be found here.

# Position Statement
# Managing for Biodiversity in Northeastern Forests

Sustainable forest management strategies can promote a mosaic of forest structure and age-classes across a landscape and create various habitat types, which contribute to the maintenance of biological diversity. Biological diversity is the natural variation of organisms among genetic-, species-, and ecosystem-levels that are influenced and interconnected by environmental conditions and ecological processes. In the northeastern United States, land use changes, such as natural succession and development, have created an underrepresentation of both early- and late-successional habitat, and a predominance of secondary growth (40-100 year old forests) across the region. Practices that more closely mimic natural processes and promote both early-successional stands and late successional/old-growth characteristics can increase biological diversity across forested landscapes. Such management can and does lead to uneven-aged forest structure on a landscape-scale that, given prudent planning, can accommodate the widest variety of wildlife species.

Prior to European settlement, forests in the northeastern United States were subject to climate variability and various forms of disturbance, such as wildfire, beaver activity, flooding, wind, and manipulation by Native Americans that reverted succession and created diverse mosaics among plant communities. As a result of the extensive and unsustainable logging of the late 19th century, farm abandonment, suppression of natural disturbances, and a shift away from regeneration harvests in many areas and ownership types, age-class distributions have shifted in northeastern forests. Today, second growth stands of 40-100 years dominate the landscape in most areas of the Northeast, which has subsequently increased forest homogeneity across the region. Sustainable forest management is successful when a comprehensive understanding of forest stand development and natural disturbance is achieved. However, such management must take into account considerations of stand-, property-, and landscape-level scales among ecological, economic, and socio-cultural spheres to achieve greatest success.

Reduction and degradation of young and old-growth forest habitat in the northeast is a major factor associated with population declines of various wildlife species. Factors contributing to these trends include loss of cover, breeding, and foraging habitat for species dependent on these respective habitat types. However, innovations in sustainable forest management practices that incorporate disturbance ecology and natural stand development into silviculture practices can help address and remedy forest stand age disparities, create habitat benefiting young and old-growth dependent wildlife, and promote biodiversity across the region.

The policy of The Northeast Section of the Wildlife Society regarding biodiversity of forest ecosystems is to:

- Advocate the creation and management of forest heterogeneity on public and private lands.
- Support planning strategies that benefit biological diversity and ecosystem health, while also involving stakeholder groups to address economic, societal, and cultural objectives.

- Support forest management operations that conserve biodiversity and its associated values, water resources, soils, and unique ecosystems.
- Encourage outreach efforts to educate and inform public perceptions on the ecological importance of young and old-growth forest habitat.
- Encourage outreach efforts to educate consulting foresters and forest landowners about the ecological benefits of sustainable forest management.
- Advocate for research of habitat requirements of forest-dependent species and monitoring their response to forest changes to better inform management decisions.
- Encourage the utilization of Forest Stewardship Council standards while conducting forest management operations.

Thank you for your time.

Scott C. Williams, Ph.D.
Certified Wildlife Biologist®
Immediate Past-President, Northeast Section
The Wildlife Society
32 County Road
Guilford, CT 06437

# Subject: GC3 Comments

**Shannon Clarkson** <shannonclarkson@everyactioncustom.com> Tue, Oct 20, 9:45 AM (11 days ago)
to DEEP ClimateChange





Dear Rebecca French,

Our health of our environment is critical to all residents of Connecticut. I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Dr. Shannon Clarkson
116 River St Guilford, CT 06437-2653
shannonclarkson@gmail.com

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Alec Shub <alec.shub@uconn.edu>

# FW: Comments on GC# working groups draft

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 12:35 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

**From:** McCarthy, Shirley <shirley.mccarthy@yale.edu>
**Sent:** Tuesday, October 20, 2020 11:03 AM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Comments on GC# working groups draft



Forests draft report

-Overall, an excellent report, however:

-More evidence should be provided regarding the extent of benefits that forests/urban forests provide to humans and other living things, by quoting and referencing a great, comprehensive literature review on human health and well being- Green Cities: Good Health from the University of Washington http://depts.washington.edu/hhwb/. It is written in an outlined/bulleted format that makes it easy to read but I have created a 6 page document (attached) that summarizes it for use when I need to make people aware of the vast benefits of trees. The human health benefits that are currently mentioned in your draft report are under-stated.

-Lack of a robust narrative in this report and the other reports on protecting wildlife and furthermore, actually endorsing killing it by including hunting and trapping in

"recreational use". Killing our dwindling wildlife for fun should not be encouraged so I do not understand why hunting and trapping has to be stated. I realize there is a big hunting lobby but you should do the right thing in this report and support our wildlife.

Note that: "The human footprint, from development and deforestation to climate change, is behind a staggering, nearly 70 percent drop in global vertebrate wildlife populations from 1970 through 2016, according to a report from the World Wildlife Fund" https://www.nationalparkstraveler.org/2020/09/world-wildlife-fund-global-wildlife-populations-have-declined-nearly-70-percent#:~:text=World%20Wildlife%20Fund

WWF Living Planet Report: https://f.hubspotusercontent20.net/hubfs/4783129/LPR/PDFs/ENGLISH-FULL.pdf

-Similarly, there should be big emphasis on planting native trees, particularly a problem with urban forests where wildlife-useless species such as the Bradford pear gets planted for "beauty". As Dr. Doug Tallamy has lectured: "Instead of a Ginkgo, plant an oak. Gingkos support no caterpillar species — important bird food — while oaks support 557 species of caterpillars," "Instead of Zelkova, which supports zero caterpillars, plant a black cherry, which supports 456 species.."

Here is a recent article about the lack of native plants causing a decline in insects and consequently birds: Desirée L. Narango, Douglas W. Tallamy, and Peter P. Marra. Nonnative plants reduce population growth of an insectivorous bird. PNAS November 6, 2018 115 (45) 11549-11554.

**-EO Wilson, the famous Harvard entomologist, says "insects are the little things that run the world. Without them our ecosystems collapse". The pace of insect extinction is now nearly 8x the high vertebrate extinction rate ( Worldwide decline of the entomofauna: A review of its drivers F Sánchez-Bayo, KAG Wyckhuys - Biological conservation, 232: 8-27, 2019).**

-Moving to microgrids and away from our archaic telephone pole system should be hastened and the relentless cutting, maiming and aggressive pruning of our street trees by the utilities must stop. Undergrounding is performed elsewhere in this country and Europe.

Thank you so much for all your impressive work!

Sincerely,

Shirley McCarthy, MD, PhD

Professor, Yale School of Medicine

Member, Branford Community Forest Commission

Chair, Clean Energy Ad Hoc Committee

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**Green Cities abstracted for PCODlatest (formatted) 2.docx**
146K

# GREEN CITIES: GOOD HEALTH



THE FOLLOWING "FAST FACTS" WERE PULLED FROM THE ABOVE LITERATURE REVIEW ON HUMAN HEALTH AND WELL-BEING

## Social Strengths

- Physical features influence social contact among neighbors, and nature plays an important role in creating vital neighborhood spaces.[1]
- A study in urban public housing found that the presence of well managed vegetation was very important feature in promoting the development of social ties within urban public housing.[2]
- People prefer natural over hardscape settings, and preferences are predictors of the use of environments. A study found that urban residents dislike and fear treeless, empty common spaces. The addition of trees and grass dramatically changed their perceptions of those spaces.[2]
- Older adults who have more exposure to green common spaces report a stronger sense of unity among residents within their local neighborhood, and experience a stronger sense of belonging to the neighborhood.[5]
- The affinity (or biophilia) that humans have for nature, the process of remembering that attraction, and the urge to express it through creation of restorative environments may confer resilience across multiple social scales, from individuals to neighborhoods and entire cities.

## Local Economics

Knowing the monetary value of things is important in our society. What is not counted does not count in public decision making. Trees in cities are not grown and managed for products that can be bought and sold on markets, but they do provide many intangible services and benefits!

- The presence of larger trees in yards and as street trees can add from 3% to 15% to home values throughout neighborhoods.[2]
- Homes that are adjacent to naturalistic parks and open spaces are valued at 8-20% higher than comparable properties, with the positive price effect declining to near zero about ½ mile away.[26,27,28,29]
- A study found 7% higher rental rates for commercial offices having high quality landscapes.[14]
- Shoppers indicate that they will travel greater distance and a longer time to visit a district having high quality trees, and spend more time there once they arrive.[34]
- Properties with trees are generally preferred to comparable properties without trees, with the trend across studies being a price increase of about 7%. Street trees appear to add value even to adjacent properties, up to 100 feet away in one study.[9] Here are results from a selection of studies:

### Retention in Development

| Price Increase | Condition |
|---|---|
| 18% | building lots with substantial mature tree cover[16] |
| 22% | tree-covered undeveloped acreage[17] |
| 19-35% | lots bordering suburban wooded preserves[18] |
| 37% | open land that is two-thirds wooded[19] |

- Given increased lot and home valuations, builders have reported that they were able to recover the extra costs of preserving trees through a higher sales price for a house, and that homes on wooded lots sell sooner than homes on unwooded lots.[21]

## Parks and Open Space

- More than 30 studies have shown that people are willing to pay more for a property located close to an urban open space than for a house that does not offer this amenity, a finding known as the "proximate principle."[22] The studies evaluate the effects of parks and open spaces that usually contain trees and forests.

| Price Increase | Condition |
|---|---|
| 10% | inner city home located within 1/4 mile of a park[13] |
| 10% | house 2 to 3 blocks from a heavily used, active recreation park[22] |
| 17% | home near cleaned-up vacant lot[13] |
| 20% | home adjacent to or fronting a passive park area[22] |
| 32% | residential development adjacent to greenbelts[23] |

## Views of Forests

| Price Increase | Condition |
|---|---|
| 4.9% | multifamily unit with view of forested open space[28] |
| 8% | house with a park view[24] |

## Retail Pricing

| Price Increase | Condition |
|---|---|
| 9% | goods and services in forested business districts in small cities[30] |
| 11-12% | goods and services in forested business districts in large cities[31] |
| 9% | goods and services in landscaped strip malls[32] |
| 7-11% | goods and services in retail districts adjacent to vegetated freeway rights-of-way[33] |
| 23% | homes within 1/4 mile of "excellent" commercial corridors[13] |

## Visual Quality

Across all studies, consumer ratings increased steadily in proportion to the presence of trees. Visual preference scores were lower for scenes without trees and much higher for places with trees. Business districts with tidy sidewalks and well-designed buildings, but no trees were rated at the low end of the scores. Images containing well-tended, large trees received the highest ratings, particularly when large trees formed an orderly canopy over the sidewalk and street.

Nonmarket valuation is helpful in the private sector as well. The pursuit of profit is based on estimates of costs and revenues. Nonmarket valuations offer the developer and land manager information to estimate return on investment for land development projects. For instance, there may be extra costs associated with taking greater care to protect trees during site preparation, but those costs may be offset by higher purchase prices for the building lots.

# Place Attachment & Meaning

## Restorative Process and Escape

Attention restoration theory proposes that exposure to natural settings reduces mental fatigue - or more precisely, directed attention fatigue.[78]Natural settings and stimuli such as landscapes and animals seem effortlessly to engage our attention, allowing us to attend to them without focused effort producing a restorative effect and reduction of stress.[88]

# Mental Health & Function

- The experience of nature helps to restore the mind from the mental fatigue of work or studies, contributing to improved work performance and satisfaction.[5,9,11,13]
- Urban nature, when provided as parks and walkways and incorporated into building design, provides calming and inspiring environments and encourages learning, inquisitiveness, and alertness.[54,57]
- Green spaces provide necessary places and opportunities for physical activity. Exercise improves cognitive function, learning, and memory.[40,41,42]
- Outdoor activities can help alleviate symptoms of Alzheimer's, dementia, stress, and depression,[25,28] and improve cognitive function in those recently diagnosed with breast cancer.[29,30]
- Contact with nature helps children to develop cognitive, emotional, and behavioral connections to their nearby social and biophysical environments. Nature experiences are important for encouraging imagination and creativity, cognitive and intellectual development, and social relationships.[18,19,58]
- Symptoms of ADD in children can be reduced through activity in green settings, thus "green time" can act as an effective supplement to traditional medicinal and behavioral treatments.[22,23,24]
- Experience of the natural world helps restore the mind from the mental fatigue of work or studies, thus office plants and views from windows help reduce stress, boost productivity, improve job satisfaction, and help workers stay more attentive.[1,7,10]
- In studies of lower income households the greenness of a young person's home or window views positively impacted cognitive functioning, ability to concentrate, and self-discipline.[27,30,31]
- Having green space in a public housing complex supported more outdoor play, adult-to-child interactions, and creative play – all important aspects of child development.[52]
- Mental fatigue can lead to irritability, lack of concentration, inability to solve problems, and increased likelihood of making mistakes or causing accidents.[40]
- Attention Restoration Theory (ART) proposes that certain environments are restorative and help individuals recover from mental fatigue, by providing time away from tasks that require voluntary or directed attention, allowing the mind to recharge.[41,42]

### The Elderly

- A 5-year study of senior citizens in Japan found that having readily available space for taking walks and the presence of parks and tree-lined streets near the residence were significant predictors of higher survival rates. Living in areas with walkable greenspaces positively influenced the longevity of urban senior citizens independent of their age, sex, marital status, baseline functional status, and socioeconomic status.[20]
- Another study of older adults revealed that longer visits to a park were associated with lower blood pressure than shorter visits.[21]
- City trees and green space are important to public health. They are more than just a luxury and should be given more attention in urban planning and development.

# Safe Streets

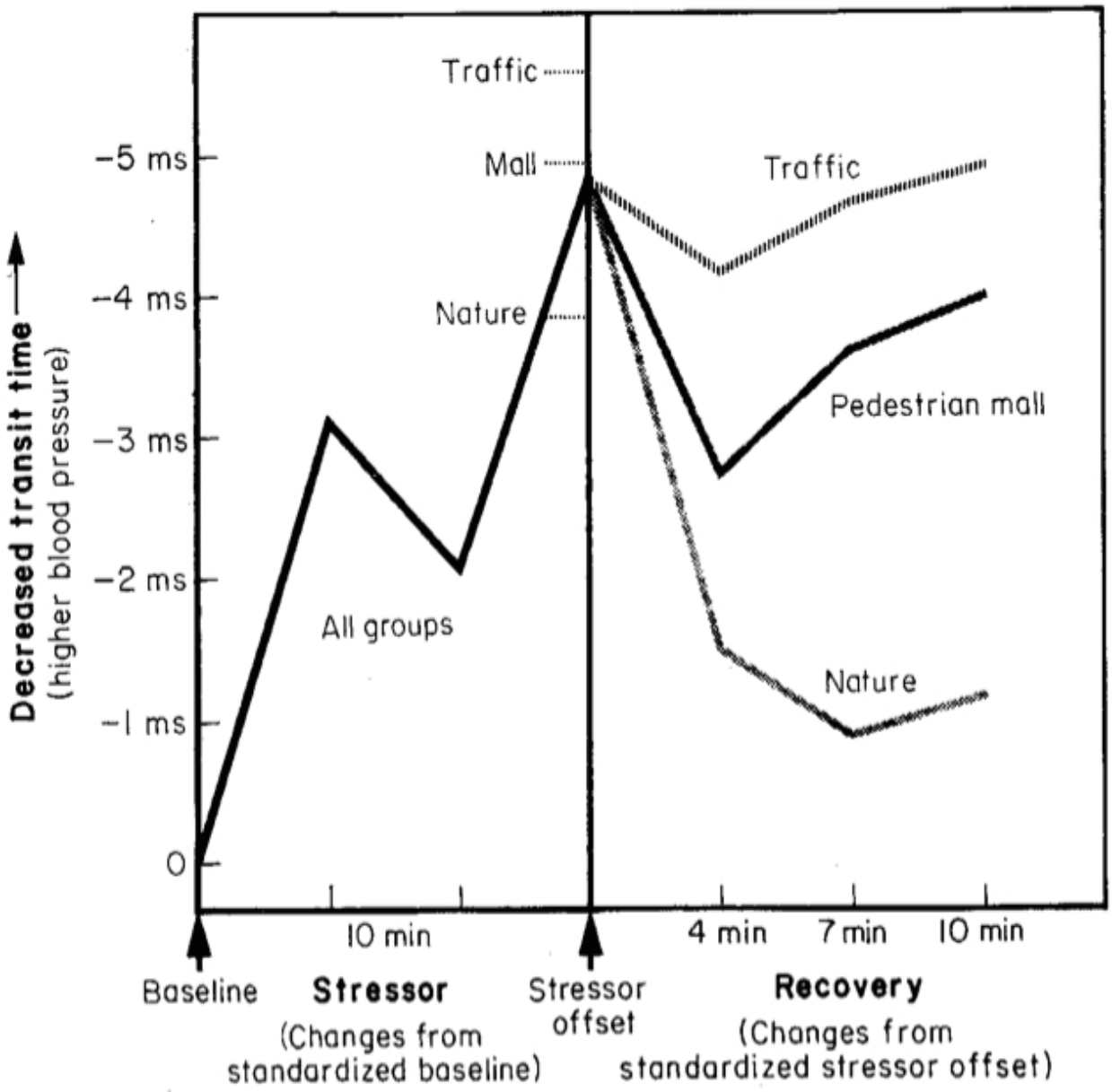
- The public judges communities having vegetation-bordered roads more positively, with ratings of visual quality for an adjoining city or town increasing as the amount of roadside vegetation increases.[6]
- Commuting by car is a stressful experience of urban life. Drivers seeing natural roadside views show lower levels of stress and frustration compared to those viewing all-built settings.[15]
- Transportation safety guidelines for roadsides are generally derived from studies of high speed rural roads, while recommendations for urban streets have been less rigorously derived.[20]
- Far less than 1% of U.S. annual vehicle crashes involve a tree on an urban street.[24] Crash prevention efforts should address high-risk conditions, such as reducing plantings at curves, rather than generalized tree removal.
- The most recent research suggests that trees may improve driving safety. One study found a 46% decrease in crash rates across urban arterial and highway sites after landscape improvements were installed.[34] Another study found that placing trees and planters in urban arterial roadsides reduced mid-block crashes by 5% to 20%.[33]
- Transportation officials acknowledge that city trees lend beauty to a streetscape, but some do not consider their presence along urban streets to be appropriate. Few appear to be aware of health and well-being influences; benefits research is not yet generally acknowledged within the transportation industry. Yet roadside public lands may have greater impact on public well-being than parks or open spaces, due to the frequency and duration of time spent driving.
- The character of a neighborhood has a significant effect on residents' physical activity. People in communities with abundant greenspace generally enjoy better health.[8]
- Public housing residents with nearby trees and natural landscapes reported 25% fewer acts of domestic aggression and violence.[5]
- Public housing buildings with greater amounts of vegetation had 52% fewer total crimes, 48% fewer property crimes, and 56% fewer violent crimes than buildings with low amounts of vegetation.[2]

# Reduced Risk

- Urban trees perform a range of environmental services that make cities healthier places, including improved air and water quality, energy savings, noise abatement, and improved soils. In total these services may provide billions of dollars of value each year.[109]
- Estimated total annual air pollution removal (of ozone, particulate matter, NO2, SO2, and carbon monoxide) by urban trees across 55 U.S. cities is 711,000 metric tons, representing $3.8 billion in public value.[7]
- Urban heat island effect occurs in built up areas. Parks can be up to 2°F cooler than the surrounding urban area in the day.[71] Large numbers of trees and expansive green spaces across a city can reduce local air temperatures by up to 9°F.[110]
- Appealing and easily accessible green environments may motivate and encourage physical exercise.[111] Activity in outdoor green spaces - at any level, intensity, duration, or type – has been associated with mental and physical benefits.[112,113]
- Also, people make more walking trips to task destinations (such as stores or coffee shops) when they perceive that there are many natural features along the route, including street-side trees. In less green neighborhoods, people judge distances to be greater than they actually are,[11] perhaps leading to inclinations not to walk.

# Stress, Wellness & Physiology

- The World Health Organization identifies stress and low physical activity as two of the leading contributors to premature death in developed nations.[26,27]
- The cumulative effect of chronic, low-grade stresses can have a greater impact on health and well-being than acute or extreme events that occur at infrequent intervals. Humans are able to manage moderate and high stress levels for a short period of time. Chronic stress, with little opportunity for recovery, can lead to unhealthy levels of psychological and physiological reaction.[13,82]
- Exposure to nearby nature can effectively reduce stress,[33,79]particularly if initial stress levels are high.[31] Simply having a view of nature produces recovery benefits.
- Individuals experience a greater degree of restorative experience and lower stress levels with greater duration and frequency of visits to green spaces.[39]
- Exercising in a green environment appears to enhance the restorative effects of urban greenery,[37] and more restorative outdoor settings may boost exercise frequency.[59]
- Public housing residents with nearby trees and grass were more effective in coping with major life issues compared to those with homes surrounded by concrete.[35]
- Exposure to nearby green space and trees may have a positive effect on infant birth weight,[47] particularly for lower socioeconomic groups.[48]
- Physical and perceived stress levels decreased significantly among those individuals between 50 and 88 years old who maintained a community garden plot compared with those who exercised indoors, suggesting benefits of gardening activity for healthy aging.[64]
- Studies in Japan of *Shinrin-yoku*, or forest walking, have found effects of improved immune system response, lowered stress indicators, reduced depression, and lower glucose levels in diabetics.[19,83]
- Dementia patients who have access to gardens are less likely to display aggression or experience injuries[41] as well as improved sleep patterns, balanced hormones, and decreased agitation.[101]
- Studies have shown that participating in activities and/or interacting with natural environments can ameliorate and help stave off attentional fatigue both before and after breast cancer treatment or surgery.[33]




- *Figure 1: Stress recovery rates when viewing different urban settings (using pulse transit time as a physiological stress indicator).*[4]

# Work & Learning

- A study of 101 public high schools found consistent and systematically positive relationships between nature exposure and student performance and behavior.[33] Views from cafeteria and classroom windows with greater quantities of trees and shrubs were associated with more positive standardized test scores, graduation rates, percentages of students planning to attend a four-year college, and fewer occurrences of criminal behavior. In addition, large expanses of landscape lacking natural features (such as lawns, athletic fields, parking lots, and large lawns) were negatively related to the scores and measures. All analyses accounted for student socio-economic status and racial/ethnic makeup, building age, and size of school enrollment.

## REFERENCES

see: http://depts.washington.edu/hhwb/ for citation information

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Alec Shub <alec.shub@uconn.edu>

# FW: Forests, farmland, greenspace, and reversing sprawl - Comments on the Governor's Council on Climate Change Forests / Agriculture / Land Use sections

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov>
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

**From:** Tony Cherolis <tony_cherolis@ctprf.org>
**Sent:** Tuesday, October 20, 2020 1:10 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Cc:** Jack Hale <jack.hale@comcast.net>; Dionne, Heather <DIONH001@hartford.gov>
**Subject:** Forests, farmland, greenspace, and reversing sprawl - Comments on the Governor's Council on Climate Change Forests / Agriculture / Land Use sections

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

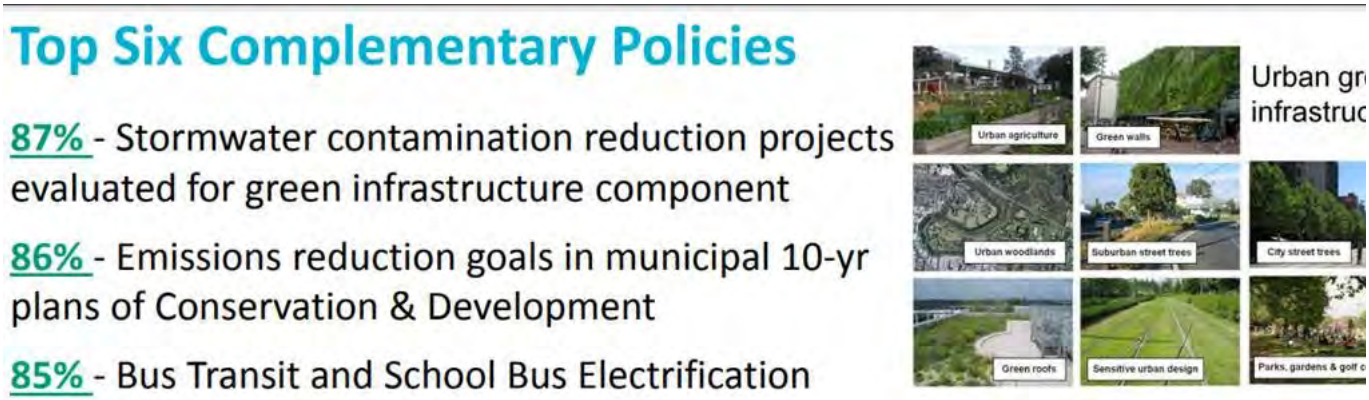
Friends,

Here are my comments on Governor's Climate Council greenspace, woodlands, farmlands, and land use.

**Youth (and Adult Climate) Conservation Corp** – Think beyond youth. We have massive unemployment at many age groups, especially in our urban areas that have been hard hit by layoffs industries. Our green spaces don't just need tree plantings. Especially in urban areas and town centers there is continuing maintenance, landscape, and upkeep of green spaces, trees, and funded long term maintenance roles (local jobs) that are respected as part of increasing green space, carbon capture, improved air quality, and reduced heat island effect.

- **Relative to funding, Hartford metro example** – The stormwater contamination reduction funds (from existing water use fees) would be much more effectively spent with eq jobs co-benefits if they were focused on ground level green infrastructure capital projects + long term maintenance of those projects in urban areas and town centers. We shouldr giant underground contaminated water storage tunnels. The remainder of that $2 billion plan by MDC to reduce contaminated stormwater must be spent on green infrastructure w related local employment.

- **Green Infrastructure has a lot of support** – Oct 2019 CT's Transportation Future Survey results summary, see slide 12. Highest ranked (supported) complementary policy from the transportation sector while providing positive co-benefits.




**No Net Loss of Forest** – We don't need to break even. We need to be reforesting and significantly increasing tree canopy, especially in urban areas and our town centers where the shade w community health.

- A 1% increase in forest cover over 20 years seems weak (pg 27). Why not 5% as a statewide goal?

- City of Hartford's Tree Plan and the Plan of Conservation and Development (pg 22) target a **significant increase from 25% (current) to 35% tree canopy by 2035**. That's forest goal we need, and a goal that overall plan should support.

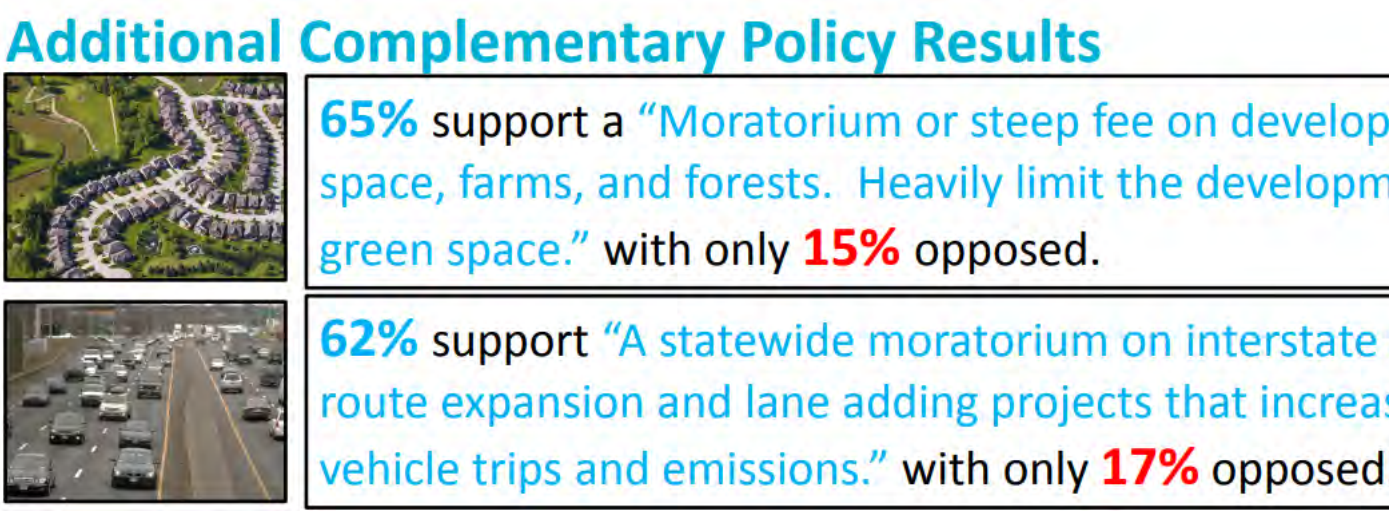
- Perhaps rural and suburban areas could aim for no net loss, but we could pick four or five priority large CT cities and target intentional tree canopy increases – and work to m tremendous equity and environmental justice benefit. See "Climate Conservation Corp" and green infrastructure proposal for an ideal funding source.

- Golf courses – We shouldn't convert any of these to single housing sprawl or rural industrial complexes. When a golf course dies, it should be converted to farmland or refore

**Education and Outreach** – I think that education on the topics of green infrastructure are important, particularly if that education results in paid internships and a career path in tree planting, related fields.

**Moratorium or Steep Fee on Rural and Suburban Sprawl** – It breaks my heart a little every time I see a single family, sprawling housing development or a big box industrial building (or CRE space, farmland, or forest. It seems that I'm not the only person that realizes how this sprawl damages our environment, creates more driving pollution (and greenhouse gas emissions), and r Transportation Future Survey included this as a question. 65% of respondents supported a "Moratorium or steep fee on developing green space, farms, and forests. Heavily limit the develop opposed.

- Transportation emissions are the biggest greenhouse gas emitter (38% in 2017). Every rural sprawling housing, school, and housing development that chews up potential fo traveled and tailpipe emissions.




**Solar Arrays, Focus on Rooftops and Not Green Space** – We shouldn't be building large scale solar arrays on green space and farmland. These solar power installations should be constr buildings. From an equity and low income community perspective, the solar power incentive need to include funds that help rehabilitate a roof before installation and include frameworks for in condos that aren't separately metered.

Thanks for your consideration of these proposals. Keep up the important work!

**Anthony Cherolis**

*Transport Hartford Coordinator*

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October 21, 2020

Via email: deep.climatechange@ct.gov
Connecticut Department of Energy and Environmental Protection
Office of Climate Planning
79 Elm Street
Hartford, CT 06106-5127

RE: Governor's Council on Climate Change (GC3) Draft Working Group Reports

Members of the GC3 Council,

I am the president of Middlebury Land Trust, Inc. (MLT). I am submitting the following comments on MLT's behalf, as regards the Governor's Council on Climate Change (GC3) draft Working Group Reports.

MLT is a member of the Litchfield Hills Greenprint Collaborative, a Regional Conservation Partnership active throughout a 29-town region of Northwest Connecticut. We collaborate in pursuit of a regional conservation strategy incorporating the Follow the Forest multistate initiative to protect core forests and the natural areas connecting them. We together care for protected land within our communities and manage public access for critical outdoor recreation. The Working Group Reports deeply resonate with what we do.

We strongly support many of the recommendations and goals included in the draft reports while highlighting herein some of the recommendations of the Working and Natural Lands Working Group, as well as those of the Science and Technology Working Group as described below.

1. We must ***prioritize the capacity of Connecticut's forests*** to mitigate climate change through carbon storage and sequestration. Proforestation (growing existing natural forests) has recently been recognized as the most powerful, low cost, and immediate mitigation opportunity with multiple immediate co-benefits and proven long-term resilience to the stresses of climate change; New England's forests have been specifically identified as part of the "Global Safety Net" needed to stabilize the climate. Connecticut's forests are critical within this Safety Net due to their considerable capacity to store aboveground carbon and their situation within climate corridors of connected core forest habitat running from Long Island Sound to Canada on either side of the State. We must:

    - ***Keep Forest as Forests***. Commit to *no net loss in statewide forest cover* and the permanent protection of *at least 50%* of Connecticut's medium (>250 ac.) and large (>500 ac.) core forests by 2040.

- ***Establish Extensive Natural Area Forest Preserves*** on existing and new state conservation lands. Establish criteria and processes for protective designation to prioritize proforestation and ensure old-growth forest and remnants are protected.

- ***Increase land protection funding*** from all available sources, including annual bond authorizations of at least $25 million for DEEP's Recreation and Natural Heritage Trust Fund and $25 million for the Open Space and Watershed Land Acquisition (OSWA) program.

- ***Encourage land stewardship behaviors that support ecosystem services.*** Provide funding and policy incentives to encourage carbon storage and sequestration, reduction of habitat fragmentation and protection of vulnerable habitats, and increased connectivity among other natural climate solutions, on non-state lands including through the purchase of easements.

- ***Action must start right now.*** We should not wait on final reports to act where the science is already sound. Land conservation organizations including those in the Greenprint plan to protect land and natural resources in perpetuity. We appreciate the long-term effort needed to effectively meet the challenges posed by our rapidly changing climate, but also the immediacy of the need to respond in accordance with proven science. The bold recommendations above can and should be implemented immediately.

2. We must be ***guided by science and do no harm.*** GHG mitigation policies in particular should ensure that gains are not offset by (i) poorly sited solar and wind installations that convert forestland and remove stored carbon, or (ii) timber sales on state lands that are far more valuable for their carbon storage as living trees than the generally low value that the state generates from the sale of logs (and associated leakage of stored carbon from the state).

3. We must ***support research and education.*** Provide funding to target areas where research is still needed to discover, monitor, and develop the science needed to mitigate climate change. Augment, accelerate and formalize a broad program of positive education and cultural change across all sectors of state government, municipalities, NGOs, and public schools.

MLT can help by protecting conservation lands, especially forests, working locally within broad-based planning. We can educate the public, focusing especially on the youth who will inhabit the future we leave to them. We can provide access to protected lands for scientific research supporting sound policies. And we can open access to the benefits of outdoor recreation and experiences in nature.

Thank you all for your leadership in this significant work, and for providing this opportunity to present comments on the recommendations. We look forward to assisting in their implementation.

Respectfully,

W. Scott Peterson, M.D.

W. Scott Peterson, M.D., President
Middlebury Land Trust, Inc.

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Tue, Oct 20, 2020 at 10:06 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

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-----Original Message-----
From: janinawoelfin@everyactioncustom.com <janinawoelfin@everyactioncustom.com>
Sent: Tuesday, October 20, 2020 7:27 AM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Rebecca French,

Thanks for letting me comment on the Governor's Council on Climate Change reports. I want our state to set a 100% zero-emissions goal in our building code, transportation and electricity and to focus on creating green jobs including for low-income communities.
Naturally this includes not approving any expansions or changes to the Killingly fossil-fuel plant or any other fossil-fuel projects.
The ISO-New England system must be reformed to comply with the new clean energy goals, and we should invest in forest, river and wetland conservation to provide natural solutions. I live right by a wetland in Madison and know how the growing pollution of the wetlands destroys water supply and is helping to make our country and homes uninhabitable.

Thank you.

Sincerely,
Yann van Heurck
PO Box 1215 Madison, CT 06443-1215
janinawoelfin@gmail.com

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# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 7:04 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

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-----Original Message-----
From: aaron.goode@everyactioncustom.com <aaron.goode@everyactioncustom.com>
Sent: Wednesday, October 21, 2020 7:01 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

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Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Mr. Aaron goode
45 William St  New Haven, CT 06511-0804
aaron.goode@gmail.com

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**Alec Shub <alec.shub@uconn.edu>**

# FW: How a Climate Corps Could Put Youth to Work in Greening America

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:47 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

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**From:** Aaron Goode <aaron.goode@gmail.com>
**Sent:** Wednesday, October 21, 2020 10:46 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** How a Climate Corps Could Put Youth to Work in Greening America



I hope the GC3 will consider this article in finalizing its report.

https://e360.yale.edu/features/how-a-climate-corps-could-put-youth-to-work-in-greening-america

# How a Climate Corps Could Put Youth to Work in Greening America

*The Depression-era Civilian Conservation Corps put thousands of young men to work in U.S. parks and forests, transforming the nation's parks system. A new Climate Corps could provide badly-needed work for young people while providing them with training for today's green jobs.*

BY DANIEL MUNCZEK EDELMAN • OCTOBER 15, 2020

As youth unemployment soars and people inside and outside of government finally begin to confront our climate crisis, numerous proposals have cropped up to resurrect the Civilian Conservation Corps (CCC) — a Great Depression-era program that had young men work on natural resources projects across the country. Joe Biden's campaign has one plan, the Biden-Sanders Unity Task Force has another. Think tanks have written a couple. And Congress has produced at least seven that I could find.

Clearly, the chances of a revival of a federal CCC are tied to the outcome of the upcoming election. But this widely shared focus on bringing back the CCC to combat climate change isn't surprising. American youth care deeply about this fight. Creating thousands or even millions of jobs to restore our natural environment is both romantic and futurist. California, in fact, just announced its own program. And now, as the pandemic has wrought the greatest economic destruction since the Great Depression, it makes sense that some look to President Franklin Delano Roosevelt's effective public jobs programs as a potential solution.

But with so many competing proposals, what should a modern-day Civilian Climate Corps look like?

Looking back, the original CCC, which ran from 1933 to 1942, was FDR's first attempt at directly creating jobs for a great number of people, predating the better-known and far larger Works Progress Administration. Although smaller, the CCC placed hundreds of thousands of unmarried men aged 18 to 25 in residential, quasi-military work sites to improve parks and forests on federal lands, eventually employing more than 3 million men.

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# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:35 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

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-----Original Message-----
From: Adam Battelstein <adambatt@earthlink.net>
Sent: Wednesday, October 21, 2020 9:21 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change,

Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit.

Nature is essential for the future, for evolution and for everything we need, and serves the public good now and for the long term.

We have so many beautiful natural areas, and some need to be protected for nature study, hiking, and places that people can count on. This has never been more important.

Meanwhile - we are burning and exporting our public forests? Who benefits? This is beyond disturbing.

We need systems that support good jobs, local resource use, AND natural areas.

Our public land is held in the public trust.

We need your leadership.

Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

Sent from my iPhone

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 7:53 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Aimee Kanzler <aimee.kanzler@gmail.com>
**Sent:** Wednesday, October 21, 2020 7:28 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change,

Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit.

Nature is essential for the future, for evolution and for everything we need, and serves the public good now and for the long term.

We have so many beautiful natural areas, and some need to be protected for nature study, hiking, and places that people can count on. This has never been more important.

Meanwhile - we are burning and exporting our public forests? Who benefits? This is beyond disturbing.

We need systems that support good jobs, local resource use, AND natural areas.

Our public land is held in the public trust.

We need your leadership.

Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 7:03 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: AJ Tessner Risser <ajtr.24@gmail.com>
Sent: Wednesday, October 21, 2020 6:53 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

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Sincerely,
Agnes Tessner Risser

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Alec Shub <alec.shub@uconn.edu>

# FW: Public comment

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 10:49 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

---

**From:** Alexander Herpst <alexandermherpst@gmail.com>
**Sent:** Wednesday, October 21, 2020 10:29 AM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Public comment



One of the main contributors to climate change is animal agriculture at ~15%. However many state funded buildings that have cafeterias have little to no plant based options. It would be much easier for people to transition to healthier food if they regularly saw it on the menu at schools and government buildings. Pushing them to have about half their menu being plant based in the next couple years would greatly reduced environmental impact and inspire people to adjust their consumption at home.

Then also

Prioritize equity in all recommendations of this workgroup.

At least 40% of all new programs should benefit low-income communities and communities of color that have suffered from decades of intentional structural racism, disinvestment, red lining, discrimination, segregation, and many other injustices.

Ensure funding for low-income equitable access by:

· Requiring insurance companies pay a tax for each fossil fuel company or project that they underwrite,

· Insurance companies pay a tax on the profits from investments in fossil fuel companies,

· A portion of any proceeds received as a result of the state's lawsuits against fossil fuel companies is invested in low-income communities.

Require that insurance companies:

· Immediately cease insuring new coal projects and coal companies, unless they are engaged in a rapid transition process away from coal to clean energy for no more than two years.

· Immediately cease insuring new oil or gas expansion projects.

· Commit to phasing out insurance for oil and gas companies in line with a 1.5ºC pathway.

· Divest all assets from coal companies and oil and gas companies that are not in line with a 1.5ºC pathway, including assets managed for third parties.

· Bring stewardship activities, membership of trade associations and public positions as a shareholder and corporate citizen more broadly in line with a 1.5ºC pathway in a transparent way. This must include forceful advocacy for a green and just recovery from COVID-19.

Reintroduce and enact SB 345 requiring the Insurance Commissioner to (1) annually conduct a study on issues related to climate change and report the results of such study to the joint standing committee of the General Assembly having cognizance of matters relating to insurance, and (2) assess the feasibility of collecting and reporting additional data concerning climate change.

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 7:54 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

---

**From:** alicia camuy <aliciacamuy@gmail.com>
**Sent:** Wednesday, October 21, 2020 7:44 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

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Best,

Alicia M. Camuy

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 draft report comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:45 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: adolce@everyactioncustom.com <adolce@everyactioncustom.com>
Sent: Wednesday, October 21, 2020 10:32 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 draft report comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Climate Change Bureau CT DEEP Climate Change Bureau,

In light of Connecticut's ambitious climate targets, I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future.

Strengthening the alignment between the state's decision-making and its greenhouse gas reduction goals is imperative. All regulatory decisions should be evaluated for consistency with meeting Global Warming Solutions Act targets.

I particularly support these recommendations from Section 1, and urge their inclusion in the final reports:

- Do not delay in creating voluntary stretch codes for municipalities and make the existing building codes more robust. Building codes are pivotal in "moving the dial" to meet the state's climate goals. Without these changes, I fear that Connecticut will fall behind the progress being made in our region, especially in Massachusetts and New York.

Strongly consider carbon codes for new construction.

- Reduce GHG Emissions from State and Municipal Buildings. Revise the High Performance Building standards and consider all electric, zero energy code, for state funded projects

We need bold action to future-proof the buildings we build now to prevent them from becoming obsolete in ten years.

- In light of CT's substantial existing building stock, scale up Deep Energy Retrofits to facilitate weatherization and create a "lock box" to protect raiding of the state's Energy Efficiency programs.

- Move climate adaptation and resiliency measures—like nature-based solutions, forest and wetland protection, urban green infrastructure and tree planting, and making low/moderate income housing energy efficient and healthy—from demonstration project scale to widespread adoption and protection

The reports could be made even stronger. Please consider these additions and modifications to build the ambitious climate mitigation, resilience, and justice plan Connecticut needs:

- Emphasize the importance and urgency of strong climate mitigation action, by:
a) highlighting the current and projected impacts of climate change in Connecticut, including health and economic impacts;
b) identifying the greenhouse gas reduction potential of suggested projects;
c) Consider the creation of high-performance design & construction accelerator programs for Zero Energy and the Passive House building standard to place Connecticut on a fast-track to transform its built environment.

This suite of policies can reduce Connecticut's contribution to climate change and help our region adapt to the changes that are already occurring—while protecting public health, generating good jobs, and protecting vulnerable communities from storms, flooding, and air pollution.

Thank you for your consideration.

Sincerely,
Ms. Alicia Dolce
301 Old Whitfield St  Guilford, CT 06437-3403 adolce@ctgbc.org

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:32 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

Looks like a duplicate comment

-----Original Message-----
From: Andrea Fabian <andrea_fabian@yahoo.com>
Sent: Wednesday, October 21, 2020 9:08 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

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Sent from my iPhone

October 21, 2020 *Submitted electronically via: deep.climatechange@ct.gov*

Michael Li
Energy Bureau Chief
Department of Energy and Environmental Protection
10 Franklin Square
New Britain, CT 06051

**Re: GC3 Draft Report of the Progress on Mitigation Strategies Working Group – Buildings Chapter**

Dear Mr. Li,

On behalf of Northeast Energy Efficiency Partnerships (NEEP)[1], I am pleased to submit comments relative to the Buildings Chapter of the Draft Report of the Progress on Mitigation Strategies Working Group for the Connecticut Governor's Council on Climate Change. NEEP is a non-profit with a mission to accelerate regional collaboration to promote advanced energy efficiency and related solutions in homes, buildings, industry, and communities.

We thank the Governor's Council on Climate Change Progress on Mitigation Strategies Working Group for the opportunity to provide input on the 2020 report. We commend the Progress on Mitigation Strategies Working Group and the Governor's Council on Climate Change for what they have done so far to comprehensively expand equitable building decarbonization in Connecticut. The following comments are intended to provide technical assistance and resources relating to the Buildings chapter of the report including topics such as building codes, building energy labeling, workforce development, thermal retrofits and more. NEEP has tools and resources available, as well as direct technical assistance.

## Introduction

Governor Lamont's 2019 Executive Order #3 tasked the GC3 to monitor and report the progress on carbon mitigation and adaptation strategies to achieve the states carbon reduction goals. It also ordered the GC3 to prioritize the equitable distribution of costs and benefits. The Report of the Progress on Mitigation Strategies Working Group builds on the strategies outlined in *Building a Low Carbon Future for Connecticut: Achieving a 45% GHG Reduction by 2030*. The Report of the Progress on Mitigation Strategies Working Group should consider disruptions to the progress of the original strategies, new strategies for achieving the goals and do so from the perspective of equity and environmental justice communities. The comments outlined below are structured to match the organization of the report for ease of access.

[1] These comments are offered by NEEP staff and do not necessarily represent the view of the NEEP Board of Directors, sponsors or partners. NEEP is a 501 (c)(3) non-profit organization that does not lobby or litigate.

## Accelerate the adoption of Building Thermal Energy Conservation Improvements

### Improve the ability of efficiency programs to overcome health, safety, and legal barriers

Physical barriers such as mold, asbestos, and lead that restrict building owners from making energy efficiency improvements are a serious issue, especially in low income communities as identified in the report. In addition to the outlined list of strategies, DEEP and the Energy Efficiency Board could develop programs that target physical barriers along with energy efficiency improvements. Auditors and health inspectors and other building professionals could be cross-trained to identify and remedy both energy and health issues at the same time instead of being isolated to their specific topics of expertise. See below for a few examples of programs from the region that target both energy efficiency and health barriers.

- New York State Healthy Homes Value-based Payment Pilot
    - A partnership between NYSERDA and the Medicaid office to address asthma and lead paint among others.
- Philadelphia Energy Authority's Built to Last Project
    - This program targets low-income home owners and includes health and safety improvements such as moisture, molt, and pests that would otherwise defer energy efficiency improvements.

### Be proactive: Create stretch codes, carbon codes, and all-electric options

Building Energy Codes and Building Performance Standards are key tools to decarbonizing the building sector and should be used proactively. The Progress on Mitigation Working group is right to ensure that the state's building codes are aligned with the International Energy Conservation Code (IECC) standards. The 2020 year has thrown everything out of schedule and NEEP understands the difficulty of keeping things on track. In August, the State Code and Standards Committee voted to both delay the adoption of the 2018 IECC standards until 2021, likely June or July, and not to adopt the forthcoming 2021 IECC code cycle. While the pandemic has caused other states to delay their code adoption none have delayed as long as a year. If possible, the code should be adopted sooner and the 2021 codes not skipped; however, the delayed time frame provides an opportunity to pass the 2018 IECC standards with strengthening amendments instead of weakening ones. Weakening the code makes the code less cost-effective to implement, disrupts potential valuation savings, causes confusion in the real estate market and among design professionals, and reduces the code's overall power to act as a driver toward further energy efficiency market transformation. Strengthening amendments include "electric ready" codes such as electric vehicle ready, solar-ready, heat pump ready, etc., or a prescriptive point-based pathway to compliance.

The CAS stated that it would review the 2021 IECC and incorporate significant changes into the adoption of the 2018 IECC. While the full adoption of the 2021 IECC codes would be beneficial, DEEP could play a role in the incorporation process to ensure consistency with broader state policy by providing criteria and guidance to direct development and goals.

NEEP has extensive experience and knowledge on the proactive use of energy codes for decarbonization. Stretch codes, zero-energy codes, and building performance standards are examples of this and NEEP commends the

WG for highlighting this as an enhancement. Zero-energy codes do not happen overnight. Connecticut could create a roadmap that sets a target to achieve all zero energy new construction by 2030 and addresses the electrification of existing buildings between 2030 and 2050. There are many model stretch codes that Connecticut could adopt to give communities the option to reach farther. Some examples include: DOE's Zero Energy Ready Homes Program, Enterprise Green Communities Program (for affordable housing), the Living Future Institute's Zero Certification or Living Building Challenge. Connecticut could also create a custom stretch code directed to the specific needs of the state. NEEP can offer technical advice and resources to aid in the creation of a zero-energy roadmap and stretch codes.

The creation of a code can only go as far as the state's ability to enforce and track compliance. Connecticut could consider offering alternative compliance pathway options to the future base energy code such as Passive House Standards, DOE's Zero Energy Ready Homes, Energy Star Certification, and lower ERI scores. More pathways to compliance give contractors the ability to choose how they will reach compliance and increase the chances of code-compliant buildings being built. To increase code enforcement and compliance capacity consider: 1. Utilizing third-party energy specialists; 2. Establishing an energy code compliance collaborative; 3. Developing robust training and certification requirements for code-inspectors, plan reviewers, and building industry professionals and; 4. Implementing statewide electronic permit processing, plan review, inspection, and fee collection systems. These recommendations all increase the states capacity for evaluating new construction to enforce and track code compliance.

Building performance standards (BPS) target energy reductions in existing buildings. Many states and cities in the Northeast and around the country are developing performance standards as a way to reduce GHG emissions and meet climate carbon goals. An 80% GHG reduction by 2050 is not possible without work being done in the existing building sector. Adopting requirements for building infrastructure to provide, track and support home energy rating and building energy benchmarking at scale is a critical first step for the state to later implement a BPS. NEEP is happy to see the initiative to expand energy rating in further sections of this chapter.

### Reduce GHG emissions from state and municipal buildings, including Lead by Example goals for 2030

Lead by example requirements for certain projects such as state and municipal buildings, affordable housing, hospitals and schools etc. are an effective way to break-the-ice on new efficiency measures such as benchmarking, building performance standards, and high-performance codes. Lead by example practices develop the market and make it easier for others to accept future regulatory changes for all projects. Connecticut is in the process of updating its High Performance Building Standards for State Agency buildings and School Buildings. Connecticut can consider the inclusion of a zero energy or a zero energy ready track to further incentivize high performance buildings. Schools are already a sector with lots of interest from the green building community and are well positioned to lead the charge on zero energy construction. The Northeast Collaborative for High Performance Schools (NE-CHPS) was updated to version 3.2 in 2019 and would be a helpful guide as Connecticut updates the high performance standards for schools. The NE-CHPS offers both a pathway to zero-energy as well as significantly improved indoor air quality, an important consideration in the era of COVID-19.

NEEP is happy to offer technical advice and resources on the best path forward for high performance schools that prioritize both health and energy.

Facility director and building manager training and education need to develop alongside high performance buildings. Traditional building management procedures are not always enough to effectively operate a high performance building and achieve the expected energy savings. A solution is to include a building operator certification requirement in the standard that ensures they are trained and educated in a manner that allows them to successfully operate more sophisticated buildings. The DOE has a number of approved certification programs listed on their website which could be used to develop the Connecticut building operator workforce for this purpose.

### Review consistency of energy efficiency cost-effectiveness testing with public policy goals

For decades utilities across the country, including Connecticut have used the utility cost test to determine the cost effectiveness of energy efficiency improvements. However, as acknowledged in the report, this method does not adequately value energy efficiency and distributed energy resources and does not align with other state policy goals such as public and environmental health. NEEP supports the proposed enhanced strategy to fully align the Connecticut cost test with the National Standard Practice Manual (NSPM) to better capture impacts supported by state public policy. DEEP's 2017-2019 inquiry relied on the guidance of the NSPM for Energy Efficiency. This past summer the National Energy Screening Project released the NSPM for Distributed Energy Resources (NSPM for DERs) which expands and serves to replace the foundational manual for Energy Efficiency.

The NSPM for DERs provides policy-neutral concepts and methodologies to support DER benefit cost analysis on five different categories of distributed energy resources: Energy efficiency, demand response, distributed generation, distributed storage, and building and vehicle electrification. NEEP recommends that Connecticut resume its exploration of a more equitable cost effectiveness test with the aid of the new NSPM document as it aligns closely with other Connecticut goals such as demand response, storage, and electrification. The current cost effectiveness test restricts some electrification and renewable thermal improvements such as heat pump adoption and a revised test could free up further funding for incentives.

### Harness the power of data to guide, initiate, and track change

Statewide benchmarking not only gives building owners the information necessary to make educated energy efficiency decisions, but it also gives the state insight on key target areas to focus on. Labeling and benchmarking speed along market transformation for new energy efficiency technologies and can even be used to add value to real-estate. NEEP has two tools, the Home Energy Labeling Information eXchange (HELIX), and the Building Energy Analysis Manager (BEAM), that serve to make data acquisition and analysis easy without expending too many resources. Both are being developed alongside ClearlyEnergy with support from the DOE.

HELIX is a residential labeling platform for storing home energy labeling program data and automatically populating it into multiple listing services (MLS). On a statewide basis, HELIX can serve as the database of new construction and retrofits. HELIX's open architecture means that Connecticut could add data fields that are

relevant to the state's needs such as fuel type, system type, and the presence of mold/asbestos/ lead. Much of this information can be drawn from tax assessor data. In the fall of 2019 NEEP presented HELIX to Connecticut Realtors hosted by the Middlesex Association of Realtors to spread awareness and educate them on HELIX and energy labeling. HELIX was used to customize and generate the Vermont Home Energy Profile to provide home buyers and real estate professionals with home energy efficiency and energy usage information. HELIX could be customized for Connecticut in a similar way.

BEAM is a platform similar to HELIX for commercial and large residential benchmarking. It is a flexible tool for importing, streamlining, and tracking benchmarked data and can also be used to implement a building performance standard. BEAM compares the building data to the policy goals and can automatically indicate who is in compliance. Similar to HELIX, BEAM allows user-created fields and data to be added to the platform. BEAM is currently in a development phase which is being closely guided through the input of an Advisory Committee composed of state and local officials with an interested in producing a tool to help measure progress towards climate goals. Connecticut is welcome to join the advisory committee and collaborate further on this topic.

### Engage municipalities as allies to improve energy efficiency

NEEP supports the concept of Energy Development Zones and recommends combining EDZ's with workforce training facilities. Local vocational and technical high schools and community colleges could be engaged to establish energy efficiency related workforce tracks. Workforce development is crucial to achieving many objectives this working group has been tasked with. To develop the market there is a growing demand for all kinds of new workers including renewable thermal HVAC installers, home auditors, building operators, code officials and design professionals. Workforce development can also have beneficial impacts on underserved communities by providing desirable skills and well-paying jobs. Roxbury Community College offers the Smart Building Tech Program to increase the number of qualified workers. Another great example is the California Community College's Advanced Transportation and Logistics Sector program; a partnership between the California Community Colleges and the California Energy Commission (CEC). The CEC provides funding to update facilities and curriculums primarily in underserved communities.

## *Transition Building fossil fuel thermal loads to efficient renewable thermal technologies*

Connecticut is on the right track with and should continue to leverage energy efficiency programs to offer incentives for renewable thermal technologies. These programs could be expanded to include extra incentives for customers using high-cost fuels such as oil, propane, or electric resistance heating. Further exploration into fuel-switching policies and cost effectiveness tests could unlock further ratepayer funds that might otherwise not be allowed. The state could develop new sustainable funding mechanisms beyond ratepayer funding and RGGI to increase available funds and grow renewable thermal programs. Possible funding could be derived from Renewable Thermal Portfolio Standards or state tax incentives. NEEP's regional Air-Source Heat Pump product list can be leveraged to ensure that the systems being installed are energy efficient and capable of handling New England winters. NEEP has extensive experience in air-source heat pump market transformation and adoption. Our website has a number of installer resources to outline core principles of an effective heat pump installation.

The Air Source Heat Pump Buying Guide gives customers important background knowledge on heat pumps and the tools they need to shop for one.

## Conclusion

NEEP applauds Connecticut in updating the 45% by 2030 carbon reduction strategies to achieve climate and equity goals. These comments are intended to support the work currently underway with the mitigation and adaptation strategies and we appreciate the opportunity to provide input. NEEP is available to provide technical assistance and resources to assist the GC3 in effectively implementing the strategies. We look forward to continuing to work with Connecticut in achieving a clean energy economy.

Sincerely,

Andy Winslow

Andy Winslow
Public Policy Associate
Northeast Energy Efficiency Partnerships
Awinslow@neep.org

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 8:49 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: annekcheng@everyactioncustom.com <annekcheng@everyactioncustom.com>
Sent: Wednesday, October 21, 2020 8:45 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Rebecca French,

Thank you so much for giving us the opportunity to our submit comments on the Governor's Council on Climate Change (GC3) reports.

These reports refer to the most relevant policies Connecticut can enact to mitigate and adapt to local climate impacts.

While I agree with many of the recommendations, I hope you focus on four actions Connecticut can take now to drastically reduce climate disasters.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you for all the good that you do,

Sincerely,
Anne Cheng
115 Clovelly Rd  Stamford, CT 06902-3006 annekcheng@gmail.com

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Alec Shub <alec.shub@uconn.edu>

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 8:08 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: Arlene Johnson <arleniejj@yahoo.com>
Sent: Wednesday, October 21, 2020 7:58 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change,

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Meanwhile - we are burning and exporting our public forests? Who benefits? This is beyond disturbing.

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Sent from my iPhone

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To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

**From:** Rowland, Avery E. (2023) <avery.rowland@trincoll.edu>
**Sent:** Wednesday, October 21, 2020 9:09 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

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**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:46 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Barbara Chase <chase753@comcast.net>
**Sent:** Wednesday, October 21, 2020 10:44 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change,

Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit.

Nature is essential for the future, for evolution and for everything we need, and serves the public good now and for the long term.

We have so many beautiful natural areas, and some need to be protected for nature study, hiking, and places that people can count on. This has never been more important.

Meanwhile - we are burning and exporting our public forests? Who benefits? This is beyond disturbing.

We need systems that support good jobs, local resource use, AND natural areas.

Our public land is held in the public trust.

We need your leadership.

Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

You have been entrusted with the responsibility to protect our precious resources. Please don’t breach that trust!

Barbara Chase

UCONN
UNIVERSITY OF CONNECTICUT

**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 2:58 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Ben L <soccerhistorybuff@gmail.com>
**Sent:** Wednesday, October 21, 2020 2:41 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** GC3



Connecticut has natural beauty. We need to protect land not by “Managing” but by setting aside and letting nature take over. Many states don’t have the natural beauty that CT has and we need to protect forests so we can keep it that way. We as citizens can protect small plots but the government can protect larger spaces. We need these large protected spaces because we are only one species of billions and the non-human world needs a place to thrive that isn’t being affected by humans. Humans aren’t the center of the world and so we need to let the rest of the earth have its own breathing space.

Ben L age 13
North Granby

UCONN
UNIVERSITY OF CONNECTICUT

**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:47 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Casserly, Elizabeth D. <elizabeth.casserly@trincoll.edu>
**Sent:** Wednesday, October 21, 2020 10:53 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future



To DEEP Climate Change,

Our ability to get outside and connect with nature is crucial. Reflecting on the ways we've coped with the isolation requirements of the current pandemic are evidence enough of this, but your own working groups lay out the years of science showing this human need as well.

Please protect our natural spaces as living resources for positive change. They are not expendable, and if we allow them to be burned or sold, WE are the ones being cheated.

We need systems that support good jobs, local resource use, AND natural areas.

Our public land is held in the public trust.

We need your leadership.

Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

Many thanks for doing the right thing!!

Beth Casserly

(Sent from a very small keyboard; please excuse any typographical errors.)

Dr. Elizabeth Casserly

Trinity College, Hartford CT

UCONN
UNIVERSITY OF CONNECTICUT

**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 6:50 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Beth Zupec-Kania <ketokania@gmail.com>
**Sent:** Wednesday, October 21, 2020 6:45 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change,

My husband and I ask that you consider our future and generations to follow. Our natural areas are a source of beauty, healthy activities, clean air, and so many other benefits. They are not replaceable.

Thank you,

Richard Kania and Beth Zupec-Kania

1325 Victoria Cir. S., Elm Grove, WI 53122

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 5:36 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Bradford Tilden <bradford@crystalmusichealing.com>
**Sent:** Wednesday, October 21, 2020 5:06 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change,

Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit.

Nature is essential for the future, for evolution and for everything we need, and serves the public good now and for the long term. Nature is also extremely healing for our bodies and minds.

We have so many beautiful natural areas, and some need to be protected for nature study, hiking, and places that people can count on. This has never been more important.

Meanwhile - we are burning and exporting our public forests? Who benefits? This is beyond disturbing.

We need systems that support good jobs, local resource use, AND natural areas.

Our public land is held in the public trust.

We need your leadership.

Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

Sincerely, Bradford Tilden, Cheshire, CT

October 21, 2020

Governor's Council on Climate Change
deep.climatechange@ct.gov

RE: Governor's Council on Climate Change Forests Sub-Group Draft Report

Representing thousands of Connecticut members who are hunter-conservationists, the below signed organizations commend Governor Ned Lamont for convening a Governor's Council on Climate Change (GC3), including a Forests Sub-Group under the Working and Natural Lands Working Group. Connecticut is both a densely populated and heavily forested state, with nearly sixty percent of its land base in forests (Hochholzer 2015). Forests in the U.S. offset around ten to thirty percent of the nation's annual $CO_2$ emissions (Houghton 2003), highlighting the opportunity Connecticut has to leverage forest management policy to offset its own carbon footprint. The diverse contributions of forests to protecting water and air quality, promoting biodiversity, and providing recreational opportunities and cultural values is well appreciated by Connecticut's outdoorsmen and outdoorswomen. In addition, Connecticut's 350,000 hunters and anglers annually spend an estimated $752 million and generate $90 million in state and local taxes in the state, and our community is a strong partner in forest stewardship. We appreciate the opportunity to provide input on the draft report, and wish to highlight a few concerns.

Our first concern is the process by which the report was developed, particularly the lack of inclusion of a number of varied stakeholders that should have been included in this process. Through our close work with the Bureau of Natural Resources within the Connecticut Department of Energy and Environmental Protection, we have a great appreciation for the important roles of your professional resource managers in considering diverse values and uses while researching, monitoring, and managing the state's fish, wildlife, forests, and other natural resources. As stakeholders with a history of directly partnering in these efforts, we are disappointed to have not been directly engaged in the process of developing this critical report. Direct representation of our community in the Forests Sub-Group would have been typical of the assistance we have provided in past planning efforts.

More specifically, the Governor's Council on Climate Change recommended that "DEEP should work with land trusts, forest owners, and *working lands managers* [emphasis added]…" There was, however, no representation on the Forest Sub-Group from private landowners, the DEEP Division of Forestry or the DEEP Division of Wildlife. The report discussed the management of state forests and wildlife management areas, nevertheless the "working lands managers" responsible for stewarding these lands, according to their statutory charters, were excluded from the Forest Sub-Group, though agency representation was included on the Agriculture/Soils Sub-Group and the Wetlands Sub-Group.

Additionally, it is particularly problematic that the report even acknowledges the contributions of sportsmen and women yet excluded them from the Forest Sub-Group. The report states that the "vast majority of funding to manage these lands (wildlife management areas), comes from the U.S. Fish and Wildlife Service Wildlife and Sport Fish Restoration Program." Indeed, sportsmen and women dollars generated through the "user-pays, public-benefits" American System of Conservation Funding supports the management of wildlife management areas, yet the agency responsible for administering these funds and managing these lands, was not consulted. Likewise, partner hunting-conservation nongovernmental organizations were not invited to the table.

**We therefore strongly urge you to reconstitute the Forest Sub-Group to include representation from the forestry and wildlife communities, and we additionally urge you to extend the timeline to finalize the report to ensure that input from forestry and wildlife stakeholders is included in the report.**

Regarding the substance of the report and looking past the aforementioned flawed process by which it was developed, we have serious concerns regarding the recommendation for establishing Core Forest Natural Area Preserves (CFNAPs) in Connecticut. The rationale cited for creating these areas is based on unsound science. "Proforestation" is an unproven concept not recognized by professional forestry and wildlife managers. We therefore present the following specific concerns regarding the recommendation for establishing CFNAPs and the associated rationale:

1. Exclusion of commercial harvests will promote uniform progression to late successional species in Connecticut forests that are vulnerable to invasive insect infestations and projected future increases in temperatures and drought occurrence – events that could increase tree mortality and convert carbon sinks to carbon sources. Counter to the opinion on benefits of passive management for carbon storage, careful management of forests can enhance resilience, particularly through facilitating adaptation to changing climate stresses, while also increasing carbon storage (Evans and Perschel 2009).
2. Significant Connecticut State Forest acres are already minimally managed, including dedicated research forests that explicitly provide their own permanent reserve areas paired as controls to managed forests. There is no need to establish CFNAPs entirely devoid of commercial harvests and salvage logging for the sole purpose to serve as control areas "to compare to the outcomes of management prescriptions" (p. 29). What would be more effective is additional collaboration to identify priority research questions and funding sources to support research and monitoring.
3. Though CFNAPs are claimed to be "a very low cost climate solution" (p. 29), the financial ramifications of losing a self-sustaining revenue source by removing lands from consideration for sustainable commercial forestry must be taken into consideration. Even where little management occurs, monitoring forest health, trespass issues, and potential timber theft and damage requires resources that would otherwise come at the burden of taxpayers.
4. Even with active management sustained on both public and private lands in Connecticut, nearly 10% of forest stands are 100 years of age or older, while less than 3% are under 20 years of age. The state's forests are primarily maturing forests, with 78% of the trees being over 60 years old. Connecticut's Forest Action Plan has identified this forest aging and progression to nearly 80% of stands in the sawtimber size class (over 11" diameter at breast height) as representing "potential detrimental effects for forest product sustainability, for protection against catastrophic weather or insect and disease outbreaks, and for wildlife species that depend on early successional habitats" (Hochholzer 2015, p. 13).
5. Although Connecticut has abundant upland forest habitats across the state, Connecticut's Wildlife Action Plan (Terwilliger Consulting 2015) identifies maritime forests and young forests (those with seedling and sapling trees, generally 0 to 20 years of age) as the only sub-habitat types in poor condition. The secure future of a number of wildlife species of greatest conservation need depends upon suitable quantity and quality of young forest habitats, including several bellwether species for whom our organizations have served as important partners to help conserve on private and public forest lands in Connecticut, such as American woodcock (*Scolopax minor*), Eastern racer (*Coluber constrictor*), Eastern whip-poor-will (*Caprimulgus vociferus*), New England cottontail (*Sylvilagus transitionalis*), and ruffed grouse

(*Bonasa umbellus*). The lack of young forest in the state is a such a serious threat to wildlife that the DEEP Division of Wildlife partnered with other natural resource agencies and conservation organizations to develop Connecticut's Young Forest Habitat Initiative to address the loss of young forest habitat. The report does account for the dire need for diverse forest habitats to support Connecticut's diverse array of wildlife.

The report did not represent the consensus of the members of the Forest Sub-Group. We are aware of strong disagreement among the Forest Sub-Group members about the recommendations contained in the report, and to our knowledge, the report failed to disclose that Forest Sub-Group members held different opinions and did not support the report in its entirety. To be clear, we have serious reservations about the process by which the report was created and the substance of the report, but even if the process was corrected, we nonetheless disagree with the recommendations in the report and consequently recommend that the group be reconvened to expand the stakeholder group to ensure a better representation of stakeholders, especially forest owners and working lands managers, as the Council recommended.

Given the points above, we believe the lack of clearly incontrovertible carbon benefits does not warrant the negative long-term consequences for wildlife habitat and populations that could come from the draft report's recommended goal of establishing more than 100,000 acres of CFNPs, set aside from any management under commercial harvests and even salvage logging. To be clear, we would not suggest intentionally converting Connecticut's most mature stands to young forest habitat, as these stands also provide different but important wildlife habitat and other values, including higher volumes of carbon storage if properly sustained. We do support allowing professional foresters and wildlife managers to adapt to future impacts of catastrophic weather or insect and disease outbreaks on these stands, to apply forest treatments and create silvicultural conditions to benefit wildlife species that depend on early successional habitats, and to sustain multiple generations of forest stands for future benefits to Connecticut residents.

We commend your interest in exploring natural solutions to address carbon storage but encourage you to involve more affected stakeholders, particularly landowners, foresters, loggers, and wildlife managers, and consider the full range of programs and practices capable of offsetting the carbon footprint of Connecticut. Ensuring that forest lands remain economically productive through sustainable forest management is a proven carbon offset. If lands cannot be managed, their value decreases and the likelihood of forest conversion to development increases. Forest management practices sustain healthy forests and the habitats upon which many wildlife species and Connecticut hunters, anglers, and outdoorsmen and women depend. The undersigned organizations appreciate the opportunity to provide input and stand ready to assist you.

Signed,

American Woodcock Society
Congressional Sportsmen's Foundation
Connecticut State Chapter of National Wild Turkey Federation
National Deer Alliance
New England Chapter of Backcountry Hunters and Anglers
Quality Deer Management Association
Ruffed Grouse Society
Theodore Roosevelt Conservation Partnership
Wildlife Management Institute

**SOURCES CITED**

Evans, A. M., and R. Perschel. 2009. A review of forestry mitigation and adaptation strategies in the Northeast U.S. Climatic Change 96:167–183.

Hochholzer, H. 2015. Connecticut's Forest Action Plan (Revised). Retrieved from https://portal.ct.gov/-/media/DEEP/forestry/assessment_and_strategy/FAP2015pdf.pdf

Houghton, R. A. 2003. Revised estimates of the annual net flux of carbon to the atmosphere from changes in land use and land management 1850-2000. Tellus Series B 55:378–390.

Terwilliger Consulting, Inc. 2015. 2015 Connecticut Wildlife Action Plan. Retrieved from https://portal.ct.gov/DEEP/Wildlife/CT-Wildlife-Action-Plan/CT-WAP-Current-Status#Review

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Climate Change Working Group reports

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 1:40 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: Bryan Anderson <andersonbryan33@yahoo.com>
Sent: Wednesday, October 21, 2020 1:15 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Climate Change Working Group reports

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

I commend the Lamont administration, and DEEP Commissioner Katie Dykes in particular, for convening key working groups to study and make recommendations on climate change. Thank you to everyone who participated in this important process. We know that pollutants in our air and water do not respect state boundaries. As such, we need to step up our game, control what we can within our boundaries, and work in concert with neighboring states and our Canadian friends on coordinated, cooperative initiatives.

I am a Trustee of the Milford Land Conservation Trust, a Member of the Milford Recycling Task Force, long-term Milford Alderman who worked to create open space, trails, bikeways, and environmental awareness. I grew up in a house that was built on a former landfill, and a neighborhood factory emitted pollutants into the air we breathed. I understand environmental justice and geographical racial disparities firsthand.

I urge a prioritization of the recommendations contained in the Working Group reports, so that policy development and enforcement, and those with financial implications for the Legislature can be clearly defined. Thank you!

Best,

Bryan Anderson
Milford

**To**: **The Forests Sub-Group, Working and Natural Lands Working Group**
**Governor's Council on Climate Change**

**From: Carol E. Youell, Certified CT Forester**
**(3180 Hebron Ave., Glastonbury, CT)**

**Date: October 20, 2020** This is an important document and deserves our time and attention.

**Re: Comments on the GC3 Forests Sub-Group Draft Report 2020**

I sincerely appreciate the opportunity to comment on this important draft report. It is obvious that a great deal of work went into its preparation. I would like to thank the Forests Sub-Group for their significant efforts. My comments are offered in a spirit of cooperation, not confrontation. If it at all possible, I and many of my peers, would like to have the opportunity to review and comment on any Forests Sub-Group updates to the original draft report before it goes public. Thank you.

I am a natural resources professional with over 40 years of experience working in Connecticut. I have worked in the public, private and nonprofit sectors, mostly focused on forest resources and water quality. In my last position I oversaw the management of more than 25,000 acres of water supply watershed forests. I received my BS in Natural Resources from UCONN and my Master's of Forest Science degree from the Yale School of Forestry and Environmental Studies (now known as the Yale School of the Environment). I am also a CT Certified Forester.

**My comments are as follows:**

**1. Managing forests for resilience and multiple uses is paramount in this era of climate change.** Resilience is achieved through active forest management using sound silvicultural practices based on science. Foresters must be able to monitor and implement practices to address changing conditions due to increases in forest insects, diseases, wind and rain storms, ice events, droughts, invasive species, browsing, etc., in order to maintain a sustainable resource to ensure a multitude of uses and benefits that the public needs and expects. We depend on our forests to provide a source of clean water, wildlife habitat, forest products, carbon storage, recreational opportunities, scientific study, aesthetic beauty, among others benefits.

My experience as a Watershed forester for a major water utility in Connecticut has clearly shown me that using proven forest management practices and tools, along with careful observations and an open mind, can result in more resilient, sustainable and healthy forest ecosystems. **(See the Appendix.)**

Foresters in Connecticut have been conducting multiple use management for many decades now, using proven silvicultural practices. Foresters must earn a Connecticut "certification" to practice commercial forestry in this state. This certification signifies that these professionals have reached

a basic level of achievement, knowledge and experience in order to understand and apply recognized forestry practices to properly manage the resource, as well as possess a basic knowledge of forest science and a multitude of other disciplines (including geology, ecology, soils, pathology, entomology, wildlife management, hydrology, statistics, and GIS among others.) This certification also requires continuing education to maintain one's certification.

**It is unfortunate that the Forests Sub-Group did not have more representation from CT certified foresters with significant on-the-ground professional experience. These are the people who have made important observations overtime as to what works and what doesn't, as well as having had the experience of confronting many significant challenges. These professionals have had the opportunity to actually see the results of their work. We need to hear more from them. This cannot be overstated. What role do CT Certified Foresters play in the context of this report and its recommendations?**

**2. Foresters need all available scientific management tools to address the dynamic changes that are occurring and will continue to occur in our forests.** Flexibility, adaptability, monitoring and education are key to future forest management decisions and healthy forests. There are many unknowns associated with climate change. It is difficult to predict the future. (Hindsight is always 20-20.) Our forest ecosystems are dynamic and complex in Connecticut. Forest carbon science is in its infancy and research is on-going. We need to learn more about the role forest ecosystems play in carbon sequestration and storage. *What about the role of forest soils? This was not addressed in the report.* With that in mind, it is essential to keep an open mind regarding forest management activities and practices on state and private lands.

**3. The term "proforestation" as referred to in the report, WILL NOT create healthy, "resilient" forests, which is a stated goal of the Forests Sub-Group. The professional Society of American Foresters does not recognize the word "proforestation" as a forestry term or a silvicultural practice (personal communication). The term is new to professional foresters in Connecticut as well.** "Proforestation" is defined in the draft report as: "natural forest growth in areas protected from timber harvesting", e.g., "protected reserves."

***A careful review of the science does not show that forests are more diverse, more resilient, or store more carbon over the long term when timber harvesting is excluded.*** Models suggesting otherwise assume the complete absence of disturbance and ignore the substitution benefits of durable wood products. Permanent restrictions on harvesting will limit our ability to protect forests, due to the dynamic nature of forest conditions, especially with a changing climate.

**Therefore the word "proforestation" should NOT be referred to at all in any of the Sub-groups' reports. Its use only adds to confusion and controversy, as the term is not supported by sound science.**

**4. The draft report recommends having long harvest rotations and growing large diameter trees to increase carbon storage (referred to as "*mitigation-focused forest management.*". However, long rotations and large trees are beneficial for carbon storage only if resilience of a forest is high.** The extent of large tree mortality in 2017-2018 across eastern Connecticut suggests that we may have prolonged rotation length too much for optimal carbon sequestration on many Connecticut forests. Other ways to improve forest management include: controlling invasive species, controlling excessively-high deer populations, reducing excessive use of forest roads, increasing structural diversity within stands and across the landscape, thinning stands to maintain vigor of the healthiest trees, establishing and releasing advance regeneration, favoring species best-adapted to climate change, and preventing widespread loss of timber suitable for durable wood products. **(See the Appendix.)**

Recent research published in ***Nature*** suggests mature forests are limited in their ability to absorb "extra" carbon as atmospheric carbon dioxide concentrations increase. Dr. John Drake assistant professor at SUNY College of Environmental Science and Forestry indicated that "the limited capacity of mature trees to respond suggests the need for a diversity of age classes of trees (younger trees sequester, older trees store carbon) and species, including species that may be better adapted to future climate conditions." (SUNY College of Environmental Science and Forestry, *"Don't look to mature forests to soak up carbon dioxide emissions: Results of Australian study may have impact on New York state carbon neutrality goals*.")

**5. The draft report repeatedly cites the need for more *protection/preservation* of Connecticut's forestland using a variety of terms that are confusing and undefined (such as passive management, reserve areas, unmanaged forest reserve, permanently protected core forests, core forest natural area preserves, etc.).**

First, the Forests Sub-Group must come to a consensus/agreement on the chosen wording and the terminology must be consistent throughout the report. Secondly, the definitions of their terms should be provided in the report. Thirdly, consideration should be given to reevaluating the forest protection related recommendations given the extent to which state lands are already managed and protected, and the reported fact that there is very little active management occurring on private forest lands in Connecticut. CT DEEP Forestry and the UCONN Cooperative Extension System should be consulted on these matters.

**6. The term "intact forest" is also misleading and confusing and needs to be defined.** The term was originally used to describe large intact forest blocks where anthropogenic forces were not a major influence, such as is in tropical rainforests. This term/concept has been expanded in its application and often applied to working forests. Clarification is needed if the term is to be used at all.

**7. Considerable public outreach, education (at all levels) and funding will be needed to successfully implement practices that support climate change mitigation goals.**

## Conclusion

I would urge the Forests Sub-Group to take advantage of the wealth of forestry and natural resources knowledge, research and experience we have here in Connecticut.

We are so fortunate to have dedicated and experienced foresters, biologists, ecologists, researchers and other professionals working right here! These include forestry and natural resource professionals from the CT DEEP, the University of Connecticut, Yale School of the Environment, Connecticut Agricultural Experiment Station, USDA Natural Resources Conservation Service, as well as private sector foresters, and many others.

I hope that the final report will reflect the level of expertise available and will serve to bring us together in addressing the important climate change issues that affect our forests now and in the future. This is an important document and deserves our time and attention. I am willing to assist in this effort.

Thank you very much for the opportunity to comment.

Sincerely,

Carol Youell
CT Certified Forester

# APPENDIX TO COMMENTS

(from CarolYouell)

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**Managing Public Water Supply Watershed Forestlands in Connecticut**

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In the next section, I would like to share with you some examples of forest management practices that have been conducted in Connecticut based on my experience as a Watershed forester.

-The first is an example of the extent to which forests can be affected by deer over-browsing and how a wildlife management program can help.

-The second is an example of an effort to restore a forested buffer that had been impacted by the Hemlock Woolley Adelgid insect and storm damage.

-The third explains typical forest management practices and desired results.

## Watershed Forests

Forests are the most desirable land use for protecting drinking water supplies:

- Provide a natural filtration system
- Buffer reservoirs from pollutants
- Intercept runoff, moderate stream flows, stabilize soils
- Reduce the amount and cost of water treatment needed
- Provide a host of multiple uses, clean water, wood products, wildlife habitat, recreation & carbon storage.

***Green Infrastructure***

## Management Challenges

- Deer/moose browsing of forest regeneration
- Invasive species control
- Forest insects and diseases: death/decline of hemlock, ash, white oak & others
- Climate change
- Recreational impacts

## High Deer Populations…

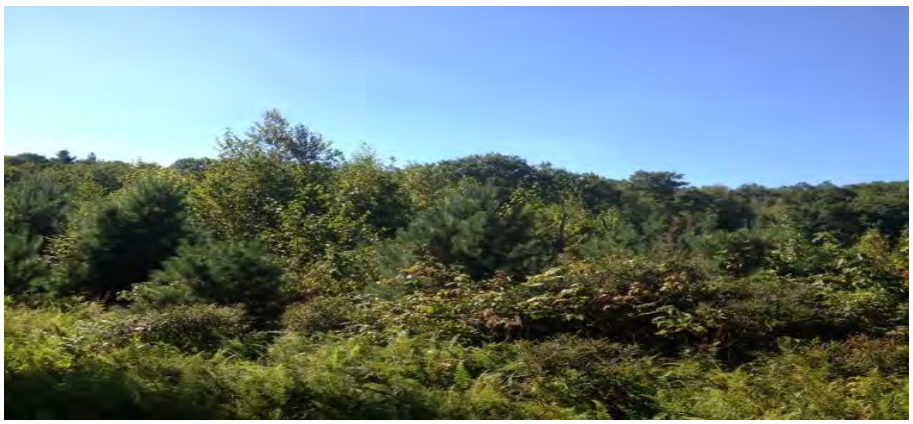
- Destroy native plant communities
- Prevent tree regeneration and growth
- Eliminate the forest understory
- Encourage invasive species
- Increase the risk of soil erosion and runoff, causing water quality degradation
- Reduce biodiversity and affects long-term forest health

**2006**

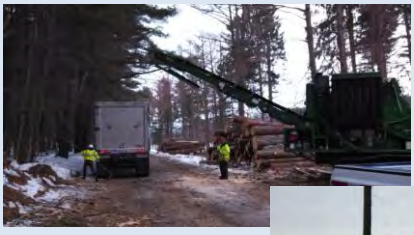
**2008**

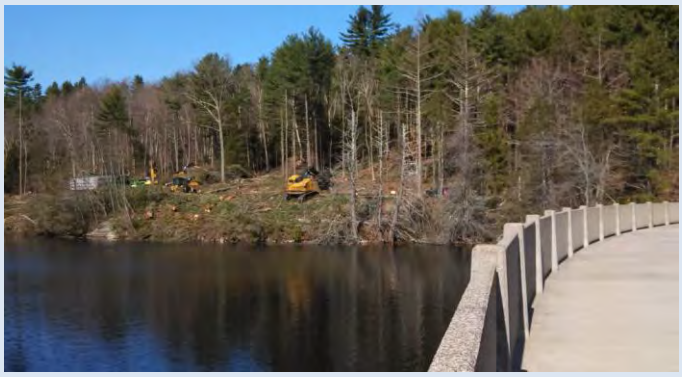
A harvest operation was conducted in this forest to remove hemlock trees infested with the Hemlock Woolley Adelgid insect. The forest did not naturally regenerate. The area appeared to be heavily browsed by deer. **A small fenced exclosure was installed in 2006 to keep deer out. The 2008 photo shows the results of the experiment: Outside of the fence - bare ground; inside the fence - trees are growing!**

**Management Program**: A cooperative Wildlife Management Program in the form of a controlled deer hunt was administered by CT DEEP in accordance with CT hunting laws and regulations, as well as other special watershed protections. **Goal: Restore the balance between deer populations and sustainable forests that protect water quality. Results: Photo taken in 2013 (below) shows an abundance of tree growth to the point where the fence is no longer visible!**

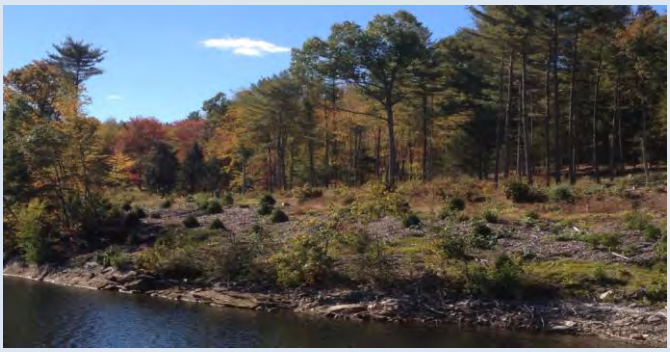


**Hemlock Woolley Adelgid insect infestation and storm damaged trees near reservoir - Salvage harvest and restoration.** Harvest followed strict tree removal conditions, adherence to proper maintenance and storage of equipment, and implementation of best management practices (BMP's) for soil erosion and sediment control. Planted nearly 1000 conifer seedlings in riparian areas.





**Restoration of Reservoir Buffer**



## Healthy forests are achieved through active management

**The Shelterwood silvicultural system is one system used to regenerate the forest -- a series of harvests over time that gradually open up the forest canopy to provide more sunlight to the forest floor, which promotes the growth of new trees under the shelter of the remaining ones.**

**Goal: Promote a continuous cycle of healthy, diverse forest cover over time. One with a diversity of species, sizes, and ages. A healthy forest is more resilient and better able to withstand disturbances. This reduces the risk that a single catastrophic event such as a hurricane, insect or disease infestation will destroy the entire forest and degrade soils, water and other benefits.**

Result: Healthy, resilient forest with a diversity of species, size classes and ages. Managed for multiple uses, including carbon sequestration and storage.

1. Compete Aggressively for Federal Funding for Forest Land Acquisition, Conservation and Management

- Land and Water Conservation Fund - Forest Legacy Program*
- USDA NRCS Environmental Quality Incentives Program (EQUIP)
- Regional Conservation Partnership Program (RCPP) - Young Forests Initiative

**The Land and Water Conservation Fund (LWCF)** - is a Federal program that supports the protection of federal public lands and waters – including national parks, forests, wildlife refuges, and recreation areas – and voluntary conservation on private land. LWCF investments secure public access, improve recreational opportunities, and preserve ecosystem benefits for local communities.

**The Forest Legacy Program (FLP)** - is a conservation program funded by the LWCF and administered by the U.S. Forest Service in partnership with the States to encourage the protection of privately owned forest lands through conservation easements or land purchases. It protects environmentally sensitive forest lands while maintaining private ownership and working forests. It helps to identify and conserve environmentally important forests from conversion to non-forest uses. Most FLP conservation easements restrict development, require sustainable forestry practices, and protect other environmental values.

**Resources Needed for Implementation:**

Increase DEEP staff and funding to specifically address this important issue on a timely, coordinated, and interdepartmental basis. In Connecticut, the Forest Legacy Program is jointly run by the Division of Forestry and the Land Acquisition and Management Division within the Department of Energy and Environmental Protection. Funding is especially needed to update DEEP's GIS Property Layer.

.....

* In August 2020, the President Trump signed the Great American Outdoors Act into law, which requires that the LWCF be funded at $900 million yearly, a significant increase from previous funding levels.

( In 2020, the Great American Outdoors Act was introduced by Cory Gardner (R-CO) on March 9th, 2020, during the 116th United States Congress. It would fully and permanently fund the LWCF. Considered unusually bipartisan in nature in the context of the 116th Congress, the bill attracted 59 co-sponsors, both Democrats and Republicans. On June 9th, 2020, it passed a procedural vote 80-17 and moved to full consideration before the Senate. President Trump expressed a willingness to sign the act after being shown an impressive picture of land within Black Canyon of the Gunnison National Park protected by LWCF funds, despite previously opposing the LWCF The Great American Outdoors Act was signed into law by President Donald J. Trump on August 4, 2020.)

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**USDA NRCS Environmental Quality Incentives Program (EQUIP)** - is administered by the USDA Natural Resources Conservation Service (NRCS). It provides financial and technical assistance to agricultural producers and forest landowners to address natural resource concerns and deliver environmental benefits such as improved water and air quality, conserved ground and surface water, increased soil health and reduced soil erosion and sedimentation, improved or created wildlife habitat, and mitigation against increasing weather volatility.

**Regional Conservation Partnership Program (RCPP) - Young Forest Habitat Initiative -** This cooperative program provides technical and financial assistance to non-industrial private forestland owners interested in implementing habitat management projects to create young forest habitat for wildlife. The CT DEEP Wildlife Division is a partner with the USDA Natural Resources Conservation Service (NRCS) and the Wildlife Management Institute in the Young Forest Initiative for At-Risk Species. The program includes Connecticut, Maine, New Hampshire, New York, Rhode Island, and Vermont. The goal of the RCPP is to increase the quantity and quality of young forest habitat essential to more than 50 wildlife species of greatest conservation need.

## 2. Enhance Existing Land Conservation Programs

**Increase state investments for existing land conservation programs and incorporate more specific climate-related criteria into selection of projects/level of funding. These include the Open Space and Watershed Land Acquisition Grant Program (OSWA), the Recreation and Natural Heritage Trust Program (RNHT), and the Recreational Trails Program (RTP).**

- **Source of funds:** State Bonding
- **Action required**: Legislative
- **Note:** Typical bond authorizations for these programs have ranged from $3 to $7.5 Million per year, but allocation of those funds has neither been consistent nor adequate to meet project demands. Based upon specific Sub-Group recommendations related to forest protection, annual bond authorizations for OSWA and RNHT should be $25 Million, respectively, and $10 Million for the Recreational Trails Program. In states offering statewide bond referendums, voters have approved the dedication of significantly higher levels of funding for open space conservation.[186] With more specific carbon accounting criteria, the OSWA scoring may be further refined to award projects that provide higher carbon mitigation benefits.

**Increase funding for Community Investment Act (CIA)**

- **Source of funds**: Increase surcharge on local recording fee (currently $40)
- **Action required:** Legislative
- **Note:** The CIA provides dedicated funds to support community-level investments across four sectors: Open Space Conservation, Farmland Preservation, Affordable Housing, and Historic Preservation. The CIA is currently funded through a $40 surcharge on municipal recording fees, which is distributed as follows: $1 remains with the Town Clerk; $3 go to



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the municipality to pay for local capital improvement projects; $10 supplements the income to dairy farmers; and the remaining $26 is distributed to state agencies to fund matching grants to the four sectors enumerated above. The Forests Sub-Group recommends an increase in the surcharge on recording fees, ranging from $10 to $20, with the additional revenue to the CIA account distributed evenly to the four sectors. A $10 - 20 increase to the recording fee would add an estimated $1.5 - 3.0 million per year for the open space sector of the CIA account. This additional funding could be dedicated to urban forest improvement projects such as tree planting or re-planting and stewardship in underserved areas, as well as support for CT DEEP to administer the program.

**Expand Urban Green and Community Garden Program to include Urban Forest Improvement Projects**

- **Source of funds**: Community Investment Act
- **Action required**: Legislative
- **Note:** CT DEEP's Urban Green and Community Garden Program provides assistance to communities designated as targeted and/or distressed to develop or enhance urban open spaces for public enjoyment and/or environmental education, including the development of a community garden or reclaiming and enhancing existing open space for the public's use. The Forests Sub-Group recommends expanding this program to specifically include funding for urban forest improvement projects. See also, Urban Forest Carbon Credit Program.

**Utilize Portion of State Revolving Funds for Land Conservation/Green Infrastructure Projects**

- **Source of funds:** Existing state revolving funds (SRF) for clean water and drinking water
- **Action Required:** None. Currently up to 10% of SRF may be used to finance green infrastructure projects, which may include street trees, bio-swales, land conservation, etc. However, legislative action would be required to mandate spending on green infrastructure projects. In 2019, S.B. No. 927, **An Act Creating the Environmental Infrastructure Fund Within the Connecticut Green Bank**, proposed expanding the types of projects the Green Bank can promote investment in to include environmental infrastructure, which, under the bill, is structures, facilities, systems, services, and improvement projects related to water, waste and recycling, zero-emission vehicle refueling, climate adaptation and resiliency, agriculture, land conservation, parks and recreations, and other environmental markets.
- **Note:** This is an opportunity for cross-sector dialogue about tapping into the Green Bank for creative financing for infrastructure projects to leverage co-benefits of land conservation including air pollution reduction, carbon removal, flood protection, food production, avoided costs for healthcare system, etc. See also, Urban Forest Carbon Credit Program.

**Expand Use of Regional Greenhouse Gas Initiative (RGGI) funds to Forest Land Conservation**

- **Source of funds:** Proceeds from sale of RGGI State Emission Allowances

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- **Action Required:** Legislative
- **Note:** While RGGI participating states may use afforestation projects to award offset allowances (project-based GHG emission reduction outside of the capped electric power generation sector),[187] this recommendation proposes the state reinvest the proceeds from the CO2 allowance auctions to fund CT DEEP land protection projects, land acquisition staff capacity, due diligence, scientific studies related to forest science (including an assessment of current forest management practices and policies and impacts on climate mitigation goals), development of a state mapping system to identify forests of highest current or future conservation value, and public education and outreach programs promoting the importance of resilient forests, forest stewardship, etc. New Jersey is an example of a RGGI state that has a legislative mandate to spend a portion of RGGI proceeds on land sector activities.[188] At the same time, Connecticut should study forest carbon offset allowances available through compliance and voluntary markets for reforestation, improved forest management, and avoided conversion, as well as programs that aggregate, evaluate and monitor forest offsets, in order to implement a system of paying landowners for enhanced carbon sequestration and storage with verifiable climate benefits and strict certification standards in place.

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## 3. Tax and Other Incentives

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**Expand Corporate Tax Credit for Donations/Bargain Sale of Open Space to Individuals for Land that meets certain Climate Mitigation Criteria and/or for Forest Carbon Services**

- **Source of Funds**: Individual Tax Credit
- **Action required:** Legislative
- **Note:** The Forest Sub-Group should include recommendations for climate mitigation criteria to include in the next iteration of the State's Green Plan, which may then be tied into legislation providing for an individual income tax incentive for forestland protection. We may also want to consider transferable tax credits for conservation easement donations as offered in multiple states, allowing landowners with little taxable income to transfer tax credits to another taxpayer and/or carry the credit forward over a number of years. The New York tax credit is unique, offered not at the time of donation, but every year in an amount equivalent to 25% of the property taxes paid on land under easement.[189] Tax credits may also be allocated to landowners engaging in afforestation, reforestation, and other forest stewardship and restoration efforts with defined carbon mitigation benefits.[190] Extra incentives may be built in to the program to encourage landowners to pursue other co-benefits.

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**Enable Compensatory Mitigation for State and Local Projects**

- **Source of Funds**: Developers make payments to a mitigation fund if unavoidable conversion of forest and other natural lands occurs.
- **Action required:** Legislative
- **Note:** Requiring mitigation for forest loss through the adoption of "no-net-loss of

forest" laws would provide an opportunity to generate significant new funding for conservation from developers mitigating their forest impacts.[191] This program should also apply to disturbances on public land, i.e. any project conducted on public land that leads to a loss of forest cover must be compensated for by the state or municipality with an equivalent amount of replanting in another location (e.g., models in New Jersey and Maryland). Any program needs to carefully consider what is deemed "unavoidable conversion," which must be strictly construed (see below).

**Incentivize the Siting of Renewable Energy Infrastructure to Avoid Loss of Forests, Farmland and Other Sensitive Lands**

- **Source of Funds:** N/A
- **Action Required:** Legislative/Regulatory
- **Note:** Incentivize the development of renewable energy infrastructure on areas other than forests and other open lands by loosening regulatory requirements to do so (e.g. requiring only a general permit) and/or disincentivizing development on open lands by developing more stringent siting approval requirements. Require developers to make payments to a mitigation fund if unavoidable conversion occurs.

## 4. Municipal Funding Programs (See also Urban Forest Carbon Credit)

**Enable Municipal Option to Fund Local Land Conservation, Stewardship and Climate Mitigation Strategies**

- **Source of Funds:** Local Buyer's Conveyance Fee
- **Action required**: Legislative
- **Note:** The legislation is enabling, giving municipalities the option, if they so choose, to establish a buyer's conveyance fee program to generate a local source of revenue to implement nature-based climate solutions and other local environmental projects. 2020 draft legislation included specific authorization to use funds for local climate mitigation strategies and to offset loss of tax revenue from land that has been permanently protected. See www.ctconservation.org for case studies and other information.

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4. Tax Revenue Options

## 5. Tax Revenue Options

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**Sales Tax Increase or a Percentage of Current Sales Tax Devoted to Fund Land Conservation and Related Programs**

- **Source of funds**: Increase CT General Sales Tax by .125% (from 6.35% – 6.475%)
- **Action required:** Legislative
- **Note:** Using the State of Minnesota Clean Water, Land and Legacy Amendment model (funds natural and cultural heritage programs), a sales tax increase of .125% would generate an estimated $78.4 million to fund a variety of climate-related programs, including land conservation. Based upon on overall New England average, this tax increase would cost approximately $47 per family per year.[192] The revenue would not

be a substitute for other state conservation funding; rather it would provide an additional source of dedicated funds which may be available to CT DEEP, as well as nonprofits and municipalities through a competitive grant process. An alternative to a tax increase is to allocate a percentage of the existing general sales tax paid on outdoor recreation and related goods and services to fund land conservation and stewardship programs.

**Carbon Tax**

- **Source of funds:** Tax on power plants, developments, and other uses (including renewable energy infrastructure projects on forest or agricultural lands) responsible for greenhouse gas (GHG) emissions and/or loss of CO2 storage, with revenues to help pay for climate initiatives including forest carbon mitigation programs.
- **Action required**: Legislative
- **Note:** Carbon legislation in Washington State is a notable example.[193] If other subgroups are suggesting a carbon tax, then a portion of the revenue should go to investments in natural climate solutions.

### 6. Public – Private Partnership Pilot Programs to Advance Land Conservation

**Connecticut Land Conservation Partnership Program**

- **Source of funds:** State Bonding
- **Action required:** Legislative
- **Note:** This, and other suggested programs funded through bonding, could be packaged as part of a larger green bond program. Using the well-established New York State Conservation Partnership Program as a model, the state would partner with a private non-profit organization to offer competitive matching grants to qualified Connecticut land trusts for organizational capacity building, collaborations, stewardship/resource management, and conservation transaction support. Studies commissioned by the Land Trust Alliance found that stronger, more professional land trusts save more land.[194] Other public-private partnership programs may include CT DEEP personal services agreements with NGOs to provide direct services to municipalities and other NGOs for grant writing, grant administration, and project administration.

**Urban Forest Carbon Credit Project**

- **Source of funds**: Urban Forest Carbon Credit[195]
- **Action required:** None unless the state wants to incentivize partnerships, including (i) enacting enabling legislation for municipalities that want to set up special carbon districts; and/or (ii) using SRF; and/or (iii) expanding Urban Green and Community Garden Program, or other incentives.
- **Note:** This program would value carbon credit (metric tons of CO2 captured in urban forests), including quantifiable ecosystem and other co-benefits associated with urban trees (stormwater reduction, air quality, energy savings, health and equity benefits, as well as employment); value the carbon revenue; establish a value per year; and sell the

carbon credits to garner funding for local preservation, planting, restoration and other projects. Whether or not there is an urban forest carbon credit program established in Connecticut, the state should fund a program for municipalities (especially in underserved/EJ areas) to increase urban tree canopy cover and resilience in plantings and post-establishment treatments/monitoring as well as, in appropriate circumstances, to maintain mature and large trees which provide especially high levels of community benefits services such as cooling, mental health, pollution reduction, and habitat.

**To**: **The Science and Technology Working Group**
**Governor's Council on Climate Change**

**From: Carol E. Youell, Certified CT Forester**
**(3180 Hebron Ave., Glastonbury, CT)**

**Date: October 21, 2020**

**Re: Comments on the GC3 Science and Technology Working Group Draft Report 2020**

I sincerely appreciate the opportunity to comment on this important draft report. My comments are offered in a spirit of cooperation, not confrontation. If it at all possible, I and many of my peers, would like to have the opportunity to review and comment on any updates to the original draft report before it goes public. Thank you.

I am a natural resources professional with over 40 years of experience working in Connecticut. I have worked in the public, private and nonprofit sectors, mostly focused on forest resources and water quality. In my last position I oversaw the management of more than 25,000 acres of water supply watershed forests. I received my BS in Natural Resources from UCONN and my Master's of Forest Science degree from the Yale School of Forestry and Environmental Studies (now known as the Yale School of the Environment). I am also a CT Certified Forester.

**My comments are as follows:**

**1. One of the stated guiding principles of the Science and Technology Working Group is "to include unbiased, interdisciplinary peer-reviewed science, examples of best practice and scientific consensus statements." In view of this important goal, I am compelled to disagree strongly with the Recommended Implementation Actions that have been made concerning our forests. In particular, the recommendations pertaining to "Proforestation," i.e., "Prioritize proforestation on public land; ensure old-growth forest and remnants are protected."**

**The term "proforestation" as referred to in the report, WILL NOT create healthy, "resilient" forests. The professional Society of American Foresters does not recognize the word "proforestation" as a forestry term or a silvicultural practice (personal communication). The term is new to professional foresters in Connecticut as well.**

***A careful review of the science does not show that forests are more diverse, more resilient, or store more carbon over the long term when timber harvesting is excluded.*** Models suggesting otherwise assume the complete absence of disturbance and ignore the substitution benefits of durable wood products. Permanent restrictions on harvesting will limit our ability to protect forests, due to the dynamic nature of forest conditions, especially with a changing climate.

**Therefore the word "proforestation" should NOT be referred to at all in any of the Sub-groups' reports. Its use only adds to confusion and controversy, as the term is not supported by sound science.**

**2. Managing forests for resilience and multiple uses is paramount in this era of climate change.** Resilience is achieved through active forest management using sound silvicultural practices based on science. Foresters must be able to monitor and implement practices to address changing conditions due to increases in forest insects, diseases, wind and rain storms, ice events, droughts, invasive species, browsing, etc., in order to maintain a sustainable resource to ensure a multitude of uses and benefits that the public needs and expects. We depend on our forests to provide a source of clean water, wildlife habitat, forest products, carbon storage, recreational opportunities, scientific study, aesthetic beauty, among others benefits.

My experience as a Watershed forester for a major water utility in Connecticut has clearly shown me that using proven forest management practices and tools, along with careful observations and an open mind, can result in more resilient, sustainable and healthy forest ecosystems. **(See the Appendix.)**

Foresters in Connecticut have been conducting multiple use management for many decades now, using proven silvicultural practices. Foresters must earn a Connecticut "certification" to practice commercial forestry in this state. This certification signifies that these professionals have reached a basic level of achievement, knowledge and experience in order to understand and apply recognized forestry practices to properly manage the resource, as well as possess a basic knowledge of forest science and a multitude of other disciplines (including geology, ecology, soils, pathology, entomology, wildlife management, hydrology, statistics, and GIS among others.) This certification also requires continuing education to maintain one's certification.

**It is unfortunate that the Science and Technology Working Group did not have more representation from CT certified foresters with significant on-the-ground professional experience. These are the people who have made important observations overtime as to what works and what doesn't, as well as having had the experience of confronting many significant challenges. These professionals have had the opportunity to actually see the results of their work. We need to hear more from them. This cannot be overstated.**

**3. Foresters need all available scientific management tools to address the dynamic changes that are occurring and will continue to occur in our forests.** Flexibility, adaptability, monitoring and education are key to future forest management decisions and healthy forests. There are many unknowns associated with climate change. It is difficult to predict the future. (Hindsight is always 20-20.) Our forest ecosystems are dynamic and complex in Connecticut.

Forest carbon science is in its infancy and research is on-going. We need to learn more about the role forest ecosystems play in carbon sequestration and storage. *What about the role of forest soils? This was not addressed.*. With that in mind, it is essential to keep an open mind regarding forest management activities and practices on state and private lands.

**4. The draft report suggests that older forests are more resilient than younger ones and are best able to withstand the stresses of climate change. However, mature, protected forests are beneficial for carbon storage only if resilience of a forest is high.** The extent of large tree mortality in 2017-2018 across eastern Connecticut suggests that we may have prolonged rotation length too much for optimal carbon sequestration on many Connecticut forests. Other ways to improve forest management include: controlling invasive species, controlling excessively-high deer populations, reducing excessive use of forest roads, increasing structural diversity within stands and across the landscape, thinning stands to maintain vigor of the healthiest trees, establishing and releasing advance regeneration, favoring species best-adapted to climate change, and preventing widespread loss of timber suitable for durable wood products. **(See the Appendix.)**

Recent research published in ***Nature*** suggests mature forests are limited in their ability to absorb "extra" carbon as atmospheric carbon dioxide concentrations increase. Dr. John Drake assistant professor at SUNY College of Environmental Science and Forestry indicated that "the limited capacity of mature trees to respond suggests the need for a diversity of age classes of trees (younger trees sequester, older trees store carbon) and species, including species that may be better adapted to future climate conditions." (SUNY College of Environmental Science and Forestry, *"Don't look to mature forests to soak up carbon dioxide emissions: Results of Australian study may have impact on New York state carbon neutrality goals*.")

**6. The term "intact forest" is also misleading and confusing and needs to be defined.** The term was originally used to describe large intact forest blocks where anthropogenic forces were not a major influence, such as is in tropical rainforests. This term/concept has been expanded in its application and often applied to working forests. Clarification is needed if the term is to be used at all.

**7. Considerable public outreach, education (at all levels) and funding will be needed to successfully implement practices that support climate change mitigation goals.**

## Conclusion

I would urge the Science and Technology Working Group to take advantage of the wealth of forestry and natural resources knowledge, research and experience we have here in Connecticut.

We are so fortunate to have dedicated and experienced foresters, biologists, ecologists, researchers and other professionals working right here! These include forestry and natural resource professionals from the CT DEEP, the University of Connecticut, Yale School of the Environment, Connecticut Agricultural Experiment Station, USDA Natural Resources Conservation Service, as well as private sector foresters, and many others.

I hope that the final report will reflect the level of expertise available and will serve to bring us together in addressing the important climate change issues that affect our forests now and in the future. This is an important endeavor and deserves our time and attention.

Thank you very much for the opportunity to comment.

Sincerely,

Carol Youell
CT Certified Forester

**(NOTE: Appendix is attached.)**

# APPENDIX TO COMMENTS

(from CarolYouell)

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**Managing Public Water Supply Watershed Forestlands in Connecticut**

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In the next section, I would like to share with you some examples of forest management practices that have been conducted in Connecticut based on my experience as a Watershed forester.

-The first is an example of the extent to which forests can be affected by deer over-browsing and how a wildlife management program can help.

-The second is an example of an effort to restore a forested buffer that had been impacted by the Hemlock Woolley Adelgid insect and storm damage.

-The third explains typical forest management practices and desired results.

## Watershed Forests

Forests are the most desirable land use for protecting drinking water supplies:

- Provide a natural filtration system
- Buffer reservoirs from pollutants
- Intercept runoff, moderate stream flows, stabilize soils
- Reduce the amount and cost of water treatment needed
- Provide a host of multiple uses, clean water, wood products, wildlife habitat, recreation & carbon storage.

***Green Infrastructure***

## Management Challenges

- Deer/moose browsing of forest regeneration
- Invasive species control
- Forest insects and diseases: death/decline of hemlock, ash, white oak & others
- Climate change
- Recreational impacts

## High Deer Populations…

- Destroy native plant communities
- Prevent tree regeneration and growth
- Eliminate the forest understory
- Encourage invasive species
- Increase the risk of soil erosion and runoff, causing water quality degradation
- Reduce biodiversity and affects long-term forest health

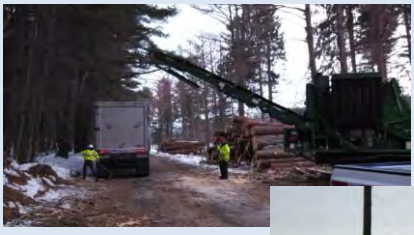
**2006**

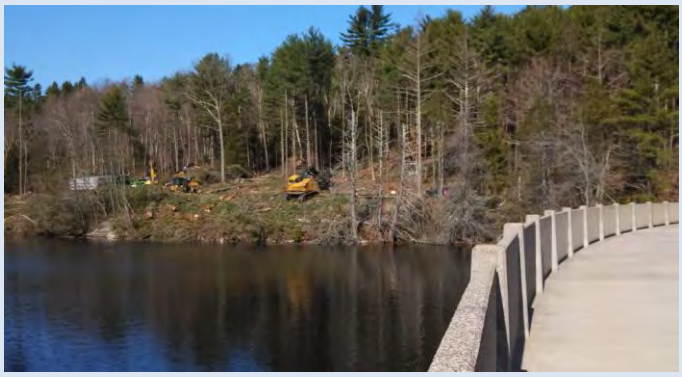
**2008**

A harvest operation was conducted in this forest to remove hemlock trees infested with the Hemlock Woolley Adelgid insect. The forest did not naturally regenerate. The area appeared to be heavily browsed by deer. **A small fenced exclosure was installed in 2006 to keep deer out. The 2008 photo shows the results of the experiment: Outside of the fence - bare ground; inside the fence - trees are growing!**

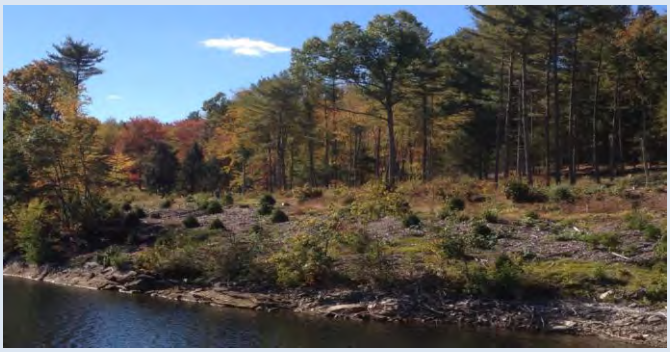
**Management Program**: A cooperative Wildlife Management Program in the form of a controlled deer hunt was administered by CT DEEP in accordance with CT hunting laws and regulations, as well as other special watershed protections. **Goal: Restore the balance between deer populations and sustainable forests that protect water quality. Results: Photo taken in 2013 (below) shows an abundance of tree growth to the point where the fence is no longer visible!**

**Hemlock Woolley Adelgid insect infestation and storm damaged trees near reservoir - Salvage harvest and restoration.** Harvest followed strict tree removal conditions, adherence to proper maintenance and storage of equipment, and implementation of best management practices (BMP's) for soil erosion and sediment control. Planted nearly 1000 conifer seedlings in riparian areas.





**Restoration of Reservoir Buffer**



## Healthy forests are achieved through active management

**The Shelterwood silvicultural system is one system used to regenerate the forest -- a series of harvests over time that gradually open up the forest canopy to provide more sunlight to the forest floor, which promotes the growth of new trees under the shelter of the remaining ones.**

**Goal: Promote a continuous cycle of healthy, diverse forest cover over time. One with a diversity of species, sizes, and ages. A healthy forest is more resilient and better able to withstand disturbances. This reduces the risk that a single catastrophic event such as a hurricane, insect or disease infestation will destroy the entire forest and degrade soils, water and other benefits.**

Result: Healthy, resilient forest with a diversity of species, size classes and ages. Managed for multiple uses, including carbon sequestration and storage.

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UNIVERSITY OF CONNECTICUT

**Alec Shub <alec.shub@uconn.edu>**

# FW: PLEASE

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 9:24 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Darr, Carolyn J. <Carolyn.Darr@trincoll.edu>
**Sent:** Wednesday, October 21, 2020 9:20 AM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** PLEASE



I am writing to ask that you to protect our nature preserves for the public, for science, and for future generations.

Carolyn Darr

107 Selden Street
Berlin, CT 06037

**Catherine Finneran**
Vice President
Sustainability & Environmental Affairs

Phone: 781-441-8859
Email: catherine.finneran@eversource.com

October 21, 2020

CT Department of Energy & Environmental Protection
79 Elm Street
Hartford, CT 06106-5127

RE: Governor's Council on Climate Change: Working Group Draft Report Public Review Period

Dear Members of the Governor's Council on Climate Change:

The Connecticut Light and Power Company d/b/a Eversource Energy and Yankee Gas Services Company d/b/a Eversource Energy (collectively, "Eversource"), is pleased to have the opportunity to submit these comments in response to the September 8, 2020 Notice of Public Review Period: Governor's Council on Climate Change (GC3), Working Group Draft Report Public Review Period.

Eversource commends the important work conducted by the GC3 working groups as part of Connecticut's commitment to decarbonization and climate resiliency. Eversource shares this goal as we work to pursue our industry-leading goal to achieve carbon neutrality by 2030. We plan to achieve this goal through targeted steps to reduce our carbon footprint, while supporting economic growth and maintaining cost-effective, safe and reliable service for our customers.

Many of the recommendations of the GC3 working groups are critical to Connecticut and this region. In fact, Eversource has already demonstrated alignment with several of these proposals. For example, in our use of battery storage to improve load efficiency and for peak reduction, supporting low-income households to increase energy efficiency, and the development of offshore wind projects. In addition, we have well executed programs for the transition towards electrification of transportation which will provide great benefit in decarbonization of this sector.

Eversource also agrees with the suggestion made in the Mitigation Strategies Working Group Draft Report to develop a holistic strategic plan to transition Connecticut to cleaner fuels. It is critically important that consideration be given to cost-effectiveness and resiliency when considering the best emission reduction pathways. This should include items proposed in the working group recommendations. It also should include natural gas given the major role it plays in providing reliable, affordable energy. We believe natural gas will enable and strongly complement clean energy development and transition as technology advancements become increasingly affordable and scalable.

Below are other limited comments that Eversource respectfully submits for your consideration on the draft recommendations:

1. **Renewable Natural Gas**: We ask that renewable gas derived from biogas be considered as a potential solution for decarbonization. We believe renewable natural gas is a proven option to reduce emissions while utilizing the existing gas infrastructure with minimal modifications. Additionally, renewable natural gas offers a beneficial reuse of organic waste that would otherwise be diverted for disposal.

2. **Hydrogen Technology**: Hydrogen may play a valuable role in the coming years. Similar to renewable natural gas, hydrogen could be delivered through the existing gas infrastructure providing a lower or zero emission energy source. Eversource is engaging on studies and opportunities to utilize hydrogen on the existing natural gas system as well as for other applications such as transportation and vehicles and energy storage.

3. **Geothermal**: Geothermal networks also offer an attractive solution to reduce greenhouse gas emissions for the State. We plan to undertake geothermal network demonstrations in Massachusetts to take advantage of significant efficiency advantages over other technologies.

4. **Role of Transmission in Clean Energy Integration**: Eversource agrees with the focus of the working group recommendations on transmission to enable clean energy integration and achieve our collective decarbonization objectives. We remain committed to engaging with CT DEEP on mechanisms to address transmission needs in the future.

5. **Community Choice Aggregation**: In response to the workgroup recommendation to engage municipalities as allies, Eversource is fully supportive of targeted energy efficiency. However, we do not believe that local control of efficiency services or Community Choice Aggregation is necessarily the best method to achieve energy efficiency savings.

6. **Building Efficiency**: We would suggest considering strategies for improved efficiencies in HVAC systems, building system controls as well as an increased focus on manufacturing facilities.

7. **Lockbox for Energy Efficiency Funds:** We strongly support the proposal to create a lockbox for energy efficiency funds which should continue to be administered through the EDCs, given their long track record of success in the area.

We look forward to working to engage and advance these topics. In the event you have any questions or comments regarding these comments, please do not hesitate to contact me directly.

Sincerely,

Catherine Finneran
Vice President, Sustainability & Environmental Affairs
Eversource

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 draft report comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:44 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: cdwlpj@everyactioncustom.com <cdwlpj@everyactioncustom.com>
Sent: Wednesday, October 21, 2020 10:20 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 draft report comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Climate Change Bureau CT DEEP Climate Change Bureau,

The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving the goals of reducing greenhouse gas emissions and planning for a resilient and equitable future.

I particularly support these recommendations, and urge their inclusion in the final reports:

- Strengthen alignment b/t the state's decision-making and its greenhouse gas reduction goals. All regulatory decisions should be evaluated for consistency with meeting Global Warming Solutions Act targets.

- Move climate adaptation and resiliency measures—like nature-based solutions, forest and wetland protection, urban green infrastructure and tree planting, and making low/moderate income housing energy efficient and healthy—from demonstration project scale to widespread adoption and protection.

- Support robust, equitable state funding and financing (leveraged and matched by federal and local sources) for emissions reduction and adaptation programs. This is a large ($150-600 million/year) investment. Promising sources include:
  a) adopting the Transportation & Climate Initiative (up to $250 m/yr) and increasing the petroleum gross profits tax (~$100 m/yr). Connecticut can help ensure robust TCI implementation that drives down emissions while reinvesting auction proceeds in other high-impact and equitable programs;
  b) increasing or re-directing state bonding (up to $70 m/yr);
  c) adopting the Maryland "flush tax" model (up to $75 m/yr).

- Reduce stormwater pollution/flooding, help municipalities afford green infrastructure/resiliency investments, by passing statewide enabling legislation for stormwater authorities.

- Target future building projects to already-developed areas, prioritize the conservation and preservation of naturally-resilient coastal marsh, dunes, and forests.

- Develop and fund a community engagement strategy to inform the 2021 GC3 process and implementation, including grants for community-based NGOs partners and ensuring environmental justice perspectives are integral to the process.

Please consider these additions and modifications to the report to strengthen and build the ambitious climate mitigation, resilience, and justice plan Connecticut needs:

- Emphasize the importance and urgency of strong climate mitigation action, by:
  a) highlighting the current and projected impacts of climate change in Connecticut, including health and economic impacts;
  b) identifying the greenhouse gas reduction potential of suggested projects;
  c) prioritizing, among the many valuable ideas in the reports, the highest-impact polices that will be most effective in driving down emissions and transitioning to a carbon-free economy.

- Eliminate, not just “phase down,” biomass as an eligible resource in the Renewable Portfolio Standard (RPS). If we are to achieve our climate goals, we can’t keep subsidizing dirty energy sources.

- Add dams to the proposed statewide GIS database of culverts, flood gates, tide gates, and other water control structures, and create a dynamic list that prioritizes structures for replacement, removal, and/or modification—including identifying dams that are vulnerable to our changing climate, and ensuring culverts can handle 100-year floods and allow migratory fish to pass.

- Encourage municipalities to adopt green infrastructure as a first-choice solution to flooding and stormwater pollution.

Nature is essential and serves the public good, now and in the future. . Some of the many beautiful natural areas need to be protected for nature study, hiking, and community well being. This has never been more important. Meanwhile - we are burning and exporting our public forests? Who benefits? This is beyond disturbing. We need systems that support good jobs, local resource use, AND natural areas. Our public land is held in the public trust. We need your leadership. Please do everything you can to protect nature AND support local communities.

Thank you for your consideration.

Sincerely,
Mrs. Catherine Watso
11 Evergreen Dr Granby, CT 06035-2216
cdwlpj@cox.net

UCONN
UNIVERSITY OF CONNECTICUT

Alec Shub <alec.shub@uconn.edu>

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:38 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Cecy Ferrrufino <ferrufinocecy@gmail.com>
**Sent:** Wednesday, October 21, 2020 9:27 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change,

Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit.

Nature is essential for the future, for evolution and for everything we need, and serves the public good now and for the long term.

We have so many beautiful natural areas, and some need to be protected for nature study, hiking, and places that people can count on. This has never been more important.

Meanwhile - we are burning and exporting our public forests? Who benefits? This is beyond disturbing.

We need systems that support good jobs, local resource use, AND natural areas.

Our public land is held in the public trust.

We need your leadership.

Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

UCONN
UNIVERSITY OF CONNECTICUT

**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:39 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

**From:** Cecy Ferrufino <ferrufinocecy1@gmail.com>
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# Governor's Council on Climate Change (GC3)
# Infrastructure and Land Use Adaptation Working Group
# Recommendations Report
September 21, 2020
DRAFT

# Table of Contents

## Introduction and Process

As originally formatted in early 2020 the Adaptation and Implementation Work Group was comprised of four subordinate working groups:

- Land Use and Buildings
- Public Health and Safety
- Utility Infrastructure
- Transportation

As the working groups proceeded it became apparent that the Public Health and Safety sub-group should be elevated to a free standing working group on the same level as (and independent from) the Adaptation Planning and Implementation work group. Accordingly what follows are the consolidated recommendations from remaining three subgroups to the renamed Infrastructure and Land Use Adaption Working Group.

Each group was populated with subject matter experts covering many but not all of the aspect needing consideration. Through the spring and summer of 2020 these three groups collectively held nearly 25 meetings working through the issues within their subject areas. Although the COVID-19 pandemic limited the various groups' from working physically together and taking public comment in person, the process included a robust inclusion of direct public commentary during many of the meetings.

Each group worked initially to define the respective scope and vision of their subject area and to review relevant existing work product. Once a preliminary understanding of the scope and vison was defined, each group began to develop a list of recommendations that were first discussed internally and then vetted through both public comment and additional research and discussion.

As these separate lists of recommendations were consolidated into a final draft list, that list was vetted through the Equity and Environmental Justice (Vulnerable Communities) work group on August 18, 2020 and that process provided valuable feedback on the substance and priority of many of the recommendations.

What follows is the consolidated list of recommendations as developed through the process described above. The recommendations are organized by work group and further prioritized by actions which are implementable in both immediate, short term and longer term time frames.

The challenge of adaptation planning and implementation is an evolving process and will take a sustained effort of ongoing research, stakeholder engagement and planning to execute well on behalf of the citizens of the state.

This list is not an end point but a starting point.

## Vision

Climate change adaptation is an investment in Connecticut's future, enabling us to improve response in urgent situations, reduce risk and preserve assets into the future. Connecticut is responsive and flexible as science evolves and demographics shift. Our economy, environment, and quality of life thrive.

## Scope

The Infrastructure and Land Use Adaptation Working Group addressed climate change adaptation issues focused on the built environment. The Working Group organized around three theme areas: Transportation, Land Use & Buildings and Utility Infrastructure. Within each of these areas, a scope of work was established as follows.

Transportation

- Resilience of the state's transportation infrastructure and assets including roads, highways, bridges, bus transit, rail operations, bicycle and pedestrian amenities, ports and airports.
- Comprehensive, multi-jurisdictional planning
- Transportation system is equitable and accessible for all Connecticut residents

Land Use & Buildings

- Conservation and development practices at all scales, from neighborhoods to the entire state.
- Location of future development, specifically targeting currently developed areas while prioritizing the conversation and preservation of natural areas.
- Current and future building practices, sustainable development and community health; sustainable building materials and practices such as passive house, especially for affordable housing development projects to provide a more resilient and healthy built environment for the state's most vulnerable populations.

Utility Infrastructure

- Focus on critical infrastructure groups necessary for the economic resilience and physical health and safety of all people of Connecticut.
- Communications, Fuel, Drinking Water, Waste Water, Electricity, Stormwater & Flood Control, Dams; recognizing interconnectedness
- Support local and regional planners as well as local and state officials and all utility stakeholders.

## Climate Change Impacts to Infrastructure and Land Use in Connecticut

Climate is changing in Connecticut, as a result of historical and continuing global emissions of greenhouse gases.[i] While the Connecticut Climate Preparedness Plan 2011 began highlighting the observed and expected magnitude of these changes[ii], work initiated by the Connecticut Institute for Resilience and Climate Adaptation (CIRCA) has recently been undertaken to downscale the assessment of climate change impacts to support state and local planning efforts.[iiiiv] An updated summary report of anticipated climate change impacts in Connecticut is

currently in development through the GC3 Science and Technology Working Group. In lieu of that report, the Infrastructure and Land Use Working Group has summarized CIRCA's recent findings as the current best available science for Connecticut.

While the magnitude of long term changes to Connecticut's climate (2100 and beyond) remains sensitive to the trajectory of global greenhouse gas emissions[v], there is high confidence on near term impacts (2050) due to historical emissions that have already occurred. As can be seen in recent assessments of sea-level rise, air temperature, and precipitation, small changes to our climate can have big impacts on the conditions that affect people, infrastructure, ecosystems, and land use patterns.

Sea-level Rise: Local measurements of the ocean surface show that sea-level is rising (SLR) in Long Island Sound, and that the rate of SLR has increased, averaging ~4 [illegible] per year since 1976. Connecticut is expected to experience up to 20 inches of sea level rise by 2050, relative to the National Tidal Datum (NAVD88), and continuing increases thereafter. In the longer-term, SLR may be as much as 3 to 7 feet higher by 2100, though projections differ significantly, based on the evolution of global greenhouse gas emissions in this century, and the modeling of sensitive climate feedbacks such as, how rapidly global ice sheets melt in response to warming. Projections for Connecticut should be updated at least every 10 years to reflect changing science and to increase the confidence of longer-term local guidance for planning.

However, in the near-term, 20 inches of SLR is likely to significantly increase the frequency of flooding from tides and storms along the Connecticut coast. As the overall water level of Long Island Sound rises, flood levels that we've previously experienced from less frequent, but big impact tropical storms and hurricanes, can occur from nor'easters and more common annual storms. What we experience today as "severe" flooding from storm surges of 4-5 feet, will occur 5 to 10 times more often in 2050[vi]. Areas that currently flood once every 10 years now, will likely flood every 2 years or more by 2050. Chronic flooding in floodplains and low-lying areas along Connecticut's coast will be a major challenge for infrastructure and land-use as a result of climate change.

Air Temperature: Since 1895, Connecticut's annual average air temperature has been increasing by 0.3°F per decade, totaling 3°F warmer as of today. Seasonal averages have also been increasing, with winter experiencing the greatest increase. Observations show more warming along the southern coast and eastern half of the state. According to high $CO_2$ emission scenarios (RCP 8.5), average temperatures in Connecticut are predicted to rise 5°F (± 1°F) by 2050 and continue rising thereafter. The most seasonal increase will likely be in summer.

As in the case with SLR, small increases in the overall annual temperature average can result in big impacts to human health, infrastructure, and land use. "Summer days" refer to the number of days per year when the daily maximum temperature is above 77°F. Statewide, summer days have increased since the 1950s with the most significant increase in southwestern Connecticut, currently averaging ~81 per year. By 2050, summer days will likely increase to 118, reflecting longer and hotter summer months. By 2050, the number of days where daily

maximum temperature in Connecticut exceeds 90°F will likely rise from ~5 on average today to ~25; and days above 100°F will rise from less than ~1 on average currently to ~4.

"Tropical nights" refer to the number of days per year when the daily minimum temperature is above 68°F, reflecting warm overnight temperatures. Currently Connecticut averages ~10 tropical nights per year, with the greatest increase over the previous century occurring along the southern coast. By 2050 the number of tropical nights is projected to increase to ~40, requiring more energy and cooling capacity across the state. "Frost days" refer to the number of days per year when the daily minimum is below 32°F. In most of the state, frost days have significantly decreased since the 1950s, currently averaging ~124 days per year. By 2050 frost days will continue decreasing to ~85, reflecting milder, shorter winter months. By 2050 and beyond, Connecticut will experience longer hotter summers, more heat waves, and more extreme temperature events as a result of climate change.

Precipitation and Storms: In a warmer Connecticut, precipitation will likely increase because of evaporation and changes to the water cycle. Precipitation across Connecticut has been increasing by 0.17 inches per decade since 1985, with the largest increase occurring in Fall. By 2050, average annual precipitation is expected to increase ~8% (4 inches per year), with much of the increase occurring in winter and spring.

Indices of precipitation are expected to increase, including the number of days with more than 1 inch of precipitation, from 12 currently to 14 days per year on average. The number of heavy precipitation days [from 3 to 5 days]; and fraction of total precipitation accounted for by heavy precipitation [from 15% to 20 %] will also increase by 2050. The maximum 1-day precipitation amount will likely increase by +27%, from 2.8 inches currently to 3.5; and maximum 5-day precipitation will increase +20%, from 4.5 inches currently to 5.4. While more of the precipitation we experience will likely come from more intense rainfall events, the risk of drought may also increase due to evapotranspiration, though modelling consensus is mixed on the question of drought and will require further study to improve confidence.

Tropical and extra-tropical cyclones, also known as hurricanes and nor'easters, have impacted Connecticut going back centuries. Major historical storms (Long Island Express, 1938; Carol, 1954; Gloria, 1985; Irene, 2011; Sandy 2012; Jonas, 2016; Isais, 2020) periodically track towards Connecticut and wreak havoc on infrastructure and land use. The long term implications of how climate change will impact the overall number of these cyclones, as well as, their track and intensity in the future is unclear, though is currently being studied. Regardless of the climate change effect, Connecticut will continue to be at risk from these storms, requiring rigorous hazard mitigation planning to prevent loss of life and damage to infrastructure.

## Equity & Environmental Justice – Vulnerable Communities

Climate change impacts will affect all residents in the State of Connecticut through increased flooding, sea level rise, stronger and more frequent storms and increased high heat days. The impacts will most acutely affect minority and low/moderate income communities less able to adapt or improve their resilience due to economic limitations, disinvestment in their communities and historic lack of directed engagement in planning processes.

In order to ensure an equitable and comprehensive plan, the Governor's Council of Climate Change (GC3) includes broad representation and coordination with stakeholders and partners that work, live and engage with these communities often not included in large scale planning activities. Ongoing engagement with members of the Equity and Environmental Justice Working group, throughout the discussion and drafting of recommendations, ensures the appropriate equity lens has been applied to all draft recommendations. Additionally, a presentation to the Adaptation Sub-group of the EEJ Working Group further refined the draft recommendations with input from all EEJ Adaptation sub-group members with diverse backgrounds and experience.

The State of Connecticut can only achieve its climate change adaptation and mitigation goals if the planning process engages and includes residents, public and private partners and stakeholders from all backgrounds and socio-economic levels. The Adaptation Planning and Implementation Work Group will continue to engage and coordinate with the EEJ working group throughout the remainder of the GC3 planning process.

## Status of 2011 Report Recommendations

The Working Group reviewed the Connecticut Climate Change Preparedness Plan (2011) to identify recommendations that are considered to have value moving forward but for which there has been insufficient progress to date. The 2011 Plan was an important step forward in climate change adaptation planning for Connecticut and provides valuable background and context for identifying the strategies and actions for adaptation in the future. Recommendations in 2011 Plan generally did not set specific implementation timeframes and measureable outcomes, nor assign responsibility for implementation and tracking. Consequently, characterization of progress to date is difficult or imprecise. Nonetheless, the Working Group was able to draw some insights and guidance from the 2011 Plan. A general assessment of the 2011 recommendations for each of the three sectors addressed in this report is provided below.

### Transportation

- The Plan contained only one recommendation specific to the transportation sector, which was to "determine vulnerable transportation routes and transportation options that may adversely impact natural resources and human mobility needs under future climate change projections." Some other recommendations, such as "develop decision tools to evaluate replacement, modification, and design life for infrastructure" and "assess flooding risk to natural and built infrastructure" apply to transportation as well as other sectors. While some progress has been achieved toward these goals through the development of various data and tools for assessing impacts of climate change conditions, completion of resilience planning efforts at

municipal and regional levels, and the planning and design practices of the Connecticut Department of Transportation, a critical need for additional action in these areas continues into the future. Thus, several of the current recommendations address assessment, planning and design to reduce transportation vulnerability.

Land Use and Buildings - The Plan contains numerous recommendations pertaining to assessing the vulnerability of land uses and the built environment, implementing practices such as Low Impact Development, and particularly, strategies for increasing sustainability of water use. The State Water Plan, completed in 2019, was a major accomplishment toward the goal of increasing sustainability water use. There has also been some progress through CIRCA and numerous municipal and regional resilience plans in assessing vulnerability, as well as progress in implementing low-impact development practices driven, in part, by regulatory requirements for stormwater management. The overall objectives of all of these strategies remain relevant and are being carried forward in several different recommendations pertaining to resilience planning and implementation, building code enhancements, land conservation and development practices.

Utility Infrastructure – The majority of the recommendations in the Plan pertaining to utility infrastructure are directed toward public water supply and water management. The State Water Plan, adopted in 2019, represents a major step forward in planning and management of the state's water resources and addresses several of 2011 recommendations. A few of the 2011 recommendations relate specifically to wastewater infrastructure, and some address utility infrastructure in general, such as developing climate assessment tools for planning and design of infrastructure. None of the recommendations pertain directly electric or other utility infrastructure. While a few of the recommendations, such as promoting water reuse and reducing combined sewer overflows, have been carried forward directly, most others have been incorporated to varying degrees into new recommendations.

# Recommended Implementation Actions

The Working Group developed a list twenty-eight Draft Recommended Implementation Actions in the categories of Transportation, Land Use & Buildings and Utility Infrastructure, as well one general recommendation not specific to these categories. Recommended Implementation Actions emerged from discussions of working group members during meetings of the full working group and subgroups assigned to each of the three categories, and were informed by input from stakeholders who participated in the meetings or submitted written comments. Working group members drafted the language of the recommendations. As a result of constraints imposed by the COVID pandemic, the Working Group did not have the opportunity to assess, discuss and develop the full set of draft recommendations to the extent desired. The Working Group made the decision to group the recommendations in two "bins." Those recommendations that the Working Group determined were adequately developed, grounded in previous planning efforts, or having a higher degree of urgency are included below as recommendations that are proposed for implementation or more focused development outside of the GC3 process in 2021. The remainder of the recommendations are briefly summarized in Table 1 and will be further assessed and discussed by the Working Group during the continuing GC3 process.

## General:

| **Recommended Implementation Action Title**<br>G-1. Establish a State-wide Climate Adaptation Implementation Committee | |
|---|---|
| **Recommended Implementation Action Description** | An Implementation Committee will coordinate and oversee the implementation of strategies and actions pertaining to climate adaptation and resiliency that are established in various state-level reports and plans, such as the GC3 recommendations and State Natural Hazard Mitigation Plan. The Committee will provide accountability for implementation entities assigned with tasks to increase statewide resiliency. |
| **Completion Timeframe** | 1 to 2 years |
| **Implementation Entities** | State agencies, COGs, CIRCA, NGOs, Water Planning Council; representatives from vulnerable communities |
| **Climate challenges addressed** | Impacts to the natural and built environment associated with projected changes in sea level, precipitation and heat. |
| **Protection of vulnerable communities** | A primary element of the committee's mission will be a focus on vulnerable communities that may experience disproportionate impacts from changes in sea level, precipitation and heat. |
| **References for action** | Connecticut Climate Preparedness Plan (2011);<br>Resilient MA Action Team https://www.mass.gov/info-details/resilient-ma-action-team-rmat |

## Transportation:

| **Recommended Implementation Action Title**<br>T-2. Improve statewide evacuation route planning and vulnerability assessment. | |
|---|---|
| **Recommended Implementation Action Description** | Climate related impacts will likely increase the need for localized evacuations due to increased coastal and inland storm events. A statewide evacuation routing database should be established, and the identified evacuation routes should be analyzed against predicted climate change impacts vulnerability to climate change projections such as increases in SLR, heat and precipitation to determine the vulnerabilities under increased climate change scenarios. Highly vulnerable portions of the evacuation routes should be prioritized for resilience improvements. The analysis and planning activities should be conducted on the hyper-local neighborhood scale to ensure specific needs of each community are included in the analysis. Planning and assessment should engage the State Mobility Ombudsmen Program and paratransit companies. |
| **Completion Timeframe** | 3-5 years |
| **Implementation Entities** | CTDOT, CTDEMHS, COGs, Municipalities |
| **Climate challenges addressed** | Climate impacts including SLR, coastal storm surge, riverine flooding and increased precipitation events will have a significant impact on the state's road network and the ability of residents to safely evacuate vulnerable areas. The identification and prioritization of evacuation routes across the state will allow for more coordinated planning and implementation for improving the routes that will be increasingly needed as coastal and inland storms increase evacuation needs across the state. |
| **Protection of vulnerable communities** | Vulnerable communities may have greater difficulty evacuating and thus are more dependent on certain infrastructure. Building upon the vulnerable community assessment being conducted by the EEJ Working group, the evacuation route database should include information on the vulnerable communities relying on the identified routes. Additional information regarding the transit dependent portions of the identified EEJ communities is a critical dataset to better understand the evacuation resources necessary to ensure the safety of all residents. This planning needs to be conducted within each specific community at a neighborhood scale including a significant amount of public participation. Often, EJ communities are note represented in these types of planning efforts and therefore their specific needs are not incorporated into the planning. Required hyper-local planning also provides the community with ownership of plan and a better understanding of how the planning work is then used to implementation resiliency measures. |
| **References for action** | |

| Recommended Implementation Action Title<br>T-3. Conduct vulnerability assessment using standard methodology on all publicly funded transit operations and facilities, and infrastructure for use by pedestrians, bicycles and people with disabilities. | |
|---|---|
| **Recommended Implementation Action Description** | The transit focused vulnerability assessments will focus on the both operations (routing/rail lines) and transit facilities including rail yards, bus depots, rail stations, bus stations, control centers and any other facilities critical to transit operations, as well as paths and related infrastructure for use by pedestrians, bicycles and people with disabilities. Climate related impacts such as vulnerability to projected increases in SLR, heat and precipitation will cause disruptions in transit service and affect ability to use facilities designed for pedestrian, bicycles and people with disabilities across the state. Bus transit route planning will need to utilize the assessments to better understand the deficiencies in their current routing and modify the routes for increase resilience. Additionally, transit planning needs to address how increased high heat days will impacts transit users, specifically as it relates transit users waiting for a bus without any shelters to provide shade. Transit users also face impacts owing to increased frequency of downpours and severe weather. Vulnerabilities in the state's rail lines, storage and maintenance facilities will have a significant impact on operations. The utility infrastructure providing the electrified rail lines is also critical to continued operations. Pedestrian paths and bridges may require modifications to design and use, particularly in flood prone areas. |
| **Completion Timeframe** | 3-5 years |
| **Implementation Entities** | CTDOT, Amtrak, MetroNorth, CT Transit, CIRCA, non CTDOT public transit operators. |
| **Climate challenges addressed** | The vulnerability assessment will analyze SLR, storm surge and inland flooding and its impact on transit operations. This will include daily tidal inundation as well as coastal and inland related flooding events. This action does not directly reduce carbon emissions, but resilient transit operations reduce the number of single occupancy vehicles on the road thereby reducing overall carbon emissions for the state. Increased high heat days will likely effect transit users ability to use transit services without adequate sheltering infrastructure. Additional analysis should also be conducted on the rail lines to determine their vulnerability extreme high heat. |
| **Protection of vulnerable communities** | Many of the state's vulnerable populations are dependent on transit system and pedestrian/bicycle paths for commuting to and from work, accessing shopping and many other critical daily uses. As such, a more resilient, continuously operating transit system and pedestrian/bicycle infrastructure is necessary to ensure these vulnerable communities and populations have ongoing access to jobs and services throughout the state. |
| **References for action** | |

| Recommended Implementation Action Title | |
|---|---|
| T-4. Identify geographically isolated communities due to limited ingress/egress resulting from coastal and inland flooding events using 2050 SLR, storm surge and inland flooding predictions. | |
| **Recommended Implementation Action Description** | The road network is essential for providing safe ingress/egress to vulnerable communities across the state. Communities with limited ingress/egress, especially those identified through the EEJ assessment of vulnerable communities, should be identified through a comprehensive and standardized assessment process. This assessment needs to be conducted on the hyper-local, neighborhood scale to ensure the specific needs of each community are identified and addressed. The initial identification of potentially isolation communities should then be incorporated municipal and statewide evacuation planning. This planning work needs to incorporate both high intensity precipitation events, coastal and inland storms and blue sky tidal inundation. |
| **Completion Timeframe** | 3-5 years |
| **Implementation Entities** | CIRCA, DEMHS, Council of Governments, Municipalities, Transit Districts |
| **Climate challenges addressed** | The identification of potentially isolated communities will analyze SLR, storm surge and inland flooding, including flood depths for statewide assessment of at risk neighborhoods. This action does not directly reduce carbon emissions but provide local and state officials with a better understanding of how the existing road network will function under climate change impacts. |
| **Protection of vulnerable communities** | The mapping of vulnerable communities by the Equity and Environmental Justice Working Group should be included in this identification process, especially related to early evacuation planning and response. The planning and analysis conducted in the identified EJ communities needs to be done at the neighborhood scale to ensure that the specific needs of each hyper-local community fully addresses the current uses and includes buy in and feedback from the entire community. |
| **References for action** | |

| Recommended Implementation Action Title | |
|---|---|
| T-5. Continue to pursue best available science for updating standards and guidelines used in transportation engineering design; including sources of sufficient confidence, specificity, acceptance and scale for CT/northeast region | |
| **Recommended Implementation Action Description** | Action is relevant to infrastructure durability and longevity, and compliments natural hazard mitigation planning. Continue working with federal and state partners to update sources of data inputs to bring those sources up to the present. After identification by and acceptance of Science and Technology Working Group's future climate change projections for CT, those projections should be evaluated in terms of updates to data inputs used when applying standards and guidelines. |
| **Completion Timeframe** | These time frame categories are a guide to implementation of this action:<br>• Periodically. Standards and guidelines that are revised through multi-state or state-federal collaboration are reviewed and revised on schedules set by the jurisdictions participating.<br>• 2 years for standards/guidelines on Stream flow (collaboration with lead agency USGS) for ungauged streams, update to CT version of "StreamStats" (point-and-click regression equations) |
| **Implementation Entities** | CT DOT generally, plus partnership with participating jurisdictional federal agencies, other state DOTs, and American Association of State Highway and Transportation Officials (AASHTO). |
| **Climate challenges addressed** | Intended to address the climate change impacts that are most likely for CT or the northeast region. Reduction or increase in carbon emissions is unknown. |
| **Protection of vulnerable communities** | Updating standards and guidelines to continue to incorporate best available science protects vulnerable communities by infrastructure durability and longevity, as well as minimizing impacts in project areas. |
| **References for Action** | NCHRP 15-61 (Kilgore, et al., 2019), Applying Climate Change Information to Hydrologic and Hydraulic Design of Transportation Infrastructure<br><br>Pending NCHRP/TRB Research:<br>- Project 20-44(23), "Pilot Test of Climate Change Design Practices Guide for Hydrology and Hydraulics," and<br>- Project 15-61A, "Updates to the Design Practices Guide for Applying Climate Change Information to Hydrologic and Coastal Design of Transportation Infrastructure." |

| Recommended Implementation Action Title | |
|---|---|
| T-6. Create a statewide GIS database of culverts, flood gates, tide gates and other water control structures that restrict flow. Develop a framework for continued identification and documentation of such structures. | |
| **Recommended Implementation Action Description** | Water management systems provide resilience but can also be the choke points that increase flooding when not properly maintained. There is currently no state-wide database with the locations of these flooding control measures which are necessary for more accurate localized modeling. |
| **Completion Timeframe** | Less than 2 years to create database and framework; identification and documentation is a long-term process. |
| **Implementation Entities** | CTDOT, CTDEEP, CIRCA, Municipalities |
| **Climate challenges addressed** | Flood control systems are necessary to moderate the flow of tidal and inland water courses and can help mitigate flooding events. However, increases in SLR, storm surge and inland flooding can overwhelm these systems reducing their functionality and potentially increasing flooding. |
| **Protection of vulnerable communities** | A statewide database of flood and water control systems will ensure more accurate assessment of vulnerabilities for all communities, including those identified by the EJ working group. Many of the vulnerable communities across the state are in flood prone areas that include flood control measures, a database of these systems will enable more detailed and accurate modeling for climate change vulnerabilities communities. This increased accuracy will allow for better planning and implementation of mitigation measures. |
| **References for action** | State Natural Hazard Mitigation Plan, 2019;<br>HVA Culvert Assessment Program;<br>North Atlantic Aquatic Connectivity Collaborative Database search page;<br>Wozniak-Brown, Joanna. "Rural Resiliency Vision and Toolkit." April 2019. Available at https://resilientrural.com |

## Land Use & Buildings:

| **Recommended Implementation Action Title** | |
|---|---|
| LUB-3. Establish Connecticut community resilience program. | |
| **Recommended Implementation Action Description** | The program would ensure consistent and comprehensive approach to accelerate greater local to state resilience to extreme weather and other climate related impacts, with a focus on more resilient development, land use and building practices. It would provide technical assistance to municipalities and COGs on resilience actions. It would include activities and actions that relate to inland and coastal, urban and rural, towns and cities, across Connecticut. It would address both short-term and long-term impacts of climate change. It would also endeavor to bring together all relevant planning documents and local stakeholders. This effort should prioritize vulnerable populations who may not have the resources to self- evacuate in an emergency. |
| **Completion Timeframe** | Less than 2 years to initiate the program and 2-4 years for implementation. |
| **Implementation Entities** | CGA, CT DEEP, OPM, CTDOT, CT DOH, Municipalities, COGs, CIRCA, Eastern CT State University Sustainable CT, DPH, local Health Directors, CT SeaGrant, Uconn CLEAR (AdaptCT), NGOs |
| **Climate challenges addressed** | The overall resilience program will incorporate climate related impact into the planning process initially using a planning horizon of 2050. The SLR, storm surge, inland flooding and temperature extreme predictions downscaled by CIRCA and others will be incorporated into the program to ensure a standardized analysis across the state. In addition, the program would analyze the potential impacts of other issues including increased severe storms, tornados, high wind events and microbursts. |
| **Protection of vulnerable communities** | The program would require significant, localized public engagement and participation from the communities identified as part of the EEJ working group vulnerable communities mapping project. Neighborhood scale planning, especially in vulnerable communities, is essential to ensure the needs of these communities are fully incorporated into the planning process. Fully inclusive public engagement provides a foundation for the continual engagement. Ongoing outreach is necessary when planning for the dynamic impacts of climate change. |
| **References for action** | Massachusetts Municipal Vulnerability Program;<br>Climate Smart NY; Sustainable CT;<br>The Nature Conservancy Municipal Resilience Program<br>https://www.communityresiliencebuilding.com/ ;<br>Resilient Rhody https://www.riib.org/mrp<br>DPH programs that work on weather and climate impacts<br>Resilient Design Institute - www.resilientdesign.org<br>AIA Resilience and Adaptation Initiative - www.aia.org<br>/pages/2906-aias-resilience-and-adaptation-initiative |

| Recommended Implementation Action Title | |
|---|---|
| LUB-5. Convene a Task Force including representatives and stakeholders from state agencies, municipalities and non-governmental organizations to review relevant planning documents, evaluate alternatives and develop a proposal to address needs related to ownership, operation and maintenance of resilience structures. | |
| **Recommended Implementation Action Description** | Resilience structures such as flood walls and tide gates exist across the state and new projects are and will be proposed. A mechanism for supporting ownership, long-term operation and maintenance of infrastructure solutions implemented for purposes of increased resilience is needed. Federal grants do not provide funds for O&M so this responsibility has to be taken on by the grantee. A state agency/authority could assume responsibility for operating and maintaining structures and systems, providing sustained funding and expertise, and potentially owning resilience structures. Alternatively, municipalities could fulfill this role with increased authority and funding. This is an important companion to the recommended municipal community resilience building program recommendation. |
| **Completion Timeframe** | Less than 2 years |
| **Implementation Entities** | CGA OPM, DAS, DEEP, DOT, DECD, municipalities, NGOs, COGs, DPH, Local Health Directors |
| **Climate challenges addressed** | As sea level rises and precipitation patterns change there are likely to be increasing demands for structures and systems to provide protection from coastal and inland flooding. The need for O&M support has emerged in the context of large-scale projects in planning stages in Bridgeport and New Haven as well as smaller scale structures such as tide gates and public living shoreline projects. These structures and systems would enhance resilience for existing vulnerable developed areas and infrastructure. Municipalities may lack the resources to provide O&M and in some cases the solutions implemented may be multi-jurisdictional requiring support at a regional level. |
| **Protection of vulnerable communities** | Vulnerable communities often located in flood prone areas and financially distressed urban communities may be particularly challenged to provide for the O&M needs of resilience structures and systems. For example, the Resilient Bridgeport project currently being planned will increase the resilience of the South End community. |
| **References for action** | http://mgaleg.maryland.gov/2020RS/Chapters_noln/CH_236_sb0457e.pdf |

| Recommended Implementation Action Title | |
|---|---|
| LUB-8. Establish an Energy Efficiency and Healthy Homes (EEHH) Equity Fund to assist low to moderately low income households increase the energy efficiency and thermal comfort and safety of their homes and remove the indoor health barriers to efficiency upgrades such as weatherization. | |
| **Recommended Implementation Action Description** | Provide direct grants and incentives to LMI households for energy efficiency upgrades including the removal and remediation of the barriers to these upgrades. LMI households have limited utility budgets and are therefore most impacted by the immediate health effects of climate change effects such as extreme heat and cold. Energy upgrades can reduce utility budgets, improve indoor air quality (with significant health benefits) and provide comfort and safety throughout the year. LMI households often have less access to participate in healthy homes programs and related incentives, and it is important to note that LMI families do not typically live in sponsored affordable housing developments which must meet standards of efficiency and building quality. Furthermore, energy efficiency measures are often not possible or safe when there are barriers such as hazardous materials in the home including asbestos, mold, PCBs, or Lead Based Paint. It is also not safe to air seal homes when these and other hazards such as High Carbon Monoxide from combustible furnaces or appliances, radon gas vapor, natural gas leak encroachment are present. Improving energy efficiency for LMI households is not possible unless these health and safety barriers are also addressed. A holistic approach to the delivery of healthy home retrofits is needed. |
| **Completion Timeframe** | These time frame categories are a guide to implementation of this action:<br>• 1 year to establish EEHH Equity Funding Source<br>• 3 years to meet 30% request, GHG - 2% reduction<br>• 5 years to meet 50% request, GHG - 5% reduction |
| **Implementation Entities** | Utilities, Agencies, CGA, Municipalities, NGOs, CT-DOH, DPH, Local Health Directors |
| **Climate challenges addressed** | There is broad consensus on the importance of residential energy efficiency as key to GHG emission reduction. Residential direct energy use in Connecticut homes assumes 17.5 % all Carbon Emissions, that is in addition to the emissions created during the power generation phase of the cycle. We cannot achieve overall GHG emission reduction goals or meet the state goal of Weatherization of 80% of households without addressing this critical need for LMI households. |
| **Protection of vulnerable communities** | This recommendation is in support of vulnerable communities. |
| **References for action** | https://efficiencyforall.org/wordpress/wp-content/uploads/2017/04/h1801.pdf<br>Green and Healthy Homes Initiativehttps://www.greenandhealthyhomes.org/wp-content/uploads/GHHI-Weatherization-Health-and-Safety-Report1.pdf<br>Environmental Defense Fund https://www.edf.org/sites/default/files/documents/liee_national_summary.pdf<br>Energy-Plus-Health Playbook https://e4thefuture.org/groundbreaking-energy-plus-health-playbook-released/ |

## Utility Infrastructure:

| **Recommended Implementation Action Title** | |
|---|---|
| UI-5. UI-5. Update safe daily yield calculations and assess current drinking water quality measures/testing to understand and address climate change impact. | |
| **Recommended Implementation Action Description** | Existing safe daily yield calculations are based on outdated precipitation and use scenarios for the state's drinking water reservoirs. This is necessary to ensure adequate supply of state drinking water supplies. Water quality testing and protection measures need to be reevaluated and upgraded to match changing and predicted conditions and the new points of risk. |
| **Completion Timeframe** | Less than 2 years |
| **Implementation Entities** | CT DEEP, CT DPH, Executive Branch, CGA, Municipalities, NGOs, Academic Institutions, Relevant Utilities |
| **Climate challenges addressed** | Assuring safe and adequate drinking water sources and protecting raw water quality will sustain these supplies for vulnerable populations. |
| **Protection of vulnerable communities** | |
| **References for action** | Connecticut Climate Preparedness Plan (2011), pp. 14, 15 |

GC3 Infrastructure and Land Use Adaptation Working Group Recommendations
September 21, 2020 DRAFT

## Recommendations for Further Review in 2021

| Cat# | Recommended Implementation Action Title | Recommended Implementation Action Description |
|---|---|---|
| UI-1 | **Inventory and geo-locate vulnerable utility facilities and their service areas and overlay to prioritize vulnerable populations.** | This is the cornerstone piece of information necessary to prioritize points of greatest risk and necessary investment. Each utility has unique areas of potential interconnected risk. For example, the electricity infrastructure should distinguish between its transmission, distribution and generation assets. Likewise, drinking water infrastructure must consider both private and conventional water system points of risk. Similarly, fuel supply must consider storage, distribution, and transportation. |
| UI-2 | **Require that all utility sectors be subject to statutory and policy-based directives that require the consideration of all projected climate change impacts in their planning** | The governance and regulatory requirements regulating different utility infrastructure sectors is inconsistent. Statutory and policy-based directives are critical to ensure the reporting of points of potential risk. By providing guidance as to the structure and the scope of vulnerability assessments, risk can be allocated appropriately between vulnerabilities within a sector and vulnerabilities compared sector to sector. |
| UI-3 | **Confirm there is sufficient planning and resources for a unified disaster response and recovery across all seven utility sectors, this should include annual drills and communications strategies** | In a post-storm recovery scenario, chain of command and communication protocols are essential in ensuring rapid recovery of services to Connecticut communities. Vulnerability assessments should include the modeling of potential service interruptions and specify chain of command and communication procedures. Given the interconnectedness of utility infrastructure, it is necessary that there be prompt communication not only within a specific sector, but across all sectors. |
| UI-4 | **Study the appropriate techniques for overall resiliency that balance the costs and climate benefits associated with different electric distribution strategies** | It is necessary to understand and compare the impacts of various protection strategies for overall resiliency including microgrids, undergrounding and other adaptive measures. We have to be in a position to holistically compare the tradeoffs associated with storm risk and the climate benefits to urban, suburban, and vulnerable communities. |

GC3 Infrastructure and Land Use Adaptation Working Group Recommendations
September 21, 2020 DRAFT

## Recommendations for Further Review in 2021

| Cat# | Recommended Implementation Action Title | Recommended Implementation Action Description |
|---|---|---|
| UI-6 | **Identify and incentivize construction of high-priority water supply interconnections to improve resiliency** | To improve water supply resiliency, it is necessary to identify areas where water supply systems could be interconnected in response to regional water shortages. This type of planning and infrastructure will ensure regional water supply flexibility in a changing climate. |
| UI-7 | **Assess viability and future needs for wastewater reuse strategies** | Significant volumes of water are presently being underutilized for some of their potential benefits. Potable, non-potable, and high-quality non-potable wastewater have the potential to provide the state with various benefits while preserving the highest value of potable resources. |
| UI-8 | **Continued emphasis on resolution of chronic CSO over-flow conditions** | CSO over-flows create human health and environmental issues for Connecticut, particularly in vulnerable communities. With the increase in extreme rainfall events, CSO over-flows will continue to be a persistent problem. |
| UI-9 | **Determine what dams are vulnerable to changing climate** | To properly understand the risk, it is necessary to evaluate the question of whether existing hydraulic capacity modeling is consistent with projected increased precipitation events. |

GC3 Infrastructure and Land Use Adaptation Working Group Recommendations
September 21, 2020 DRAFT

## Recommendations for Further Review in 2021

| Cat# | Recommended Implementation Action Title | Recommended Implementation Action Description |
|---|---|---|
| UI-10 | **Identify and prioritize funding for critical infrastructure** | Utility infrastructures do not operate across a consistent business and governance models. Small water systems are known to be chronically short on the financial resources necessary to provide consistent water quality. Likewise, municipal wastewater infrastructure is also financially stressed and commonly relies on highly competitive Clean Water Act funding opportunities, which are insufficient to meet Connecticut's needs in the aggregate. |
| UI-11 | **Evaluate standing advisory council for infrastructure in EEJ communities** | To ensure resiliency in vulnerable communities, local stakeholders should be engaged in the necessary planning and implementation processes to ensure community needs are recognized in all cases. Permanent advisory groups will ensure community interests are a fixed part of planning in utility infrastructure projects. |
| UI-12 | **Price utility infrastructure risk correctly** | Given the known changes in climate and commensurate changes in probabilities for severely disruptive events to utility infrastructure, the cost of these interruptive events must be appropriately modeled and calculated to fully understand bonding priorities. |

GC3 Infrastructure and Land Use Adaptation Working Group Recommendations
September 21, 2020 DRAFT

## Recommendations for Further Review in 2021

| Cat# | Recommended Implementation Action Title | Recommended Implementation Action Description |
|---|---|---|
| UI-13 | **Assess, plan for, and Implement actions to improve access to services and availability of electricity for people with disabilities, limited mobility or special medical needs.** | Storms or climate-driven changes such as increased frequency of extreme heat events may create conditions under which people with critical needs such as those with disabilities, limited mobility or special medical needs are unable to access essential services. Conduct an assessment of and develop a plan for addressing the needs of such vulnerable populations. The plan should include, but not be limited to: Utilities creating a priority list for community-dwelling people using electricity-driven devices for medical use; prioritizing programs for mobile solar panels, backup generators for people over 55+ and people with disabilities for prepared disaster events; creating electricity centers (similar to cooling centers) for people who will need electricity and internet for disability-related needs; promoting Smart 911 where people with disabilities can inform fire departments and first responders in advance of their needs; and creating solar outlets in neighborhoods, so if the power goes out, electricity can still be accessible for emergency needs. |
| LUB-1 | **Establish state-wide storm water utility.** | Increased precipitation across the state will exacerbate existing storm water management issues. A state-wide utility would allow for watershed scale planning and implementation of storm water capture. |
| LUB-2 | **Prioritize Low Impact Development to mitigate the effects of stormwater runoff, especially where combined sewer stormwater systems still exist.** | Low impact development, analyzed at a watershed scale should include BMPs for sustainable development, agriculture water, and drinking water treatment. Siting decisions should minimize the impact to climate vulnerable locations such as riverine flood plains, coastal flood zones, inundation prone areas, and erosion. There should also be a prioritization of 303d impaired watersheds, where LID will work in concert with storm water management to reduce impairments state wide. |

GC3 Infrastructure and Land Use Adaptation Working Group Recommendations
September 21, 2020 DRAFT

## Recommendations for Further Review in 2021

| Cat# | Recommended Implementation Action Title | Recommended Implementation Action Description |
|---|---|---|
| LUB-4 | **Update State Building Code.** | The State Building Code should be modified to address resiliency measures including climate related impacts such as stronger storms, increased precipitation events, high winds, and increased temperatures and require construction materials and designs that mitigate these impacts. Address shelter-in-place measures such as sustainable building materials, reinforced structural design, passive survivability, and increased building elevation requirements for all critical activities with respect to 500 year base flood elevations.<br><br>Increased storm water controls to be required or incentivized through either the state-wide regulations, local zoning regulations or requirements for the use of public funding.<br><br>Update the State Building Code with additional amendments to the referenced International Energy Conservation Code (IECC) for new buildings with critical activities to require stricter building envelope and system efficiency requirements to both reduce carbon emissions and facilitate shelter-in-place. Require existing buildings at Level 3 Renovations to meet IECC for new construction except as waivered by the Office of the State Building Official.<br><br>Incentivize alternate building energy strategies to reduce peak and annual energy demand such as passive cooling, daylighting, and solar thermal for projects with potential energy savings. |

GC3 Infrastructure and Land Use Adaptation Working Group Recommendations
September 21, 2020 DRAFT

## Recommendations for Further Review in 2021

| Cat# | Recommended Implementation Action Title | Recommended Implementation Action Description |
|---|---|---|
| LUB-6 | **Incentivize and prioritize redevelopment of previously used sites within established neighborhoods, including Brownfield Remediation** | Low impact infill redevelopment includes promoting and prioritizing redevelopment and infill development in urban centers and village centers to preserve greenspace, offer housing and commercial opportunities to a diverse racial and socio-economic population, and reduce transportation impacts. Additionally, in less developed area conservation subdivisions should be required in local zoning to increase forest block side and reduce negative edge effects. Consider adaptive reuse and urban infill projects targeted to benefit a diverse group of racial and socio-economic households and communities. Increase incentives for brownfield remediation; require stricter standards for both state funded and private development for removal, consolidation, or in-situ treatment of historical contamination. Historic industrial and manufacturing uses throughout the state have created an abundance of underutilized development sites with significant levels of contamination. The underdeveloped sites decrease the ability for municipalities to enact infill development strategies or create more resilient environments through additional open space. Additionally, a significant portion of these site are located in or adjacent to EJ communities so these communities are negatively affected directly by the increased contamination levels and indirectly through decreased environmental resilience. Furthermore, the locations of many brownfield sites along the coastal and riverine areas of the state further exacerbate their vulnerabilities to climate change through increased inundation and transport, salt water intrusion and storm water capture. This action would prioritize the remediation of these contaminated sites, focusing on those in or near EJ communities to standards that would allow for redevelopment or the creation of resilient open space. |

GC3 Infrastructure and Land Use Adaptation Working Group Recommendations
September 21, 2020 DRAFT

## Recommendations for Further Review in 2021

| Cat# | Recommended Implementation Action Title | Recommended Implementation Action Description |
|---|---|---|
| LUB-7 | **Inventory, assessment, and prioritized protection of currently undeveloped land.** | Preserve undeveloped land including, but not limited to, natural lands, parks, floodplain, salt marshes, headwaters, watershed areas, and riparian zones which currently provide immediate and ongoing protection for people and the built environment. The assessment will include the identification of ecosystem services for the undeveloped areas. The prioritization will evaluate the separate areas for their immediate and long-term vulnerabilities to climate related impacts. The CT Green Plan and open space funding should prioritize conservation and acquisition of habitats at highest risk to climate change and those with populations at highest risk of danger. |
| T-1 | **Conduct vulnerability assessment using standard methodology on the entire road and pedestrian/bicycle network using 2050 estimates.** | The road and pedestrian/bicycle network vulnerability assessment will analyze the systems vulnerability to climate impacts such as SLR, storm surge and inland flooding. The assessment will allow for state-wide prioritization of improvement projects to address the deficiencies in the system. The assessment needs to include both roads, bridges, and pedestrian/bicycle infrastructure initially at a screening level with more in-depth analysis for the most vulnerable areas. The analysis will include assessment of the connections between the road network and critical facilities, including not limited to hospitals, emergency shelters and utility infrastructure. |

# Notes and References

[i] IPCC, 2013: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1535 pp.

[ii] Adaptation Subcommittee. 2010. The Impacts of Climate Change on Connecticut Agriculture, Infrastructure, Natural Resources and Public Health. A Report by the Adaptation Subcommittee to the Governor's Steering Committee on Climate Change. http://ctclimatechange.com/wp-content/uploads/2010/05/Impacts-of-Climate-Changeon-CT-Ag-Infr-Nat-Res-and-Pub-Health-April-2010.pdf

[iii] Seth, A., Wang, G., Kirchhoff, C., Lombardo, K., Stephenson, S., Anyah, R., & Wu, J. (2019). Connecticut Physical Climate Science Assessment Report (PCSAR): Observed Trends and Projections of Temperature and Precipitation. UConn Connecticut Institute for Resilience and Climate Adaptation. https://circa.uconn.edu/wp-content/uploads/sites/1618/2019/11/CTPCSAR-Aug2019.pdf

[iv] O'Donnell, J. (2019). Sea Level Rise in Connecticut Final Report. UConn Connecticut Institute for Resilience and Climate Adaptation. https://circa.uconn.edu/wp-content/uploads/sites/1618/2019/10/Sea-Level-Rise-Connecticut-Final-Report-Feb-2019.pdf

[v] IPCC, 2018: Summary for Policymakers. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. World Meteorological Organization, Geneva, Switzerland, 32 pp.

[vi] Liu, C., Jia, Y., Onat, Y., Cifuentes-Lorenzen, A., Ilia, A., McCardell, G., Fake, T. and O'Donnell, J. (2020) Connecticut Coastal Towns Storm Surge and Significant Wave Height Dataset, (v.1), [Plots and Data File], University of Connecticut, Connecticut Institute for Resilience and Climate Adaptation, Retrieved from https://resilientconnecticut.uconn.edu/resources/datasets/connecticut-coastal-towns-storm-surge-and-significant-wave-height-dataset/

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Alec Shub <alec.shub@uconn.edu>

# FW: Comments on the Land Use and Infrastrcture Report

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:49 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Charles Vidich <cvidich@gmail.com>
**Sent:** Wednesday, October 21, 2020 11:39 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Cc:** cvidich@westcog.org
**Subject:** Comments on the Land Use and Infrastrcture Report



My comments on the Land Use and Infrastructure report are contained in the attached PDF of the draft document using the comments options in PDF documents. I also have some general comments:

1. **Zoning Issues:** The report would benefit by addressing several ways in which zoning influences the ability of our 167 municipalities with zoning regulations (Bethlehem and Eastford do not have zoning) to address climate change issues. Specific examples include the following:

a. **Low Impact development.** This concept is mentioned in the report but more needs to be said on this topic. Only 20% of the states zoning regulations have adopted limits on impervious cover

standards for developments within their towns (this is based on a statewide analysis I conducted 2 years ago). Low impact development is a broad concept and needs more specificity to be meaningful. Studies by CT Department of Energy and Environmental Protection and other land use professionals have determined that when 11% of the land area in any given watershed is impervious, water quality deteriorates significantly. This should be addressed in this report.

b. **Energy Efficient Patterns of Development:** The Connecticut General Statutes require zoning commissions to "encourage energy-efficient patterns of development, the use of solar and other renewable forms of energy, and energy conservation." Solar energy systems - whether house connected or grid connected - are critical components of any infrastructure strategy designed to reduce the impacts of our over reliance on petroleum based means of generating electricity. This needs to be part of the analysis and recommendations section of this report. Connecticut has a long way to go with the adoption of solar energy systems at the municipal level - especially since it is now the most competitive means of generating electricity.

At a much broader level, energy efficient patterns of development is not just about encouraging solar infrastructure development, it is also about avoiding the costs of sprawl development that result in inefficient use of our state's lands. The classic study by Anthony Downs, titled "*The Costs of Sprawl*" emphasizes the importance of higher density development strategies that reduce infrastructure costs and costs of services to our state's taxpayers to maintain the road, sewer, water, telecommunications and other infrastructure that support our way of life. There should be recommendations that discourage the extension of critical infrastructure into areas subject to Sea Level Rise or expected to

be impacted by Sea Level Rise or increasing storm intensities that widen the geographic boundaries of the so-called "100 year floodplain. The report would benefit by addressing the importance of steering urban infrastructure away from areas where development should not occur since it would exacerbate future flooding or be inconsistent with our long term need to reduce investment in areas that will be ceded over to the rising sea. The federal government is already taking a position that it will not support flood insurance in areas that continue to be devastated by flooding or sea level rise issues.

c. **Transfer of Development Rights**: The report's authors might wish to consider policies that encourage innovative applications of transfer of development rights along coastal Connecticut or even along riparian corridors in inland areas of our state. The Connecticut General Statutes authorize Zoning commissions to transfer development rights across municipal boundaries and this concept has an important strategic value as a means to de-emphasize growth along the sea coast and transfer those development rights to inland municipalities that might be amenable to a joint venture strategy. The Connecticut General Statutes state: (Sec. 8-2e):

"Municipal agreements regarding development rights. Any two or more municipalities which have adopted the provisions of this chapter or chapter 125a or which are exercising zoning power pursuant to any special act may, with the approval of the legislative body of each municipality, execute an agreement providing for a system of development rights and the transfer of development rights across the boundaries of the municipalities which are parties to the agreement. Such system shall be implemented in a manner approved by the legislative body of

each municipality and by the commission or other body which adopts zoning regulations of each municipality.

While few Connecticut municipalities have had experience with this innovative tool, it has been used for many years in New York City as a means to transfer development to areas within the city that would be to the best advantage of the city's development plans. We will soon be dealing with very significant land use impacts as sea levels begin to take away existing development along our coastline and innovative strategies are needed more than ever. I submit the transfer of development rights concept is a tool that will be an essential one in the toolbox of strategies aimed at reducing the adverse impacts of climate change.

I commend the authors of this report for making important contributions to a more resilient infrastructure for our state. I hope that my suggestions are of value to your work and look forward to seeing your final report.

Charles Vidich

Senior Project Manager

Western Connecticut Council of Governments

1 Riverside Road

Sandy Hook, CT 06482

PS. This is being sent from my home email. I have copied by office email on this submission in case you need to reach me regarding these comments.

**GC3_Infrastructure_LandUse_draft_report_public_comment_092120 Vidich Comments.pdf**
352K

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Comments for GC3 Forests Subcommittee

2 messages

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 5:34 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** mferrucci@iforest.com <mferrucci@iforest.com>
**Sent:** Wednesday, October 21, 2020 4:40 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Cc:** Eric Hammerling <ehammerling@ctwoodlands.org>; Martin, Christopher <Christopher.Martin@ct.gov>
**Subject:** RE: Comments for GC3 Forests Subcommittee

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Please direct this email to the Governor's Council on Climate Change, Working and Natural Lands Working Group, particularly the Forests Subcommittee.

Please note that there are three (3) attachments, my letter summarizing my comments, and then two documents with detailed, page-specific edits and comments shown with "changes" tracked.

Michael Ferrucci

26 Commerce Drive

North Branford, CT 06471

203-887-9248 mferrucci@iforest.com

**3 attachments**

**Ferrucci GC3 Forests Subcommittee Letter.docx**
27K

**GC3 Forest Sub.Comments.DEEP.Urban.Vulnerable.COMP by FERRUCCI A.docx**
257K

**GC3 Forest Sub.Comments COMPILED by FERRUCCI B.docx**
179K

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**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:45 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** cmdonnelly.northford@gmail.com <cmdonnelly.northford@gmail.com>
**Sent:** Wednesday, October 21, 2020 10:28 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Cc:** Eric Hammerling <ehammerling@ctwoodlands.org>; Martin, Christopher <Christopher.Martin@ct.gov>; mferrucci@iforest.com
**Subject:** RE: Comments for GC3 Forests Subcommittee

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To the Governor's Conference on Climate Change:

Please include the attached file as part of the commentary regarding the Forests Sub-Group Report. It relates to pages 32-38 of that report, the section that relates to Vulnerable Populations.

It was originally intended to be included as part of a compilation assembled by Michael Ferrucci. However, it is not clear if this file came through in that compilation in a clear fashion – Word editing compilations can be messy.

Thank you for your interest and apologies for any confusion or redundancy.

Chris Donnelly
Northford, CT

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**GC3 Forest SubGroup cmd comments vulnerability.docx**
85K

## Climate Change Threats to Vulnerable Populations

### Top Priority Actions

Vulnerability to Climate Change is often described as some combination of exposure, sensitivity and ability to respond, or adaptive capacity. It is helpful to think of vulnerability in terms of these component parts, because there are instances in which exposure is greater for some groups over others, while in other circumstances it is ability to respond or adaptive capacity that is the ruling factor. For example, exposure to the urban heat island effect is much greater among urban populations, within whom those without the means to use personal vehicles or run their air conditioning continuously can be considered as having a lesser ability to respond. Those with existing medical conditions, such as hypertension or heart conditions, are also apt to have greater sensitivity to the urban heat island effect, and so it a factor in their vulnerability to an increase in this phenomenon in the course of climate change.

Among the groups generally cited in the United States as most apt to be vulnerable to climate change arecommunities of color, low-income groups, people with limited English proficiency (LEP), and undocumented immigrant groups.[143] These populations are at increased risk of exposure given their higher likelihood of living in risk-prone areas (such as urban heat islands, isolated rural areas, or coastal and other flood-prone areas), areas with older or poorly maintained infrastructure, or areas with an increased burden of air pollution. These groups of people also often have an increased sensitivity to these climate change threats due to relatively greater incidences of chronic medical conditions, such as cardiovascular and kidney disease, diabetes, asthma, and COPD

Finally, the ability to respond to these threats is often impeded by socioeconomic and educational factors, limited transportation, limited access to health education, and social isolation related to English language deficiencies. Likewise, these populations also may have limited access to medical care and may not be able to afford medications or other treatments. High poverty rates, language and cultural barriers, and citizenship status can each limit access to and use of health care and other social services. Some members of these groups are likely to be hesitant to seek out help out of concern that effort might might cause their immigration status in the United States to become compromised.

Many of these factors are beyond the scope of the Forest Sub-Group to address. However, there are some areas where forests and the role of forests has the potential to be helpful in terms of reducing the vulnerability to climate change. These include

- Through urban forestry, reducing the exposure and providing the means to adapt to those climate change exposures that primarily occur in urban areas. Many of these are heat-related, and include not just the urban heat island effect, but also the exposure to greater amounts of air and water pollution and flooding, due to greater, temperature-influenced exposure to ozone, increased generation of electricity in response to higher temperatures, and more extensive run-off due to more intensive rainstorms.
- Through careful analysis of meaningful economic data, identify ways in which both the urban and rural forests can contribute more to economic development, including jobs, in order to give vulnerable populations greater wherewithal to deal with exposure to increased threats from climate change.
- Through recognition of the importance of being outdoors and of getting outdoors to the sake of health and recreation, provide increased opportunities for all residents of Connecticut to gain access to and feel welcome in all public forests, from city parks to State Parks and Forests. This includes intentional efforts to remove barriers to as access perceived by all vulnerable groups,

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whether these barriers are perceived to be do to race, transportation, physical access or simple unfamiliarity with the opportunities.

144,145

In addition, the critical role of rural forests, especially, in terms of decreasing exposure of all populations, including the most vulnerable, to the effects of climate change must be acknowledged. These forests have key role to play in providing the people of Connecticut with clean air and clean water, including clean drinking water from the many surface reservoirs throughout the state. These forests are greatly important in filtering out the air pollutants and in countering some of the heat build-up that come from urbanized society.

- **Assess the social determinants of health inequities** at the individual and community levels that lead to increased vulnerability to the threats from climate change and that can be improved through pro-active forest policies.
- **Support community interest in tree planting, parks, and/or community gardens** in densely populated areas to support climate solutions that could meet multiple needs such as increasing health outcomes, employment, and entrepreneurial opportunities. Youth Conservation Corps could help community-based groups with implementation.
- **Build a market for creative re-use of urban wood waste** to store carbon while simultaneously creating education, employment, and stewardship opportunities.
- **Engage, train, and educate on adaptation planning, resiliency, and risks** from climate change with emphasis on local officials, planners, community organizations, and emergency responders.

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**Deleted:** The number of people of color in the United States who may be affected by heightened¶
vulnerability to climate-related health risks is growing. Currently, Hispanics or Latinos, Blacks or¶
African Americans, American Indians and Alaska Natives, Asian Americans, and Native¶
Hawaiians and Pacific Islanders represent 37% of the total U.S. population and 24.8% of the¶
population in Connecticut. 22.1% of the population in Connecticut speaks some language other¶
than English at home, and 10.4% of the population was born outside the U.S. As a proportion of¶
Connecticut's population, people of color as a group grew by 2.6% from 2010 to 2014

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As noted earlier in the Status of CT Forests section of this report, 36.4% of the land area of Connecticut is considered by the U.S. Census to be "urban" (1.13 million acres), with 87.7% of the population, nearly 3 million people, living in these urban areas. Despite the high population concentration in these areas, these same lands have a fairly high degree of tree cover, with tree canopy cover estimated at at over 60%. However, there is good evidence that this canopy cover is not equitably distributed, particularly in Connecticut's larger and more densely-populated cities, but potentially also in Connecticut's rural areas. Efforts need to be made to better identify areas of low canopy cover in settled areas throughout Connecticut and how those areas correlate to lower income neighborhoods, communities of color and communities exposed to other environmental threats, such as flooding, increased air pollution or environmentally-related public health concerns.

**Figure 8.** Urban areas like Hartford are hotter than more rural areas during summer. Tree cover can help reduce health and other problems associated with urban heat islands.[146]

## Vulnerability to Climate-Related Health Stressors

[147]

Race and class are important factors in the vulnerability to climate-related stress. In many situations, it can be difficult to isolate the role of race from other related socioeconomic and geographic factors. Some racial minorities are also members of low-income groups, immigrants, and people with limited English proficiency, and it might be inferred that it is their socioeconomic status (SES) that contributes most directly to their vulnerability to climate change-related stressors.

However, with regards to race as an independent factor, it is undeniable that it influences behavior, particularly as relates to the use of rural forested areas. In a recent edition of the New Yorker magazine, the naturalist Corrina Newsome is quoted as saying, ""Birding in the marsh is as remote as I will go," she added, quietly. "There's no way I'm going in a remote area, or the woods, without a white person as cover.""[1]

The sorts of racial and cultural stereotypes that infer that people with certain characteristics, whether that be skin color, language, cultural affiliation or other similar feature, do or do not belong in certain areas, need to be addressed directly and pro-actively, to diminish and ultimately eliminate their role in inhibiting the full use of public spaces, including rural public parks and forests.

[1] New Yorker Magazine, Georgia Postcard, June 29, 2020 edition, "Corina Newsome and the Black Birders Movement", article written by Carolyn Kormann



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**Deleted:** between lower-income neighborhoods,¶ communities of color, and a distinct lack of tree cover

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**Deleted:** SES is a measure of a person's¶ economic and social status, often defined by income, education, and occupation. Additional¶ factors such as age, gender, pre-existing medical conditions, psychosocial factors, and physical¶ and mental stress are also associated with vulnerability to climate change. Because many

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Table 7. Estimated Ecosystem Benefits Provided by Harford's Tree Canopy in 2014

| Hartford Tree Canopy Ecosystem Benefits | Annual Ecosystem Benefits | |
|---|---|---|
| | Quantity | Value |
| Air: CO removed | 5,400 lbs. | $3,600 |
| Air: $NO_2$ removed | 15,260 lbs. | $6,466 |
| Air: $O_3$ removed | 109,020 lbs. | $198,218 |
| Air: $SO_2$ removed | 2,920 lbs. | $369 |
| Air: particulate matter removed | 15,190 lbs | $47,437 |
| Carbon sequestered | 11,264 tons | $225,280 |
| Stormwater: reduction in runoff | 591,022,346 gallons | $4,728,178 |
| Energy: savings from cooling | 3,843,654 kWhs | $277,665 |
| **Total Annual Benefits** | | **$5,487,213** |
| Current stored carbon* | 362, 445 tons | $7,248,900 |
| Property: increase in property values* | - | $11,416,730 |
| **Total** | | **$18,665,630** |

**Current stored carbon and contribution to property value are measures of total contribution, not an annual value.*

Source: https://www.americanforests.org/wp-content/uploads/2015/04/AF-Community-ReLeaf-%E2%80%94-Hartford-UTC-Assessment.pdf page 18

***Extreme heat events.*** Some communities of color and some low-income, homeless, and immigrant populations are more exposed to heat waves as these groups often reside in urban areas affected by heat island effects.

***Other weather extremes.*** As observed during and after Hurricane Katrina and Hurricane/PostTropical Cyclone Sandy, some communities of color and low-income people experienced increased illness or injury, death, or displacement due to poor-quality housing, lack of access to emergency communications, lack of access to transportation, inadequate access to health care services and medications, limited post-disaster employment, and limited or no health and property insurance.

***Degraded air quality.*** Climate change impacts on outdoor air quality will increase exposure in urban areas where large proportions of minority, low-income, homeless, and immigrant populations reside. Fine particulate matter and ozone levels already exceed National Ambient Air Quality Standards in many urban areas.

***Waterborne and vector-borne diseases.*** Climate change is expected to increase exposure to waterborne pathogens that cause a variety of illnesses—most commonly gastrointestinal illness and diarrhea. Health risks increase in crowded shelter conditions following floods or hurricanes, which suggests that some low-income groups living in crowded housing may face increased exposure risk.

***Food safety and security.*** Climate change affects food safety and is projected to reduce the nutrient and protein content of some crops, like wheat and rice. Some communities of color and low-income populations are more likely to be affected because they spend a relatively

larger portion of their household income on food compared to more affluent households.
***Psychological stress.*** Some communities of color, low-income populations, immigrants, and LEP groups are more likely to experience stress-related mental health impacts, particularly during and after extreme events. Other contributing factors include barriers in accessing and affording mental health care, such as counseling in native languages, and the availability and affordability of appropriate medications.

## Improve Community Health and Reduce Health Inequities

The impacts of climate change on health and health inequities are moderated by individual and community vulnerability and resilience. Interventions that improve the social determinants of health and population health and reduce health inequities can significantly reduce vulnerability and increase resilience to climate change, at the individual and community-levels. Increasing resilience to climate change will require investing significantly in the public sphere, including in social determinants of health and in public health infrastructure.
Many climate actions bring significant health co-benefits, but some may have significant adverse health consequence and/or increase health inequities. Some health interventions also

**Commented [CD3]:** These are all vague and, if previous comments are accepted, redundant. If any of these topics are to be included, I would suggest using Connecticut based examples, such as the air and water pollution reduction numbers generated by the 2007 Hartford UFORE Study or through URI for New Haven. I am including the table from the 2014 American Forests study of Hartford.

have climate co-benefits. Thoughtful implementation of actions to reduce greenhouse gas emissions and adapt to climate impacts will help maximize co-benefits and minimize co-harms.

Urban trees and other natural systems provide a range of physical health benefits. Trees can improve air and water quality, mitigate the heat island effect, and help alleviate noise.[148] Trees can shield people from ultraviolet (UV) radiation, the cause or contributing factor for three types of skin cancer.[149] Urban ecosystems are increasingly recommended by national and State environmental protection agencies to mitigate the harmful impacts of air and water pollutants, harmful emissions, and the negative effects of urban heat and noise.[150] Trees also help reduce flooding by slowing rainwater runoff.

The demands of modern life can often be mentally exhausting. Focusing attention on flows of information and tasks, screening out distractions, and responding to the constant stimuli of commuting, work, school, and family leaves many people feeling drained, with memory loss and reduced capacity for sustained attention.[151] Rachel and Stephen Kaplan's Attention Restoration Theory (ART) suggests that we can use nature to restore depleted cognitive functions and maintain performance.[152]

Access to green spaces also provides other health benefits. Researchers at the University of Exeter surveyed 10,000 urban residents in the United Kingdom, asking how satisfied they were with their lives and whether they had signs of depression, anxiety, or other psychological disorders. After controlling for other factors known to significantly influence well-being such as income, employment, marital status, health, and housing, researchers found a strong correlation between a boost in a feeling of well-being overall and increases in green space within a 2.5-mile radius of residents' homes.[153]

**Figure 9.** Maps showing tree canopy cover and surface temperatures in New Haven help to show the urban heat island effect that trees help to mitigate.[154]

### Support Community Interest in Tree-Planting, Green Spaces, and/or Gardens

Tree planting in urban areas provides many potential benefits to human health, but it's important to note that the top green priority for a neighborhood may not be tree-planting, and policy-makers should be careful to not approach community green spaces with a "top-down" approach.[155] It is critical to engage the community locally to understand local needs and discuss trees as one potential solution rather than approaching the community with the assumption that tree-planting is the answer. Ongoing stewardship of local investments in green spaces is critical and may be more important than tree-planting depending upon various factors. Ultimately, community support is the foundation for long-term stewardship. As an additional benefit, work done to increase access to community green spaces may also inspire young people of color to consider outdoor employment opportunities, and perhaps this kind of locallydriven effort might provide the first step to a conservation career.

Underrepresented communities are adversely impacted by climate conditions, but historically, these communities have been marginalized, set aside, and not engaged in these discussions. While this report addresses Climate Change Threats to Vulnerable Populations, assessing community needs without their input would further exacerbate the vulnerabilities these communities face. Decisions about others without their input would further perpetuate the effects of climate when leaders are not communicating with the communities they represent. So, it is critical that we connect with leaders within the communities we're identifying as vulnerable populations and learn with them while assisting them.

That said, the existence of trees in areas with limited canopy cover can sometimes literally be the difference between life and death. Neighborhoods with little to no trees can, on average, be 5 to 7 degrees hotter during the day and up to 22 degrees hotter at night than neighborhoods with good tree cover. Treeless neighborhoods also have worse air pollution because trees trap air pollutants and the hotter temperatures in these treeless neighborhoods help cook air pollutants into dangerous smog. That's one of the reasons why health experts project a ten-fold increase in heat-related deaths across America's cities.[156]

Another reason for considering tree planting amongst community options is that some trees in urban areas are in poor condition and need to be removed and/or replaced. For example, Connecticut is currently losing many ash trees due to the emerald ash borer. A recent study suggests suggest that the loss of trees to emerald ash borer is increasing human mortality related to cardiovascular and lower-respiratory-tract illnesses. [157] This finding adds to the growing evidence that the natural environment provides major public health benefits.

The need to maintain and increase urban tree cover (UTC) in Connecticut is not a new issue and is well-documented. Studies of UTC were conducted in New Haven (2009),[158] Hartford (2010),[159] Bridgeport (2012),[160] and the Greater Bridgeport region (2014)[161] to map UTC, show areas where heat islands are a current problem, and suggest areas where UTC could be increased through a combination of plantings or replantings and stewardship of existing trees. There have been follow-up studies and recommendations such as Hartford's Urban Tree Canopy Assessment and Planting Plan (2014).[162]

**Commented [CD4]:** Tree planting is often over-stated as a stand-alone solution to urban forest shortcomings. Renewal of the urban forest is important, of course, but tree planting that does not come from a comprehensive plan and that is not balanced with maintenance program for existing trees can cause more problems than it solves. As just one example, the City of Hartford did an internal assessment how much a planted tree actually costs the city. By the time the tree is fully established, at around 15 years of age, it is likely that a single tree is apt to cost the city $1,000, for water, pruning and mulching, over and above the cost for planting the tree (perhaps $500). Thus, a gift to the city of a tree is apt to be more of an expense than is realized. This expense may come at the cost of necessary maintenance work on older and larger trees.

The City of Hartford, working with the city's Tree Advisory Commission, developed a Hartford Tree Canopy Action Plan (June, 2020)[163] with the following laudable long-term goals:

- Maintain the health of the urban forest.
- Ensure public safety.
- Increase our tree canopy to at least 35% (current tree canopy is ~25%).
- Reduce the urban heat island effect through targeted planting in the urban heat islands.
- Increase tree plantings aimed at energy savings.
- Reduce storm water run-off through target plantings.
- Improve air quality through forest management and careful selection of new trees.
- Design and implement an environmental stewardship program for Hartford schools, City of Hartford employees, and Hartford citizens.
- Become an urban forestry model for cities in the northeast and beyond.

The Hartford Tree Canopy Action Plan calls for the a 5-year goal of planting 3,000+ trees each year to increase its canopy from 25% to 35% over the next 50 years. According to the Tree Plan, planting ~1,500 trees each year is required just to maintain the current tree canopy. Of course, to maintain and increase tree cover in a healthy urban forest requires more than tree planting alone. Hartford and other cities must also make investments to remove dead trees, care for diseased, damaged or aging trees, and have a plan for replacing trees that are lost through storms or other common stressors for trees in cities.

Tree planting programs are more impactful when complemented by local environmental education and green jobs programs at the municipal level. KNOX for example, provides handson environmental education for Hartford students through their Gaia's Guides program which offers a combination of after-school educational opportunities and in-school programming on the benefits of trees to communities. In addition, KNOX offers Green Jobs Apprenticeships that provide job counseling and hand-on experience for out-of-work Hartford residents in the fields of landscaping (which includes tree planting), and horticulture. These kinds of job opportunities build experience for potential careers in landscaping, landscape design, land management, plant and soils science, agriculture, arboriculture/tree care, forestry, and many more fields. Actively nurturing a broad appreciation of trees at the community level through outreach and education is important because there are ongoing costs associated with maintaining tree health that individual land-owners and community residents should consider. Well-maintained trees can be seen as a community asset and point of pride, but poorly maintained, unhealthy, or dead trees can be viewed as symbols of community neglect.

The plans and goals for Hartford's urban tree canopy are very good. However, due to budget shortfalls and other challenges, Hartford has been losing ground and has only been able to plant a few hundred trees in recent years. In the Tree Plan, it is suggested that Hartford's urban tree cover may have actually decreased by approximately 2% between 2014 and 2018 due to inadequate plantings despite best intentions, strong plans, and an appreciation for trees. Without additional state or federal funding, human resources, and support with technical elements such as GIS mapping of heat islands and potential planting zones, to assist cities like

Hartford and local partners like KNOX, Connecticut's urban areas will continue to struggle just to maintain the status quo for their urban tree canopies. A program like a Youth Conservation Corps could help provide some human resources to complement and extend the capacity of existing community-based organizations such as KNOX (Hartford), Urban Resources Initiative (New Haven), and Groundwork Bridgeport.

A Youth Conservation Corps, funded through a model like the national AmeriCorps program or perhaps a model like the "Greening the Gateway Cities" program being implemented in 13 towns in Massachusetts,[164] could employ high school or recently graduated students to build trust and cultural understanding at the community level around environmental restoration. Work that could be led by this youth corps could include controlling invasive plants or protecting native plants, working on trails connecting green spaces, and cleaning-up/plantingup open spaces in urban and rural environments. This could be a great program for expanding outdoor youth employment and career enrichment opportunities for students of color in fields such as landscaping, horticulture, and land management/conservation, and can bring multiple benefits when students from the local community are employed.

**Investigate Opportunities to Improve the Economic Contributions from both Urban and Rural Forests towards Assisting Vulnerable Populations**

Investigations should be made into ways that forests can better serve vulnerable populations, especially those that are economically distressed, both in the rural and urban context. These could be based on the results of two such economic analyses are under way. Both are being conducted under the auspices of the Northeastern and Midwest State Foresters Alliance.[2] One is being conducted by the NMSFA Forestry Markets and Utilization Committee and is looking at the economic contributions of the forest products industry in the 20 NMSFA states, plus Nebraska. The other is associated with, although not directly being conducted by, the NMSFA Urban and Community Forestry Committee and is looking at the economic contributions of urban forestry in the 20 states, plus Washington DC. Both are being funded through US Forest Service Landscape Scale Restoration grants. The FMUC report is expected by October 2021. The UCF report is likely due in 2022.

It is recommended that a commitment be made to using these economic analyses to better evaluate how the statewide and regionwide forest products industry and also how the urban forest management programs in all of their forms can be used to assist populations vulnerable to climate change in both rural and urban areas.

For example, a program to encourage the local re-use of wood from the urban forest can accomplish multiple goals. Trees in urban areas provide many benefits while trees are growing and healthy, especially if they are well-maintained. However, some trees are not in good condition and need to be removed. In this situation, urban trees can move from being seen as a benefit to becoming a cost for the municipality. If the wood from that tree were re-used, it could reduce costs associated with tree removal and disposal, create job opportunities, partially offset the use of wood products from international forests that can be poorly regulated and leave a larger carbon footprint, and store carbon in long-lived wood products.[165,166]

It's worth noting that some tools and equipment that would support local wood re-use can represent barriers to entry. Some tools and equipment – e.g., a portable sawmill or lathe or chipper or kiln for drying wet wood – may be more apt to be readily accessed if it were available for rent from an equipment rental business or loanable through a local/regional coop. Start-up job incubators that allow for shared used of space and equipment are also helpful. There are significant resources on urban wood re-use to provide models that work.[167]

[2] For further information on NMSFA, visit http://www.northeasternforests.org/



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Better use of local or regionally grown wood in construction in densely developed neighborhoods as a substitute for r more carbon-dense materials (e.g. steel, aluminum, or concrete) can be used as carbon offset benefits.[168,169] Wood products have many important benefits when used as a construction material. New techniques, such as cross-laminated timber and wood fiber insulation, are allowing use of wood in new ways that expand potential beneficial impacts. In a climate context, long-lived wood products have two benefits. First, they can store carbon previously captured by trees; as living forests may potentially experience increasing mortality and associated carbon release due to climate change, this could become an increasingly important benefit.[170,171,172] Greater focus and incentives toward reduced-impact techniques of forest harvest, improved forest management to enhance growth rates, and directing more of the harvest to long-lived products has potential to improve the efficiency of this carbon benefit over past performance.

Energy savings, through the use of trees properly placed so as to provide shade and windbreaks to buildings, along with other building energy-saving approaches, such as the use of wood fiber in insulation[3] and the use of local lumber in home upgrades and repair, can also significantly reduce carbon emissions. A recent study of Hartford's street trees shows that the amount of carbon release avoided due to those street trees exceeded that amount of carbon sequestered by those street trees, at a ratio of 2,167 tons to 1,825 tons of carbon.[4]

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[3] https://www.finehomebuilding.com/2019/05/08/284-in-favor-of-wood-fiber-insulation#:~:text=Contributing%20editor%20Michael%20Maines%20describes%20the%20introduction%20of,on%20the%20product%20type%3A%20batt%2C%20board%2C%20or%20blown.

[4] https://hartfordct.treekeepersoftware.com/

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Clear cutting

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 10:50 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Chris Johnson <westhillwoman@gmail.com>
**Sent:** Wednesday, October 21, 2020 10:47 AM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Clear cutting



Protect Public Forests for All People and the Planet

Treat our public forests as nature preserves

We need to protect nature – all species – for us now and for the future.

Why are exporting and burning our public forests – and at the same time asking people to subsidize solar panels to help with climate change?

--

Chris Johnson
"Life is not measured by the number of breaths we take, but by the number of moments that take our breath away."

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UNIVERSITY OF CONNECTICUT

Alec Shub <alec.shub@uconn.edu>

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 5:37 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Chris Matera <christoforest@gmail.com>
**Sent:** Wednesday, October 21, 2020 5:14 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change,

Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit.

Nature is essential for the future, for evolution and for everything we need, and serves the public good now and for the long term.

We have so many beautiful natural areas, and some need to be protected for nature study, hiking, and places that people can count on. This has never been more important.

Meanwhile - we are burning and exporting our public forests? Who benefits? This is beyond disturbing.

We need systems that support good jobs, local resource use, AND natural areas.

Our public land is held in the public trust.

We need your leadership.

Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

---

cema
CONNECTICUT ENERGY MARKETERS ASSOCIATION

October 21, 2020

# GOVERNOR'S COUNCIL ON CLIMATE CHANGE
## Working Group Draft Report Public Comment

To: Governor's Council on Climate Change

Fr: Christian Herb, President

**Re: Comments on Buildings and Transportation Working Group Draft Report**

The Connecticut Energy Marketers Association (CEMA) represents retail fuel dealers engaged in the sale of ultra low sulfur heating oil that is blended with renewable biodiesel. Our members employ approximately 13,000 Connecticut residents who install, repair, and maintain heating equipment and sell heating fuels to approximately 40% of the homes in the state.

Last year, CEMA's Board of Directors unanimously adopted the following motion in support of reducing emission for the heating sector:

***"CEMA will work with its stakeholders to reduce greenhouse gas emissions based on 2001 emissions baseline by a minimum 45% reduction by 2030 and an 80% reduction by 2050 for deliverable liquid fuels used for heating. "***

CEMA is here to provide information in support of the recommendations in the Governor's Council on Climate Change (GC3) Buildings draft report that include biodiesel. Specifically, we are **supportive of the recommendation to create a "Renewable Thermal Portfolio"** that includes biodiesel and other low carbon liquid fuels (ie. renewable diesel, ethyl levulinate, etc). This recommendation is consistent with Public Act 19-35 which states that the Integrated Resource Plan (IRP) *"include recommendations for the creation of a portfolio standard for thermal energy that may include, but not be limited to, biodiesel that is blended into home heating oil," and requires the Department to consult with representatives of the heating oil industry and biodiesel producers in developing its recommendations."*

It is important GC3 have a greater understanding of why there is no other energy source or technology that can make a faster impact on reducing greenhouse gas (GHG) emissions and curbing the need for fossil fuel generated electricity that low carbon liquid fuels that can achieve net zero carbon.

CEMA believes that the hundreds of family owned companies who have provided energy services to Connecticut homes and businesses for over a century, can be a big part the solution to complying with the mandated 2030 and 2050 GHG reductions found in Public Act 08-98.

With just under half the homes in Connecticut using liquid fuel to keep warm, our industry is uniquely positioned to transition from traditional heating oil to Bioheat®. Bioheat® is a blend of ultra low sulfur heating oil and renewable biodiesel that is derived form waste products like used cooking oil and grown products like soy beans. Hundreds of thousands of homes in our state need little or no modifications to their heating equipment to start using a fuel that is cleaner and has the ability to displace fossil fuel TODAY! Low and moderate income (LMI) families were incentivized to convert to natural gas when they were told that it was "cleaner, cheaper and more reliable" only to find out a short time later that methane is dirtier, more expensive and less reliable than other fuels that are available to them.

LMI households can not afford to convert to another promised energy source and technology that will only perpetuate the need for additional natural gas lines to generate enough electricity to meet the demand that electric heat pumps will put on the grid.

Using liquid renewable fuels like biodiesel does not require homeowners to have to spend money to replace their oilheat equipment with other technologies, and it does not require the cost of upgrading electric service to accommodate heating equipment that solely relies on electricity to produce heat. Biodiesel does deliver a number of benefits to the environment and the ratepayers of our state by forgoing the need for massive investments in new electric generation and upgrading its distribution.

The liquid fuels infrastructure has been privately developed and maintained for many decades, and has been transitioning from heating oil to Bioheat® fuel for a number of years. Implementing a Renewable Thermal Portfolio that includes biodiesel and other low carbon liquid fuels would help facilitate the transition from traditional heating oil by implementing a thermal renewable energy credit program (TREC). This would be a big step forward in the liquid fuel evolution that is underway and it would relieve the tremendous pressure to bring adequate amounts of zero emissions electricity online to accommodate the states efforts install electric heat pumps and move to electric vehicles.

No one can guarantee that the deployment of renewable thermal technologies (RTT) will happen fast enough and in large enough numbers to actually have a measurable impact on reducing GHG's. And no one can guarantee that the RTT's that are deployed will be able to access enough low or zero emissions electricity to comply with the state required GHG reductions. As we recently learned, electric ratepayers are increasingly sensitive to rate increases, and will resist programs that increase rates. That is why biodiesel is a perfect solution to lower emissions today – it does not cost consumers any more to purchase it and it does not require capitol investments to switch their heating system to use it.

In the heating season, when the increase in peak load from cold-climate heat pumps would be realized, CO2 emissions are higher due to efficiency issues with heat pumps in the cold winter months of Connecticut. A 50% biodiesel blend produces less CO2 emissions than electricity in Connecticut and conversions to cold climate heat pumps and to electric vehicles will only increase the CO2 emissions from electricity. Biodiesel reduces life cycle GHG emissions by 78-86% from ultra-low sulfur heating oil when using the 100-year LCA, providing immediate benefits to the environment.

- A Brookhaven Laboratory study, looking at the CO2e emissions over a 100-year atmospheric lifetime from the use of, ultra low sulfur heating oil (ULSHO) = 192.93 lbs. CO2e /MMBtu, while a 50% biodiesel blend = 116.115 lbs. CO2e/MMBtu.
- In addition, according to the EIA, in 2017 Connecticut's electricity was generated from 46% natural gas, and natural gas used for electric generation was increasing at 4.4% per annum from 2007-2017.
- The EIA reports that Connecticut's electricity generation in 2017 averaged emissions of 501 lbs. CO2/MWh. That equates to emissions of 146.83 lbs. CO2/MMBtu from electricity in Connecticut. In addition, the 501 lbs. CO2/MWh emissions are the yearly average.

If a TREC program is properly implemented, biodiesel can plug in almost instantly to homes and businesses that will deliver two immediate benefits to the environment – 1. displace oil used for heating and 2. reduce the need for fossil fuel generated electricity. What other option delivers so much for so little?

Fifteen state Renewable Portfolio Standard (RPS) programs have added renewable thermal technologies. Renewable thermal energy has many of the same benefits as other renewable technologies, including improved air quality, economic development and job creation, along with the promotion of regional energy security.

Now that we have clearly demonstrated that biodiesel is a solution that GC3 has been looking for to reduce emissions, lets look at what impact it may have on electric rates.

The National Renewable Energy Laboratory, the national laboratory of the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, published a fact sheet titled "Understanding the costs, benefits, and impacts of U.S. Portfolio Standards". After studying portfolio standards across the U.S., NREL concluded that the current portfolio standards from 2015-2050 will affect cost of electricity prices by a range from -2.4 cents/kWh to 1.0 cent/kWh. Most portfolio standards across the U.S. decrease the cost of electricity to end users. When considering these studies, it is important to note that Thermal Portfolio Standards are typically 10-20% of the size of Renewable Portfolio Standards and their impact on cost is typically 10-20% of RPS programs.

In the Massachusetts 2016 Renewable Portfolio Standard and Alternative Portfolio Standard Annual Compliance Report, published on December 27, 2018, the Massachusetts Department of Energy Resources estimated that the compliance costs from the APS increased electricity rates between $0.0004 and $0.0009 per kWh from 2011 to 2016. It is also noteworthy that the estimated cost impacts also likely declined between 2015 and 2016.

This de minimis cost has resulted in the displacement of fossil fuels in the Massachusetts APS program since biofuels became eligible in 2018 has been a major benefit to the state. In 2018, 9.8 million gallons of heating oil was displaced with biofuel. In the first two quarters of 2019, 9.7 million gallons of heating oil was displaced with biofuel. 2019 will result in more than 21 million gallons of heating oil displaced, eliminating more than 205,000 metric tons of CO2e emissions (calculated using 100-year atmospheric lifetime).

The National Renewable Energy Laboratory, the national laboratory of the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, published a fact sheet titled "Understanding the costs, benefits, and impacts of U.S. Portfolio Standards". NREL estimates that U.S. Portfolio Standards will create an increase in renewable energy employment by 19% by 2050 if no additional portfolio standards are implemented and 47% by 2050 if additional portfolio standards are created. Connecticut is in a great position to leverage the benefits of a thermal program to enhance what we are already doing.

We believe that a TREC program will be successful in increasing the consumption of biodiesel with tremendous emissions savings at little to no cost to ratepayers and CEMA recommends that Connecticut design a TREC program that can be a robust as possible by not restricting the feedstock used in producing biodiesel.

Used cooking oil is a biodiesel feedstock that is considered a waste product. Soy-based biodiesel, is also a waste feedstock. Soybeans are grown for food consumption in the U.S. and throughout the world. Every soybean that is grown, 80% becomes protein meal and much of the remaining part of the soybean is oil waste product is used in biodiesel production. If this oil was not used as a heating fuel it would enter the waste stream.

Thermal Portfolio Standards across the U.S. that include biomass, biogas, and biofuel typically require a reduction of life-cycle greenhouse gas emissions by at least 50% compared to a high-efficiency unit utilizing the fuel that is being displaced. Used cooking oil and soy-based biodiesel qualify for that standard.

Soybean oil is the most abundantly used feedstock for biodiesel production in the United States, producing more than double the gallons than the second used feedstock. In order to adequately supply

Connecticut with biodiesel and reduce the greatest amount of carbon, soy-based biodiesel should be an eligible feedstock in the Connecticut Thermal Renewable Portfolio Standard. A study conducted by Argonne National Laboratory in 2017 concluded; "Relative to the conventional petroleum diesel, soy biodiesel could achieve 76% reduction in GHG emissions." Used cooking oil does not have the production capacity to support high demand for biodiesel in Connecticut and the northeast, so it is imperative that the program is feedstock neutral.

Another recommendation that CEMA has, is to measure fuel emissions differently. If Connecticut wants to be environmentally and intellectually honest about emissions, life cycle analysis, opposed to burner tip emissions, needs to be the new standard to measure emissions.

Burner-tip emissions are a one part of the life cycle assessment and haven't been used as an emissions measurement exclusively by any national laboratory for years. When our goal is to reduce GHG emissions to combat climate change, using exclusively burner-tip emissions would provide inaccurate data and cause decisions to be made that could harm efforts to reduce emissions.

Life Cycle analysis (LCA) is used to quantify the environmental impacts of products or services. It includes all processes, from cradle-to-grave (or well head to burner tip), along the supply chain of a product or service.

LCA calculations:

- Land management change
- Cultivation and harvest of biomass
- Transportation of feedstock
- Conversion to energy carrier
- Distribution
- **Use**
- Disposal\

Burner-tip emissions only measure the emissions from the **use** of the product and fail to give a clear picture of the true impact.

LCA is used by:

- National Renewable Energy Laboratory
- Lawrence Berkeley National Laboratory
- Argonne National Laboratory

- U.S. Department of Energy
- U.S. Environmental Protection Agency
- European Union

For Connecticut to meet its 45% GHG reduction goal by 2030, an all hands-on deck method must be adopted, where all thermal heat sources and electricity generation both reduce GHG emissions. A 50% biodiesel blend by 2030 would decrease GHG emissions from heating oil by 45% and a TREC program would be a big step forward in accomplishing that goal.

While CEMA disagrees with the recommendation to ultimately eliminate combustion in place of electricity that is generated with methane, we believe that GC3 should modify its recommendations to eliminate RTT's that utilize grid electricity until the electric sector can demonstrate it has enough zero emissions power to accommodate the added demand that RTT's will demand. Clean combustion that can achieve net zero emissions is as good as wind or solar generated electricity, if not better. GC3 should only be focused on emissions and not on a particular fuel or technology, if lowering emissions is the goal. If we want to had our energy future over to utilities, then a rush to add electric load to the grid by incentivizing electric heat pumps will accomplish that.

GC3 should be aware that heat pump technology requires the homeowner to keep their primary heating system to accommodate colder temperatures. Our members report that nearly all their customers that have added a whole-home electric heat pump system have had to keep their oil, gas or propane system so that they have adequate heat when they need it most in the winter. Consumers typically complain about the large investment in a heat pump system when they learn that they have to use their primary heat source when it gets cold out. LMI families that can not afford to install an new electric heating system and also maintain a second heating system to get through the winter.

Since heat pumps are inefficient in cold weather and expensive to install, and currently use electricity primarily generated with natural gas, it seems unwise to use ratepayer dollars to deploy a technology that will burden the grid and sustain the need for fossil fuels to generate electricity.

Here is more information on the true cost of heat pumps –

## Conversion: Cost

*The cost of converting to an electric air-source heat pump system in Massachusetts is substantial and isn't affordable for most low- and middle-class residents*

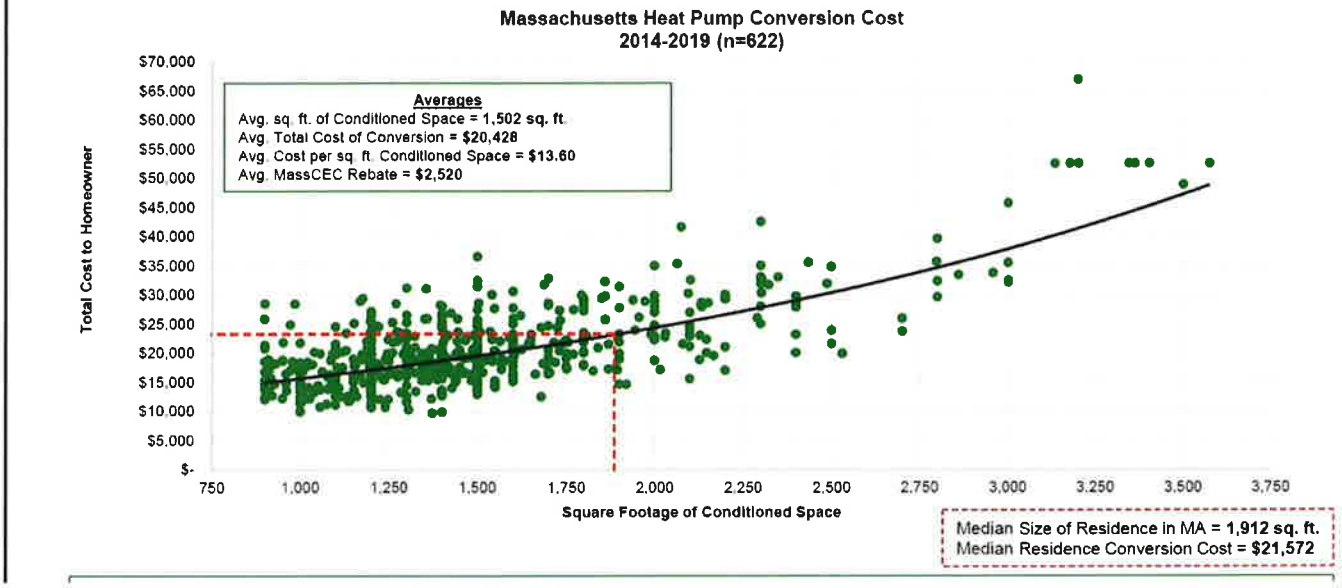



Chart: Diversified Energy Specialists, *Case Study: Massachusetts Air-Source Heat Pump Installations 2014-2019*

**COST OF OPERATION**

Heat pumps of course require electricity to run. Their efficiency degrades in cold weather and backup heating systems are needed. As the ACEEE report mentioned above states, "Cold weather increased the need for back-up systems, defrost operation, and reduced the performance of the heat pump (p. 1-13)

The cost of operation is a function of very specific information: the SEER and HSPF ratings of the heat pump, its heating capacity at 47 F, the geographic conditions of where the home is, the heat loss of the building, the cooling and heating load hours, and of course the cost of electricity. These are calculated in the informative website www.learnaboutheatpumps.com. This website shows the cost of operation for two different heat pumps (shown on the following page):

A **Fujitsu FO314RSJ** outdoor unit married with a FH3617TTDS*SN indoor air handler.

Region V - Connecticut
$0.2154/KWh electricity cost (EIA)
Cooling load hours: 600
Heating load hours: 2500
Building heat loss: 40,000 BTU/hr
Fujitsu SEER: 14.0
Fujitsu HSPF: 8.2
Heating capacity @ 47 degree F: 24,000 BTU/hr

These properties then result in the following annual costs:

**Summer cooling: $219**
**Winter heating: $2,431**

Next we look at a so-called cold-climate heat pump, the **Mitsubishi MXZ-3C24NAHZ**. We keep the same housing, electric costs and geographic parameters as with the Fujitsu unit above, but change the equipment ratings for the Mitsubishi as follows:

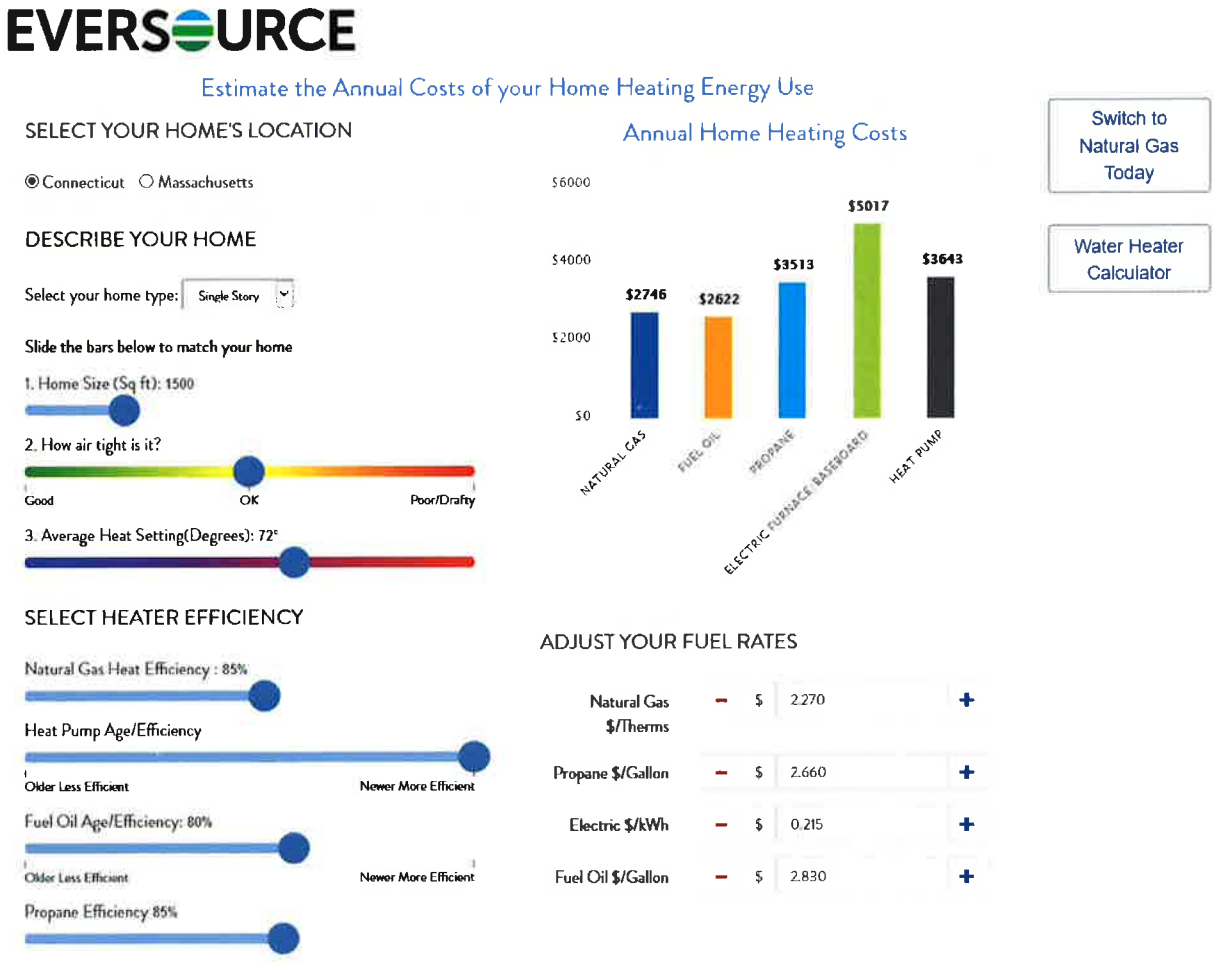
SEER: 15.5
HSPF 9.0
Heating capacity @ 47 degree F: 30,600 BTU/hr running at maximum capacity

**Summer cooling: $250**
**Winter heating: $2,141**

**Eversource Calculator**

Interestingly, Eversource shows even more expensive costs of operation of heat pumps on its online calculator which can be found here
https://c03.apogee.net/mvc/home/hes/land/el?utilityname=eversource&spc=hcc

This Eversource calculator is not equipment specific, as shown above, but rather looks at just a few key variables for the user to input: size of home, which we put in as single-story, 1500 sq. ft., average temperature which we put in as 72° F. and gas/propane equipment efficiency at 85%, heating oil efficiency at 80% and heat pump efficiency at the maximum, (giving them the benefit of the doubt). Pricing comes from the DEEP website https://www.ct.gov/deep/cwp/view.asp?a=4405&Q=481616&deepNav_GID=2121, using the DEEP regional heating oil survey price for heating oil, and EIA propane, natgas and electricity prices. A screenshot of the results follow:




The annual heating costs of various fuels are shown in the bar chart, which are repeated below for readability purposes:

| Energy Source | Fuel Rate | Annual Heating Cost |
|---|---|---|
| Natural Gas | $2.27/therm | $2,746 |
| Fuel Oil | $2.83/gall | $2,622 |
| Heat Pump | $2.15/KWh | $3,643 |
| Propane | $2.66/gall | $3,513 |
| Electric Resistance | $2.15/KWh | $5,017 |

As can be seen, even according to electricity utility Eversource, heat pumps are the second most expensive heating system to operate for a homeowner, behind electric resistance heating, using the assumptions shown for this calculator. In fact, the two most expensive ways to heat your home are both electricity based.

**HEAT PUMPS ONLY A SECONDARY HEAT SOURCE**

Finally, heat pumps, which work less efficiently during the cold months, are only a secondary source of heat for the vast majority of homeowners, primarily used during the "shoulder" months and on hot days for air conditioning. As shown in the survey results below from the Massachusetts Clean Energy Center, only 19% of respondents said that their heat pumps are the primary source of heat for their homes, and 89% said that they had another heating system in the house, be it oil, propane or gas. And of those that didn't have another heating system, 84% were dissatisfied with their heat pumps, saying it did not sufficiently heat at least 90% of their living space. We suspect some "buyers remorse" at play here.

Chart: Dive

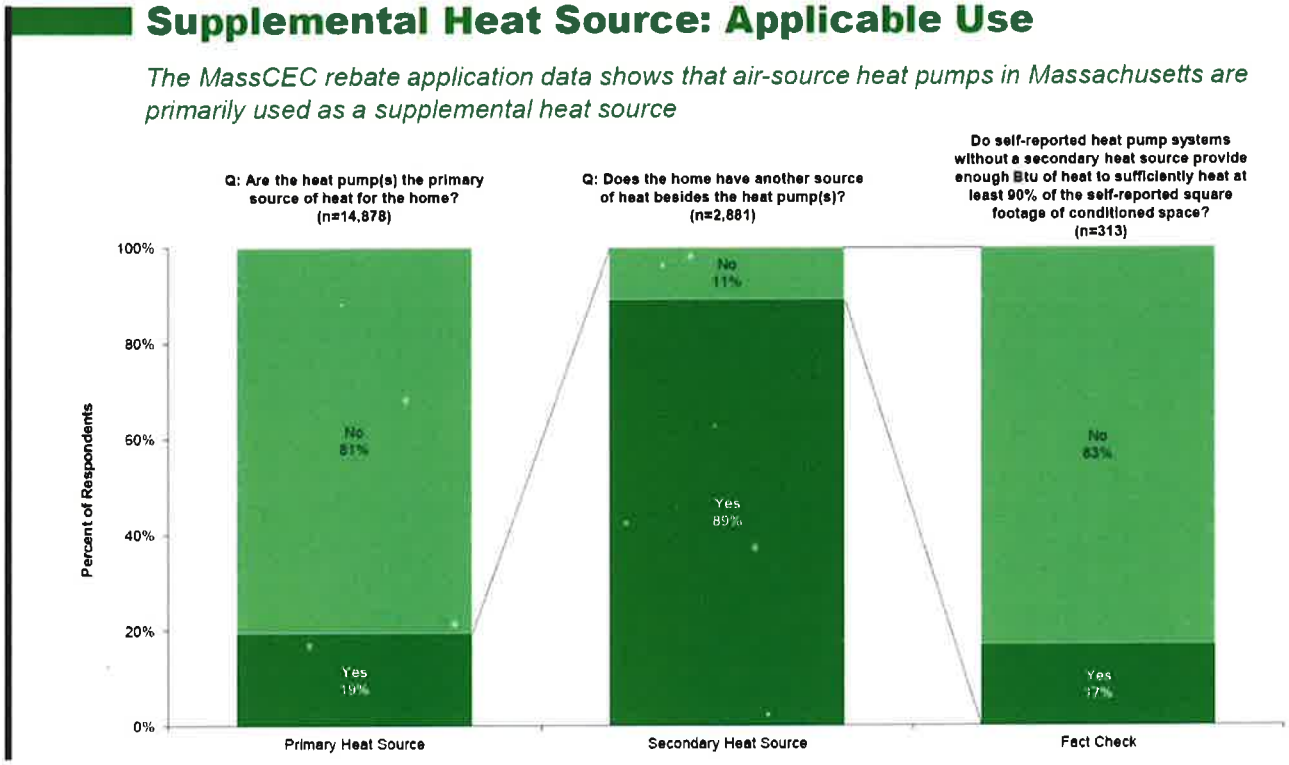



Chart: Diversified Energy Specialists

Using real-world numbers rather than theoretical assumptions, heat pumps are very expensive to install, out of reach financially from lower and even some mid-income households. They are expensive to operate, more expensive according to Eversource than even heating oil and propane, and these expensive systems are a lot to pay for, to use just as a secondary heating source or a shoulder season heating system. Let the buyer beware. Buying into the hype of a heat pump is "buying a pig in a poke."

The state should be cautious before committing to entirely replacing Connecticut's current power capacity with wind and solar power generation. Unless technology in the future should radically change, there are physical constraints to making such wholesale conversion possible. In the meantime, Connecticut can transition to a zero-net carbon energy source in the heating sector, without the need to put any additional burden on the existing electric power grid, through the use of Bioheat® fuel.

It is a fact that solar and wind electric power farms are much more land intensive than gas or nuclear power plants. For example: "Wind farms require up to 360 times as much land area to produce the same amount of electricity as a nuclear energy facility, a Nuclear Energy Institute analysis has found. Solar photovoltaic (PV) facilities require up to 75 times the land area." https://www.nei.org/news/2015/land-needs-for-wind-solar-dwarf-nuclear-plants. It's simply the nature of the science and engineering behind wind and solar plants that they are land intensive.

Given that the state of Connecticut wants to move entirely to renewable power, specifically wind and solar, for electricity generation, it's reasonable to ask how much land such plants would consume.

SOLAR

Let's look at solar first. Connecticut has a large solar farm currently in Somers, CT. https://en.wikipedia.org/wiki/Somers_Solar_Center It has a capacity of 5 MW of electricity, and covers 50 acres of land. According to ISO-New England, Connecticut power plants have a nameplate capacity of 8,700 MW https://iso-ne.com › grid_mkts › key_facts › final_ct_profile_2013_14

Doing the math, Connecticut would require some 1,740 solar farms the size of the one in Somers to replace all existing electric power capacity in the state, and doing another calculation, this would require some 87,000 of land use. Now, there are some 3,548,000 acres of land in Connecticut, so the 87,000 acre solar farm would only take up 2.5% of all the land area of Connecticut, which doesn't sound too bad. But this land area is equivalent to the total sum of all the land taken up by the cities of Hartford (11,490 acres), Bridgeport (12,400 acres), New Haven (12,870 acres), Waterbury (18,530 acres), New Britain (8,576 acres), New London (6,886 acres) and Meriden (15,440 acres). Conversion of such an area to PV solar power plants would be among the greatest land seizures by eminent domain in U.S. history.

WIND

Wind power plants come in two forms, onshore and offshore.

- Onshore

For our onshore example, we look at the Sheperds Flat wind farm in Oregon, the world's fifth largest onshore wind farm. https://www.power-technology.com/projects/shepherds-flat-wind-farm-oregon/

This wind farm has a capacity of 845 MW and covers some 80 square kilometers. We calculate that 10.3 such wind farms would be needed to replace CT's 8,700 nameplate capacity, and these would span some 823.7 square kilometers. As Connecticut consists of 14,360 km in area, this onshore wind plant would cover 5.7% of the state, more than twice the area of the solar plant described above.

- Offshore

Since solar and onshore wind power plants take up so much land space, perhaps an offshore wind plant in Long Island Sound would be preferable. After all, there are no homes or businesses to disrupt out in the Sound.

The world's largest offshore wind power plant is the Walney Extension wind farm off the coast of England. https://www.power-technology.com/features/largest-offshore-windfarm-world/

Unfortunately, as we shall see, the news isn't good. The British wind farm has a capacity of 659 MW and is spread over 145 sq. kilometers in the North Sea. To replace CT's 8,700 nameplate capacity, we'd need some 13.2 Walney-sized windfarms which would cover an expanse of 1,914 sq km of Long Island Sound. But the Sound only covers 3,056 sq km. In other words, this huge wind farm would choke off Long Island Sound, covering 62.6% of its entire surface area. This would mean a wind farm covering every square meter of Long Island Sound from the New York border to Rhode Island, and penetrating from a few miles into the sound at its narrowest point, to over 100 miles at its widest point.

The shaded area in the map below gives you an idea of the magnitude of such a wind farm.

If biodiesel is included in a renewable portfolio standard for thermal resources it will reduce the need to use the acreage requiored for wind and solar generation.

**TRANSPORTATION RECOMMENDATIONS**

CEMA also represents motor fuels distributors who own, operate and distribute gasoline to approximately 1,000 convenience stores in the state. Our members own property in virtually every municipality, pay local and state taxes, employ thousands of people, and play a vital role in Connecticut economy.

While we recognize the role that electric vehicles (EVs) can play in helping to mitigate carbon emissions from the transportation sector. Fuel retailers in Connecticut are uniquely positioned to play an important part in the future of fueling vehicles and lowering emissions.

In order to do this, it is essential that the state does not pick winners and losers by allowing regulated utilities to unfairly use their monopolistic status to overpower private market participation in EV refueling. Allowing massive (and in some cases foreign owned) utilities to do this would be unfair, it would destroy competition, and drive local family owned companies out of business taking with them thousands of jobs.

**We are asking that GC3 add recommendations that prohibit monopolies with a guaranteed rate of return to control EV charging.** If utilities are allowed to own and/or operate EV charging infrastructure it would not only discourage private companies from investing in infrastructure, but it would also have a detrimental effect on their ability to maintain the current infrastructure that motorists depend on and will continue to use as EV's become more prevalent.

Over the past decade, federal policies such as the Renewable Fuel Standard (RFS), the Biodiesel Blenders Tax Credit, and others, have created incentives for fuel retailers to invest in infrastructure necessary to bring cleaner burning fuels to the market. Our members support policies that encourage a vibrant and competitive market that will deliver the most efficient prices to the public, but if electric utilities are allowed to exercise government granted power in the motor fueling space, private businesses will not be able to compete.

Connecticut needs to examine a regulatory landscape which encourages fuel retailers to invest in alternative fuels before generations of investment in thousands of locations throughout the state are irreparably harmed. Connecticut has one chance to get this right, or a major segment of the economy will be decimated.

CEMA's members have serious concerns with the prospect that regulated utility companies may be allowed to enter the EV charging business. It is an inappropriate use of ratepayer dollars to underwrite utility investment in EV charging infrastructure without having to put a single dollar of their

shareholders at risk. We strongly discourage Connecticut from granting the utilities an insurmountable competitive advantage over privately owned businesses. By doing so, continued investment in the existing motor fuels infrastructure will likely end over time and it will stifle the development of a robust EV charging infrastructure and other alternative low/zero emissions fuels.

While utilities need to play a role as EV's enter the market, they should be focused on grid enhancements, distribution upgrades (ie. line extensions), cyber security and other issues to ensure that the "lights stay on" as demand for electricity grows - these are fundamental to the reason that they have been granted monopoly status. Owning and operating retail EV charging infrastructure is inconsistent with why utilities are allowed to operate without having to compete, especially since there are hundreds of market participants who are currently involved in fueling vehicles today. **GC3 should include recommendations that support pathways that leverage the current fueling network that has been privately developed to bring alternative fuels to consumers - not allow for unfair competition that will destroy over 100 years of private investment.**

Connecticut has a long-established policy that prevents vertical integration in the motor fuels sector. Since 1979, state law (CGS Sec. 14-344a and Sec. 14-344b) has divorced gasoline refiners from both owning and operating gas stations in our state. CEMA believes that the spirit of this law is to protect consumers and local retailers from monopolistic type behavior in the motor fuels sector. When this law was enacted over forty years ago, the legislature could not have foreseen the potential for regulated monopolies from selling fuel to the public. CEMA would argue that the same law that applies to refiners, would apply to utilities if they could have predicted the potential of a monopoly selling fuel to the public. **We ask the GC3 include this protection in their recommendations.**

Another issue that GC3 needs to look more closely at is the impact that a shift from gasoline and diesel fuel will have on the states tax revenue. The gasoline excise tax, diesel excise tax, and the petroleum gross earnings tax (GET) will all be negatively impacted as EV's become a larger part of the state's vehicle fleet. Connecticut must have a tax that applies to electricity that is used to fuel EV's that generates the same amount of revenue that traditional vehicles generate. As the Governor and legislature debate ways to fund the repair, maintenance, and expansion of our transportation infrastructure, EV's need to contribute their fair share to support transportation funding!

We have expressed our concerns (and recommended solutions) in this document about the impact that EV's will have on competition, local businesses, investment and tax revenue, but GC3 also needs to be cognizant of the impact that the "electrify everything" policy that the state is pursuing will have on grid reliability, the cost electricity, and grid emissions.

GC3 should be cautious before committing to entirely replacing Connecticut's current power capacity with wind and solar power plants to accommodate EV's. There are physical constraints to making such

wholesale conversion possible. In the meantime, Connecticut can transition to a net-carbon zero energy source in the heating sector, elevating the need to put any additional burden on the existing electric power grid, through the use of biodiesel. Why further burden the grid by adding electric heat pumps, when electrons can be saved with liquid fuels that can deliver on emissions reductions that help the state comply with the greenhouse gas reductions required under the Global Warming Solutions Act? Since biodiesel and renewable diesel can be used as a transportation fuel (along with other low carbon fuels), the state can significantly reduce demand on the grid and significantly lower emissions by utilizing the potential of local businesses to sell low/zero liquid fuel to the public.

We know that policymakers are concerned about increasing what are already the highest electricity rates in America, and as business owners we are troubled about the impact that potentially billions of dollars in ratepayer investment that will be needed to upgrade the grid, subsidize new clean electric generation sources, the subsidization of EV infrastructure, and EV incentives will have on rates. We believe that Connecticut should put as much effort into finding low carbon/zero carbon liquid fuels, that utilize existing infrastructure that has been privately developed, as they are into electrification of the transportation and heating sectors.

Before the state has even adopted any of the costly suggestions that have been made by EV industry advocates, Eversource customers are paying 15.8% more for electricity in 2020 and United Illuminating (UI) customers realized a 26.4% increase (which equates to average customer using 750 kilowatt hours a month paying $9.65 and $16.55 more per month with Eversource and UI respectively)! Connecticut needs to factor costs in and "right size" their electrification plans before fixed income and low-income families are disproportionally affected by the proliferation of EV's and the infrastructure that comes with it. GC3 needs to address the question of who benefits from all the costs that go into creating an electric future for Connecticut, and needs to avoid the mistakes that have advantaged the wealthy over LMI families.

Of the 57,066 households that received the federal EV tax credit in 2016, 78% had at least a six-figure income and 7% reported more than $1 million in income, while less than 1% of all EV credits went to households earning less than $50,000 in 2014, meaning that about half of Americans receive virtually no benefit from the credit. EV manufactures data shows that EV's are overwhelmingly benefit the wealthy. Tesla's customers have an average household income of $293,200 while even the buyers of the more modestly-priced electric Ford Focus have an average income of $199,000. On top of the EV tax credit, electric cars owners don't pay gas taxes to help support the roads they use, shifting more of the burden onto other drivers, contributing to a funding deficit that support our roads and bridges. GC3 should not recommend incentives to purchase EV that will only benefit citizens who would be able to afford them without it.

GC3 also, has to ask the question are we trading one type of pollution for another? Much of the literature noted that EV's emit less CO2 than traditional internal combustion engines (ICE). However,

the makeup of the electric grid plays a role in the release of other gaseous pollutants and particulates. According to Weeberb J.Requia's "How Clean Are Electric Vehicles? Evidence-based Review of the Effects of Electric Mobility on Air Pollutants, Greenhouse Gas Emissions and Human Health", in China, even with an electric grid largely powered by coal, EV's decrease CO2 emissions by 20% compared to ICE's. However, in the same study, emissions of PM10, PM2.5, NOx, and SO2 emissions increased 360%, 250%, 120% and 370%, respectively.

The environmental impact of EV batteries cannot be ignored and needs to be a part of the states plan. Li-ion battery production primarily occurs in China and South Korea, whose electricity mix is generally carbon-intensive. Han Hao's "GHG Emissions from the Production of Lithium-Ion Batteries for Electric Vehicles in China." (April 4, 2017) showed that the GHG emissions were nearly 30% higher than those for comparable ICE's. EV battery materials impact the environment in different ways. Batteries that use large amounts of aluminum LiMnO2 and LiFePO4, for instance, have a greater impact on ozone depletion. At the end of the day, GC3 needs to factor in the environmental impact of EV batteries and their disposal. A lifecycle analysis of EV and the infrastructure needed to support them needs to be done comparing them to low emissions liquid fuels before ratepayers are burdened with more costs and environmental issues.

The current electric grid is not clean and adding EV's and electric heat pumps to it will only exacerbate the need for natural gas to ensure that we have enough power to support current demand and the additional demand that EV's will create. According to Gale Ridge, PhD, a scientist and researcher, *"In a one month period, we found about 700 [natural gas] leaks in Hartford. Over a one year period covering the same area, PURA reported 139 leaks. Even recognizing that some of the leaks we found are known to PURA, that's about a 5 fold difference. We believe that CNG may be missing a large percentage of its leaks."* Current overreliance on natural gas is clearly causing greater methane and CO2 emissions and a massive expansion of EV's and heat pumps in Connecticut will only drive more emissions for a grid that depends on natural gas to power the state. The state should not move forward with any plan to electrify the transportation sector until they can verify that the electricity that is being used to power EV is truly emissions free.

Finally, energy security is of the utmost importance to the health and wellbeing of the residents of the state and a vibrant economy. Similar to the natural gas expansion and conversion plan that attempted to decimate the liquid fuel industry, the current electrify everything plan jeopardizes our energy security by putting all of our energy eggs into one basket.

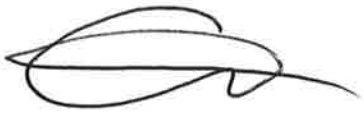
Low carbon liquid fuel helps diversify the state's energy mix and hardens the overall system against catastrophic failure due to weather, cyberattack, or other issue that could cause wide spread electric outages. Biodiesel has the highest energy content of any other fuel that is widely available in Connecticut and is stored everywhere it is used. Our industry has created a "nano-grid" that ensures that consumers have weeks of onsite fuel storage to meet their needs.

Since liquid fuel is delivered to our customers in a variety of ways - over the road by trucks, through pipelines, and by waterborne vessels - it is extremely unlikely that the distribution chain would ever be susceptible to the same catastrophic failure that electric power lines and natural gas mains are exposed to. GC3 needs to be aware that renewable liquid fuels not only reduce emissions, but they ensure that homes and businesses have fuel when other sources of energy are not operating.

**Summary**

- We support the recommendation to create a lockbox for energy efficiency funds.
- We are opposed to the overall concept of electrifying the buildings and transportation sectors, as the electric grid is heavily reliant on fossil fuels, is not positioned to handle the additional load that heat pumps and EV's would add, and that there are alternatives to lower GHG's like low carbon liquid fuels that can achieve net zero carbon emissions.
- We support the recommendation to create a renewable portfolio standard for thermal resources that includes biodiesel (and other low carbon liquid fuels). This recommendation will facilitate the transition form traditional heating oil to renewable fuels.
- We are opposed to the recommendation to assess a fee or tax on heating oil and propane as it would disproportionally impact LMI families who are least able to afford to install new heating equipment.
- We support ending the subsidized natural gas expansion and conversion plan, as there is no way to reduce the GHG impact that methane has, like we do with liquid fuels that can be blended and replaces with renewable liquid fuels.
- We are opposed to the recommendation that would require deliverable fuel dealers to collect and report annual sales by town and class of customer. Small family owned businesses do not have the ability like utilities to pass administrative cost along to their customers. Creating new administrative burdens are time consuming and costly, and are unfair to small businesses.
- We are opposed to the recommendation that prohibits fossil fuel infrastructure in new buildings and retrofits. Biodiesel and renewable diesel are net zero carbon fuels that utilize the same equipment as fossil fuels. Prohibiting their instillation in new construction will limit consumer choice and provide an unfair advantage to electricity utilities. Fossil fuel equipment that utilizes net zero liquid fuels is a part of the solution to reduce GHG emissions.
- We are opposed to recommendations that incentivize the purchase of EV's, until a system is implemented to tax the electricity that they use, the grid achieves zero emissions electricity, the grid is enhanced to accommodate the additional load that will be required to power EV's, and that LMI families will have equal access to them.
- We recommend that GC3 endorse a shift in how Connecticut measures emissions form tailpipe and stack emissions to a life cycle analysis approach. Until the state adopts a life cycle analysis approach to measuring emissions, we will never truly achieve the reductions set in the Global Warming Solutions Act.

Respectfully,



Christian A. Herb

President

DIVERSIFIED ENERGY SPECIALISTS

# Case Study

## Massachusetts Air-Source Heat Pump Installations 2014-2019

***Report Prepared For:***

cema
CONNECTICUT ENERGY MARKETERS ASSOCIATION

*November 20th, 2019*

# Disclaimer

This study was created by Diversified Energy Specialists for CEMA. All data was obtained from the Massachusetts Clean Energy Center and the Massachusetts Department of Energy Resources through a public records request filed by Diversified Energy Specialists on October 18th, 2019.

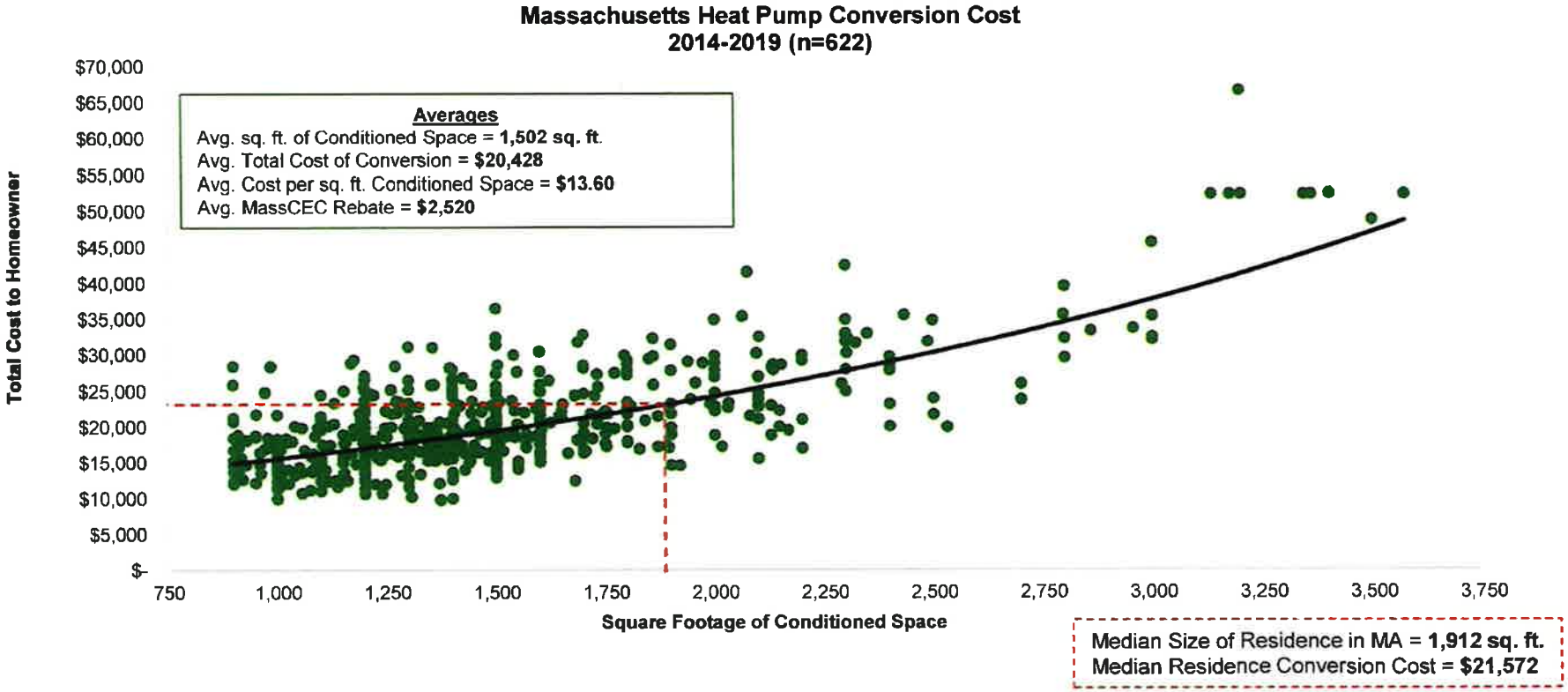
All data collected by the Massachusetts Clean Energy Center was obtained from applications for rebates. All data was self reported.

All data collected by the Massachusetts Department of Energy Resources was obtained from applications for the Massachusetts Alternative and Renewable Energy Portfolio Standards. All data was self reported.

This presentation is up to date as of November 20th, 2019.

# Conversion: Cost

*The cost of converting to an electric air-source heat pump system in Massachusetts is substantial and isn't affordable for most low- and middle-class residents*




**Assumptions**

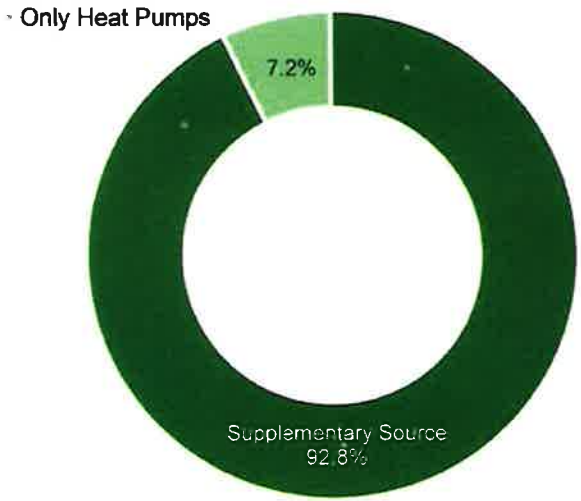
- ✓ Applications that reported a contained space under 900 square feet were excluded
- ✓ Applications that reported the installed heat pump capacity at 5° F (Btu) could not sufficiently provide heat for a minimum of 80% of the residences heat load were excluded. This calculation was based on a 40 Btu per square foot requirement
- ✓ Applications that reported the project as new-build construction or an addition were excluded. Only reports of "existing home" or "retrofit" were included
- ✓ Applications that reported heat pumps as a supplemental heat source were excluded
- ✓ Only applications within 2 standard deviations of the mean were included
- ✓ Any application that did not report square footage of conditioned space, any cost metric, installed capacity at 5° F (Btu), or number of heat pumps were excluded

Source: Diversified Energy Specialists Research & Analysis; MassCEC; MA DOER

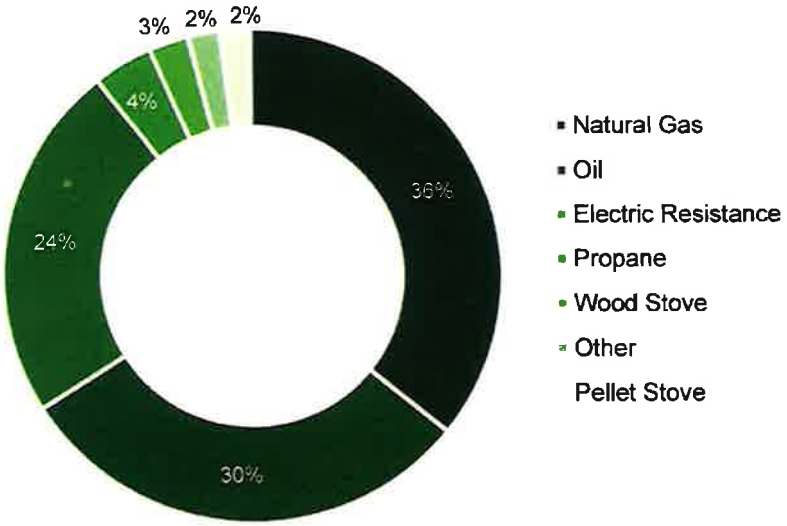
# Conversion: Supplementary Heat Source

*In addition to the high cost of conversion to air-source heat pumps, most installers recommend retaining a supplementary source of heat due to the heat pump systems inability to sufficiently heat residences in the cold Massachusetts winters*

**Percent of Conversions Retaining a Supplementary Heat Source (n=622)**




**Supplementary Heat Source (n=571)**



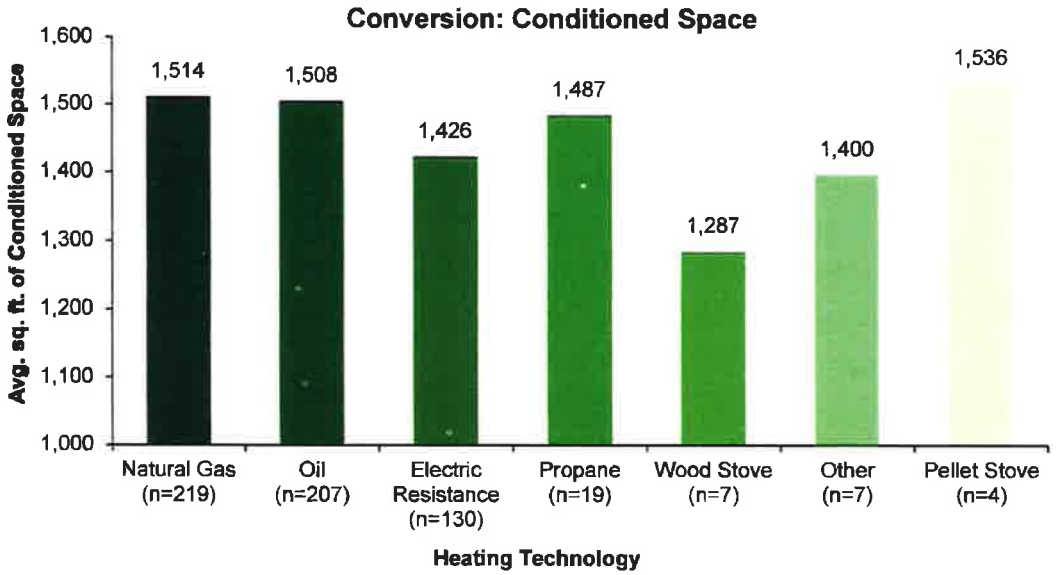

**Assumptions**

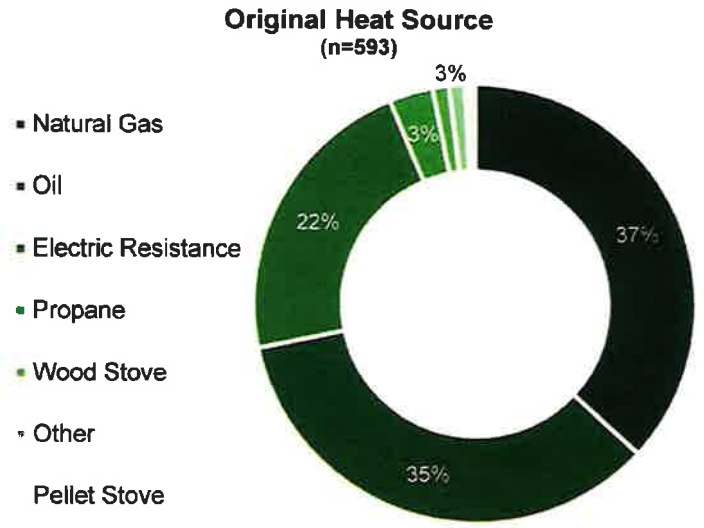
- ✓ Applications that self-reported whether a backup source of home heating would be used were included
- ✓ For applications that failed to report whether a backup source of home heating was used, DES used their self-reported installed capacity at 5° F (Btu) to determine if the heat pump system could sufficiently provide heat for greater than 90% of the residence's heat load. The determination was made based on a 40 Btu per square foot requirement. If the system could not provide sufficient heat for 90% or more of the residences heat load, DES made the assumption that a supplementary heat source was used

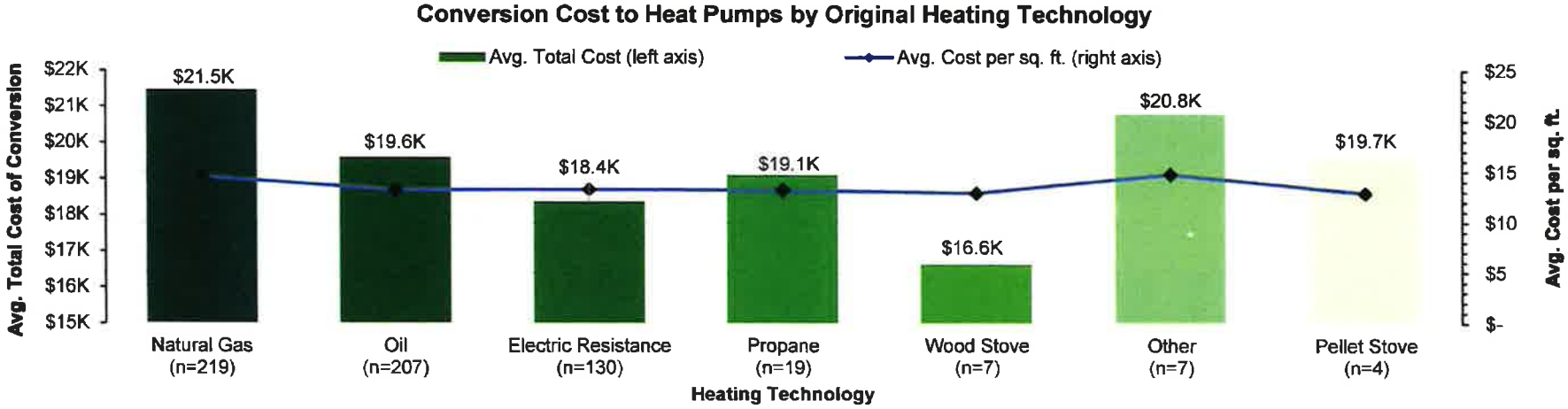
Source: Diversified Energy Specialists Research & Analysis; MassCEC; MA DOER

# Conversion: Original Heat Source

*The heating technology that is being converted to heat pumps slightly affects the price of conversion*



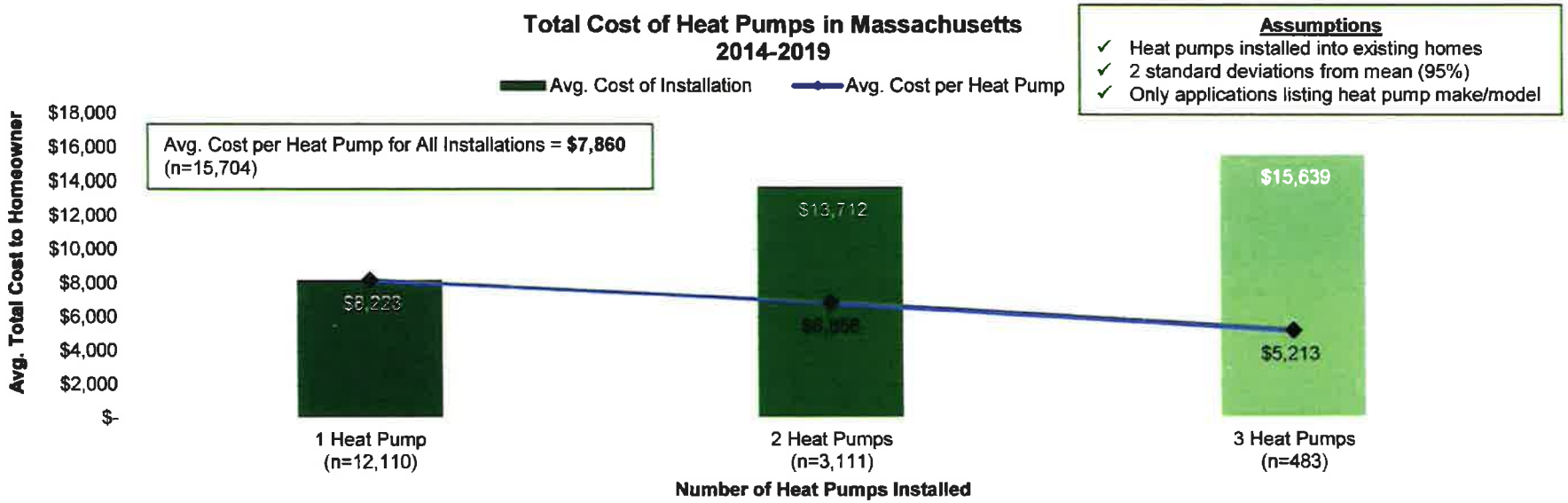



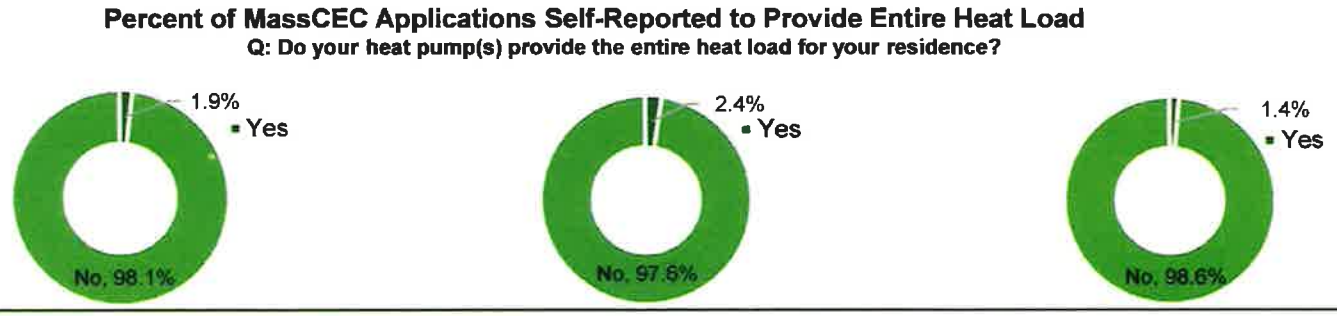




Source: Diversified Energy Specialists Research & Analysis; MassCEC; MA DOER

# Supplemental Heat Source: Cost

*DES estimates that 96%* of the data from the MassCEC rebate program from construction in existing homes was from single or multi-room systems that did not provide sufficient heat for the entire home*




*The average Btu needed to sufficiently heat a home in Massachusetts is 40 Btu per square foot. Of the 16,572 applications of retrofit construction from existing homes, DES estimates that 622 (3.8%) were full conversions (displayed on slide 3). 2 standard deviations from the mean ensured that the above data contains less than 2% full conversions and displays the price of heating less than 90% of a home. Of the less than 2% self-reported to provide the entire heat load for their home above, DES determined that only 17% were accurate based on their self reported Btu output and square footage of conditioned space (see next slide)

Source: Diversified Energy Specialists Research & Analysis; MassCEC

Conversion | Supplemental



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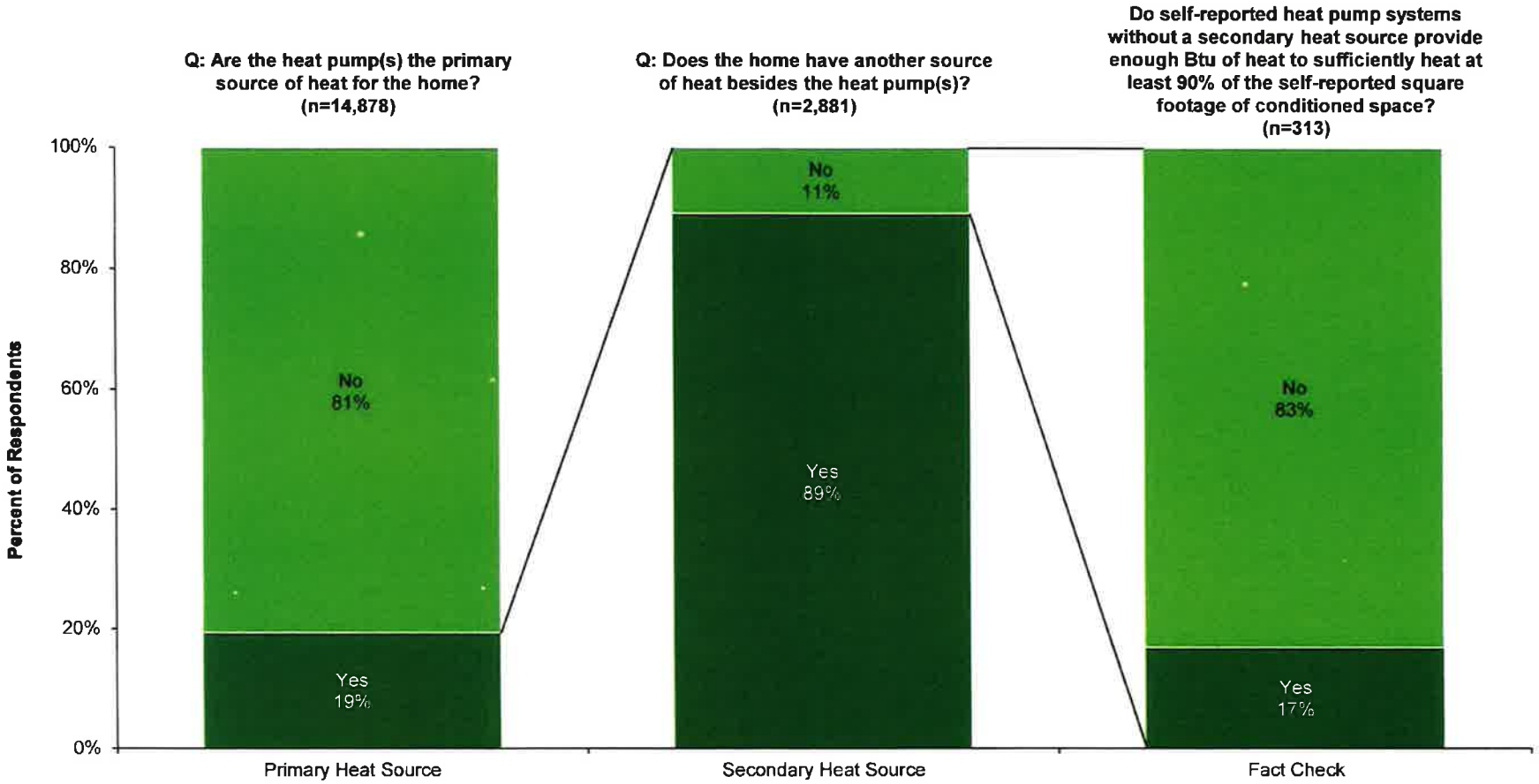
# Supplemental Heat Source: Applicable Use

*The MassCEC rebate application data shows that air-source heat pumps in Massachusetts are primarily used as a supplemental heat source*




Of the applications that self-reported that their heat pump(s) are the residences only source of heat, only 17% reported a Btu output from their heat pump(s) that could provide greater than 90% of their homes heat load. DES fact checked this number using a 40 Btu per square foot requirement

Source: Diversified Energy Specialists Research & Analysis; MassCEC

Conversion | Supplemental



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# Contact Information

*Diversified Energy Specialists is a biofuels consulting company and an aggregation in the Massachusetts Alternative Portfolio Standard*

**Joe Uglietto**
**President**
**Diversified Energy Specialists**
**857-500-0385**
**Joe@DiversifiedEnergySpecialists.com**
**www.DiversifiedEnergySpecialists.com**

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 8:37 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: editintime@everyactioncustom.com <editintime@everyactioncustom.com>
Sent: Wednesday, October 21, 2020 8:08 AM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.
5.Prioritize equity in all aspects of the GC3 working groups reports.
6.Action on climate change can start now. We should not wait on final reports to act if the science is already sound.We have reviewed and considered all of the reports

In addition to supporting the CTLCV position broadly, I would add that CT should act now to create and implement an urban/suburban reforestation plan. Urban street trees are an essential tool for mitigating the effects of climate change in urban and residential areas. But, we can't rely on our old standard trees, we have to be planning for urban trees that are drought resistant and heat resistant to plan for the environment they will face 50 years from now and more. Towns and cities need planning assistance from the state to pick appropriate trees, and will then need "seed money" to initiate planting programs that make adjacent residents partners in the care of the urban tree canopy. Trees create O2, soak up storm water, and improve property values. It is essential that care of the urban canopy be included in climate resilience planning.

Thank you again for the opportunity to submit comments.

Sincerely,
Christina Crowder
65 Treadwell St  Hamden, CT 06517-2340
editintime@gmail.com

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**Alec Shub <alec.shub@uconn.edu>**

# FW: public comment

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 11:16 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Christopher Hager <christopher.a.hager@gmail.com>
**Sent:** Wednesday, October 21, 2020 11:08 AM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** public comment



I want to thank everyone involved in the GC3 for producing the very impressive draft Working Group reports. A key thread I find running through many of them involves human impacts on the environment, and the way development patterns' ragged edges -- the places forests meet human-made spaces -- contribute to a general weakening of Connecticut's forests and negative impacts on our population (including invasive-species spread, contact with disease vectors, etc.). I think it's important for the state to have smart strategies for land protection that prioritize intact forests, which will help sequester atmospheric carbon and contribute to the overall health of our environment and population. Obviously economic development is important, but we can develop smart ways of allowing development while also protecting land more robustly than we do now.

Thank you,

Chris Hager

Canton, CT

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# Memo

October 21, 2020

To: Dr. Rebecca French
From: CIRCA Staff

Subject: **Comments on the Draft Report of the Governors Council on Climate Change.**

## Introduction

CIRCA was established in 2014 as a collaboration of UCONN and CT DEEP to increase the resilience and sustainability of vulnerable communities to the growing impacts of climate change on the natural, built, and human environment. In collaboration with the State Agencies Fostering Resilience (SAFR) group, which includes CT DEEP, DOH, DOT, and DEMHS, CIRCA leads interdisciplinary research, stakeholder outreach, and technical assistance program to towns and state agencies. Since 2014 CIRCA has raised approximately $15,000,000 to support its work, most of it from the federal government. Products included projections of sea-level rise, precipitation, temperature for Connecticut, and many more mapping and planning resources available at https://CIRCA.uconn.edu. Through the Resilient Connecticut project (https://resilientconnecticut.uconn.edu/), CIRCA and SAFR are developing an adaptation planning process in Fairfield and New Haven Counties that can be replicated across the State. To inform the GC3 process, the CIRCA faculty and staff have reviewed the draft reports from working groups and respectfully offer the following comments for your consideration.

## Financing Adaptation and Resilience

We applaud the diverse and well-articulated details in each of the five strategies and the well-organized tables that identify the action, implementation entities, equity impact, and funding scale. It would also help if each table (or using an overview table like Appendix II) were to identify which strategies are best positioned to be implemented in the short term (the coming years) vs. longer-term (5-10 years).

We fully support the Financing Working Group's recommendation that implementing and financing adaptation programs should encourage (where feasible) nature-based solutions (NBS). We believe that there is a strong case that the State should prioritize such projects for subsidies in the near-term to establish their utility and limitations and to build capacity in local engineering and construction businesses. However, there is a compelling need for adaptation projects of all types. In many, well-tested solutions are practical, necessary, and only require funding. Only funding NBS projects is unlikely to yield the most adaptation value.

We recommend that the working group consider proposing broad guidelines for allocating adaptation project costs between federal, State, and local governments and private property owners. Clearer expectations may reduce the incentive to wait for the availability of new federal or State funds. Of course, equity would require recognition of the heterogeneity in wealth across the State. Financing for more education, outreach, and training in resilience and adaptation planning for municipal staff and consultants

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CIRCA
Connecticut Institute for Resilience and Climate Adaptation

will also accelerate adaptation. We also recommend that the committee recommend a process for prioritizing projects and an interagency task force to assist in developing funding strategies.

We highly recommend Strategy 3's approach (p32) to "Provide State General Obligation Bonds as Green Bonds for Financing for Resilience and Adaptation Programs and Projects and Matching Funds for Federal Grants". With direct support and funding from CT DEEP, CIRCA ran both a Municipal Resilience and Matching Funds Grant program in Connecticut from 2014-2019 and had far more applicants than funding allowed for awards. These competitive grant programs were both popular as they allowed local implementation of resilience projects and matching funds required by other funding applications. For example, CIRCA funded 18 grants through its Municipal Resilience Grant Program totaling $745K, leveraging an additional $400K. CIRCA's Matching Funds grant awards of $330K to 11 projects leveraged approximately $1.4 million in additional project funding. While these amounts were impactful, Connecticut can look to neighboring states, especially Massachusetts, where 82% of the State's communities participate in their Municipal Vulnerability Preparedness (MVP) Program. This year, $11.6 million in grants were awarded to cities and towns through this program. Massachusetts is proposing to spend $1 billion on climate resilience by 2022, and Connecticut must anticipate the need for a similar level of investment to minimize the impacts of climate change.

## Working and Natural Lands

### Wetlands:

Given that the report highlights the importance of ecosystem services that tidal wetlands deliver, there could be more emphasis placed on living shorelines as a climate resilience strategy to protect private property and adjacent marsh and dune wetland habitats. To date, only one living shoreline has been constructed (in 2014 at Stratford Point), and two are nearing implementation (Fenwick and New Haven's East Shore Park). These sites should be monitored both pre- and post-installation to better understand the benefits and challenges of living shorelines and to promote these shoreline stabilization practices in the future at sites where conditions allow their construction. Specific places that the concept of living shorelines can be mentioned or strengthened in this report include the following strategies under 2020.W.1:

- Encourage land and ocean management behaviors that support ecosystem services (including carbon sequestration).
- Identify and conserve ecosystem services vulnerable to climate change.
- Expand monitoring and scientific assessment of climate change impacts on wetlands and near coastal waters and update management tools and strategies.
- Encourage research to understand the effects of potential adaptation approaches and develop new, innovative approaches to support adaptive management.
- The importance of living shorelines can also be articulated in Recommendation 2020.W.3 – Further-develop policies that encourage wetlands protection. CT DEEP policies encourage nature-based solutions and "green infrastructure" or "living shoreline" strategies over hardening and armoring. These practices help protect existing wetlands within or adjacent to vulnerable shorelines.

### Forests:

We strongly support the recommendations in the "Monitoring, Evaluation, and Planning" section, particularly the call to "Identify areas that are especially important to landscape-level resilience." Effectively balancing the management goals at the landscape-level requires reliable and consistent data, as noted in the report and stressed throughout this letter. We support the development of a

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comprehensive monitoring plan. State agencies and conservation organizations would use such information to track and manage the resource more effectively and prioritize highly vulnerable ecosystems and resilient landscapes for preservation and conservation.

**Agriculture/Soils:**
The potential for the expansion of Aquaculture, including inland fisheries and nearshore industries, to be a component of a resilience and adaption strategy should be noted and explored.

While occupational safety is noted in the Public Health & Safety report, we believe that specific recommendations should be added. For example, there is a need for data on climate change effects on farmers and agricultural workers' exposure to health risks. Studies should appreciate the diversity of language skills in the industry.

**Equity and Environmental Justice**
We agree that mitigation, adaptation, and resilience strategies should be co-developed in partnership with community groups and that engagement effort to assure equity is a key responsibility of planners. We have found that there is planning fatigue in some communities. Coordination and collaboration among academic, State, and non-profit groups should be enhanced. Approaches should have multiple goals to ensure as much information from the platform useful for climate, environmental, and social science context. Hyperlocal engagement aims to build rapport between agencies and the community to increase the support needed to implement adaptation and mitigation policies in the future. The community's feedback approach should be both ways to inform the public after the engagement process and share that information on different platforms other than online reports. Some of these approaches can be social media, radio, local tv news, local newspapers.

We also suggest preparing an agency-non-profit-academia project portal that lists all the engagement and partnership that has been done in the area, conducted agency, and resulted in reports. This portal will help the different groups to build on what has been done, increase partnership and collaboration, and reduce over engagement with the community over similar issues.

We see the development of the statewide environmental mapping proposed here as a critical element of a comprehensive climate change vulnerability assessment. An effective initiative should include the capacity to visualize the vulnerability, include health impacts of economically disadvantaged communities. In our opinion, the key factors to consider:

- Preparing a statewide analysis provides a state standard for social and health sensitivity. Connecticut has regions that are on both ends of the spectrum within the State in socio-economically. The statewide analysis may not give a sense of urgency in particular towns that require more assistance in providing services to create environmental equity. We suggest the tool to prepare the analysis in a multi-scale approach where the decision-makers can visualize the reanalysis in the county, Center of Government, or any other jurisdiction level to emphasize the environmental inequity within that boundary. We also suggest there may be a need to define new boundaries beyond the political jurisdictions to learn more about the health and environmental risks.
- The mapping tool should use metadata standards and protocols to facilitate data sharing and integration of new information.
- A broad committee should be engaged to advise on the data that is available and should be acquired.
- Community organizations should be participants in the prioritization and data gathering and process.

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**Infrastructure and Land Use Adaptation**

The draft report includes a recommendation to create a Community Resilience Program for the State of Connecticut, inspired by the Massachusetts Vulnerability Program and Climate Smart New York. While these programs exist in other states already, our State stands ahead in its commitment to technical capacity, as evidenced by the lengthy and successful partnership between State Agencies (through SAFR) and CIRCA. This existing capacity could inform, train, and serve municipalities and Councils of Governments with support. Data creation and maintenance, climate vulnerability assessment, adaptation and resilience planning, and grant preparation will be critical elements of a successful strategy and should be sustained. Any policies and programs that encourage or require climate change adaptation must be accompanied by a committed and adept partner.

Recommendations should be added that incorporate climate change vulnerabilities, adaptation planning, and resilience-building activities into planning activities. Some potential activities include:

- Revise CGS 8-23 "Section 8-23 - Preparation, amendment or adoption of a plan of conservation and development" to include climate change as a required consideration. These could include restriction development in flood zones, encouraging conservation areas in flood zones, managing heat islands, etc.
- The state POCD should incorporate climate change into its priorities, especially in funding priorities and designation of growth areas.
- While FEMA does not require climate change to be considered in Natural Hazard Mitigation Plans, the State mandate it through agency policy or enabling statute.
- Create multi-generational capital improvement plans for infrastructure projects. Plans of Conservation and Development and Natural Hazard Mitigation Plans operate on ten- and five-year scales, respectively. Large scale infrastructure requires planning, construction, and maintenance beyond those time-scales.
- Land use data, such as parcels and planimetric information, should be standardized across the State with funding and technical assistance provided to municipalities and COGs to undertake the effort, similar to Massachusetts and New York.

**Public Health and Safety**

Increased variability in precipitation will make drought periods more likely. Drought should be added as an additional concern for private potable water wells on the recommendation on page 63.
Inland shelters should also be included in the evacuation plan recommendation, particularly for large-scale evacuation events from the coast.

**Science and Technology**

We support the recommendations on climate science education for both the public and K-12 school curricula. However, public education on the costs of inaction and options for mitigation adaptation and resilience should be increased.

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:35 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Soto-Canetti, Claudia A. (2022) <claudia.sotocanetti@trincoll.edu>
**Sent:** Wednesday, October 21, 2020 9:23 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change,

Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit.

Nature is essential for the future, for evolution and for everything we need, and serves the public good now and for the long term.

We have so many beautiful natural areas, and some need to be protected for nature study, hiking, and places that people can count on. This has never been more important.

Meanwhile - we are burning and exporting our public forests? Who benefits? This is beyond disturbing.

We need systems that support good jobs, local resource use, AND natural areas.

Our public land is held in the public trust.

We need your leadership.

Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Comments on Infrastructure and Land Use Adaptation Working Group Recommendations Report

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:45 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Garden Club of New Haven, Inc. <gcnhtreesandpower@gmail.com>
**Sent:** Wednesday, October 21, 2020 10:37 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Comments on Infrastructure and Land Use Adaptation Working Group Recommendations Report



The Garden Club of New Haven submits the following comments for your consideration:

Suggestion regarding the organizational structure of the Infrastructure and Land Use Adaptation Working Group:

Having considered the contents of the Infrastructure and Land Use Adaptation Working Group, which we discuss below, and recognizing that the work is not complete, we suggest that, in addition to having subgroups for Transportation, Land Use and Buildings and Utility Infrastructure, Utility Infrastructure should be separately studied within each of the seven utilities, and then the interrelationships among them and with Transportation and Land Use could be more effectively addressed. Having thoroughly analyzed the threats to each utility and the measures that can be taken to address them, each utility group could then address the impact of the interrelationships within the Utility Infrastructure group and with Transportation and Land Use and Buildings. This organization would provide greater focus, and future work should include extensive consultation with those having expertise regarding each utility. At some point, especially with regard to electricity, major infrastructure suggestions should be passed on to DEEP for the hiring of professional consultants to do further evaluation and strategic planning.

Comments on the report:

The report fails to adequately address the central role of electricity in all of the "theme areas," not only utility infrastructure, but transportation and land use & buildings. For example, with regard to the impact of the electric infrastructure on transportation, no mention is made of the impact of downed wires from the pole and wire overhead distribution system that are intermingled with fallen trees after extreme weather (tropical storms, hurricanes, tornadoes

and microbursts). The downed wires prevent prompt clearance of state highways and municipal roads as road crews must wait for utility crews to arrive. Evacuation to safe shelter, emergency vehicle access, and refueling of generators, as well as normal daily activities, such as going to work or buying supplies, are all impeded.

Although the description of the scope of the Utility Infrastructure sub-group charge recognizes the interconnectedness of "communications, fuel, drinking water, waste water, electricity, stormwater, flood control [and] dams," the report does not specify the nature and extent of the interconnections. For most of these groups, a reliable and resilient distribution of electricity is an important determinant of their reliability and resilience.

Beyond this, the electric infrastructure -- generation, transmission and especially distribution, must be examined for its impact on the environment, such as the impact of generation facilities on greenhouse gases and the impact of tree removals and potentially harmful pruning of large trees for overhead distribution wires, which reduce the beneficial effects of street and roadside trees on carbon capture, and on public health and safety, as set forth in the Working and Natural Lands Forest Subgroup Report.

These are perhaps encompassed within the UI-4 study, but it is not clear what costs, climate benefits and storm risks are to be considered and how they will be measured and valued. Simply because benefits cannot be easily given a monetary value does not mean that they should not be valued. We have reviewed numerous studies of undergrounding by states and cities throughout the United States, as well as the report on undergrounding in the Edison Electric Institute's Out of Sight, Out of Mind 2012. None address the impact of climate change and none address the detrimental impact of an overhead distribution system on the benefits provided by a robust tree canopy, especially in urban, suburban, and residential rural communities.

As to U-10, only water systems are mentioned, but we assume that funding for all infrastructure will be addressed. With regard to the investor owned electric distribution companies, we urge you not to assume that the current method of financing infrastructure is the only one to be considered. Infrastructure investments by these companies in Connecticut are now treated as capital improvements, for which the company is then guaranteed a rate of return. In effect, all the costs are passed down to ratepayers. For such an undertaking as undergrounding other methods of financing must be explored. In Washington, DC, an undergrounding project is being funded by the utility and the municipality through bonds. Residential and commercial customers pay different rates. The average residential customer has had a monthly increase of $3.25. Low income customers are exempt from the rate increase.

The analysis proposed in UI-12 would seem to be an integral part of the analysis proposed in UI-4 for electricity. UI-12 calls for an analysis of infrastructure risk in each separate infrastructure, and as suggested above, it would be useful to initially organize future work on each separate utility infrastructure separately. After that, consideration can be given to the risks that may be heightened due to the interrelationships among the separate utility infrastructures.

UI-13 lists a number of possible actions, but it does not clarify what risks are being addressed for each possible action, or how electricity affects access to other critical utility services, *e.g.* water for drinking, cooking, cleaning and flushing toilets. Loss of electricity and extreme heat pose different problems. Many of these solutions could be viewed as alternatives to the infrastructure improvements listed in UI-4, and as such, should be considered in any cost analysis, as costs incurred by not adopting infrastructure improvements to

increase reliability.

Respectfully submitted,

Mary-Michelle (Mikey) Hirschoff

Spokesperson on Trees and Power

The Garden Club of New Haven

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Alec Shub <alec.shub@uconn.edu>

# FW: Comments for the GC3 Forests Subcommittee

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:33 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

**From:** Connor Hogan <connor.hogan@mcleancare.org>
**Sent:** Wednesday, October 21, 2020 9:10 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Comments for the GC3 Forests Subcommittee

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Good Evening,

My name is Connor Hogan, and I am a forester here in Connecticut. I currently serve as the director of the McLean Game Refuge, a 4,410-acre wildlife sanctuary in Simsbury, Granby, and Canton. The forest concerns central to my management follow closely those of the state and those noted in the Forests Sub-Group Draft Report. I manage some of the oldest continuous forests in Connecticut (over 40% of our forests are older than 120 years – approximately 2,000 acres), including some old growth and very old second growth areas. I also manage open fields and some very small areas of regenerating forest. While I am heartened to hear that the forests sub-group is looking to promote some areas for long term permanent reserves like ours and promote forest conservation in their report, I have three concerns about current draft which I believe merit serious consideration.

1. The recommendation of employing "Profestation" is problematic as a solution for maximizing a) forest carbon and b) forest diversity
   a) Forests left alone do not always trend toward a maximum state of carbon storage with age, especially with the decline of our longest lived species due to invasive insects. Oak forests of one to three hundred years may continually increase their carbon storage over time. However, due to the decline of shade-tolerant and long-lived hemlocks and beech (trees that would naturally replace oak), our oak forests will no longer succeed into the carbon-rich long-lived forests they would before invasive insects. We are seeing in many areas that black birch, beech sprouts, and understory species are becoming the dominant species in declining oak stands. This diminutive structure is decidedly less carbon rich. The better solution for maximizing carbon may be the regeneration of the oak forest through timber removal.
   b) Because of the relative tolerance of our native trees for shade within a forest, and the thickening canopy of our aging forests often prevents the survival of our tree species that cannot survive in shade. Even when small natural gaps occur, our most shade intolerant species (aspens, cherries, oaks, and others) do not return to the forest or do so in very limited ways. This is playing out in real time in our

forests and has been seen in old growth forests in Pennsylvania, Massachusetts, and Maine. Forests will almost always be capable of their greatest diversity when younger and regenerating.

2. Your description of "No-Net-Loss of Forests Policy" leaves the status of harvested forestland ambiguous. Foresters and loggers operating in forestland across Connecticut are not removing forest from the landscape. They are regenerating it or altering it, but it remains forestland. The loss of forests in Connecticut is the result of land conversion for development, not logging. The inclusion of this policy in the forest sub-group seems to penalize forest owners for the sins of urban development.
3. The focus on maximizing carbon may seriously harm wildlife over time for two reasons:
   a) Connecticut's wildlife populations have been tied to nut-producing forests for thousands of years. These nut-producing trees – oaks, hickories, and [formerly] chestnuts – are lost from the landscape over long periods without disturbance due to their need for full sunlight to regenerate. Native peoples routinely burned large areas of southern New England to ensure the production of nuts for deer, turkey, bear, and countless other forest habitants, including themselves. Our forests today are functionally similar to historical forests in this manner (despite the shift in species from white oak to red oak and the loss of the chestnuts), and our wildlife are abundant as a result. Allowing our oak forest to age and convert to shade-tolerant maple, birch, sickly hemlock, and degraded beech sprouts will have serious consequences for our species that depend on them, from caterpillars to black bear.
   b) Maximizing forests for carbon by promoting old forests greatly reduces the already scant early forest habitat in Connecticut. Early forests under twenty years of age provide crucial habitat for countless animal species. Due to the declining percentage of early forests in Connecticut, DEEP has listed many on their Endangered, Threatened and Special Concern Species list.

In summary, I laud this sub-group for its efforts to address climate change and conserve forests. However, this report should not use proforestation as a model due to its unrealistic application for Connecticut forests, and it should provide significant support for forest operations to maintain oak forests and consequently young forests in the process.

Thank you for your consideration.

Respectfully,
Connor

Connor Hogan
CT Certified Forester
Master of Forestry, Yale
Director, McLean Game Refuge

NEW ENGLAND FORESTRY FOUNDATION

October 21, 2020

Dear Members of the Governor's Council on Climate Change,

New England Forestry Foundation (NEFF) is grateful for the work of the various committees reporting to the Connecticut Governor's Council on Climate Change (GC3) and thankful for the opportunity to submit public comment on draft climate policy reports. Please find below public comment in reference to the Forests Sub-Group draft report.

NEFF owns and manages more than 140 community forests covering 30,000 acres throughout New England, including four in Connecticut. Through the application of our core expertise in conserving forestland and advancing Exemplary Forestry, NEFF's mission is to help the people of New England to sustain their way of life, protect forest wildlife habitat and ecosystem services, and mitigate and adapt to climate change.

Consistent with that mission, NEFF advances a holistic, systems approach to addressing climate change that includes forest conservation (both wildlands and working woodlands), improved forest management and substitution of long-lived wood products for other building materials whose production creates significant carbon emissions, as part of a suite of strategies to achieve natural solutions from the forest sector.

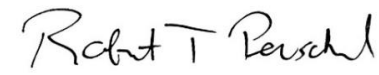
**NEFF respectfully submits the following public comments in reference to the draft report of the Working and Natural Lands – Forests Sub-Group:**

NEFF joins the Connecticut forestry community in calling for the removal of the term "proforestation" from the Forests Sub-Group draft report. Proforestation is at times portrayed by its small group of supporters as the creation of appropriate forest reserves where no or minimal management takes place, an approach which NEFF in principal supports. However, the proforestation position has in reality taken on a much more extreme connotation through the discourse and advocacy behind it, becoming associated with a drive to end sustainable, multi-use management of forests in New England. This approach ignores much of the systemic complexity of forests and their role in climate change mitigation, as it is based on a narrow embrace of in-forest carbon sequestration; carbon leakage and the social benefits and burdens associated with natural resource production are excluded from the proforestation analysis. In contrast, NEFF and its partners across the Connecticut forestry community support a science-based, systemic approach to sustainable forest management and forest-based climate change mitigation. NEFF strongly believes that the implementation of the proforestation concept would be detrimental for the people of Connecticut, its forests, and state and regional efforts to mitigate climate change, and could well result in a perverse increase in atmospheric carbon dioxide levels. We recommend that this term be removed from the draft report.

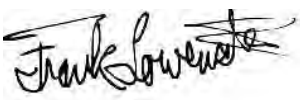
Thank you again for considering these comments. NEFF is grateful for the dedicated work of GC3 members and DEEP staff. We look forward to continuing our engagement with you all to help Connecticut mitigate and adapt to climate change.

**Sincerely,**

**Robert T. Perschel, Executive Director**



**Frank Lowenstein, Chief Operating Officer**



**New England Forestry Foundation**
**32 Foster St,**
**Littleton, MA 01460**

**Bob Perschel** joined NEFF as Ex. Dir. in April 2012. In his 35 years as an environmental professional he has worked on forestry, large landscape conservation, and wilderness issues. Previously Eastern region director for the Forest Stewards Guild, Bob worked for the forest industry before establishing his own forestry consulting business, including work in Connecticut, and founding the Land Ethic Institute. He is an original co-founder of the Forest Stewards Guild. Bob has a master's degree in forestry from the Yale School of Forestry and Environmental Studies and a psychology degree from Yale College.

**Frank Lowenstein** joined New England Forestry Foundation as Deputy Director in December 2013, and is now COO. He has played a critical role in overseeing and advancing NEFF's climate change mitigation and adaptation work, policy engagement and strategic planning. He also leads NEFF's Exemplary Forestry Center, which seeks to maximize the contributions of New England forests to mitigating damaging climate change. Prior to joining NEFF, Frank worked for more than 20 years for The Nature Conservancy, where he led programs ranging from community-based conservation in the Berkshires and Connecticut's Northwest Corner to leading the organization's global climate adaptation work. He is a Switzer Fellow, a former Senior Fellow in the U.S. Department of State's Energy and Climate Partnership of the Americas, author of three books including Clothed in Bark, and adjunct faculty in Environmental Studies at Brandeis University and the Masters of Sustainability program at Harvard University Extension School.

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Report Comments from New England Forestry Foundation

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 5:40 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Connor Rockett <crockett@newenglandforestry.org>
**Sent:** Wednesday, October 21, 2020 5:28 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Cc:** Robert Perschel <rperschel@newenglandforestry.org>; Frank Lowenstein <flowenstein@newenglandforestry.org>; Lisa Hayden <lhayden@newenglandforestry.org>
**Subject:** GC3 Report Comments from New England Forestry Foundation



Dear DEEP Staff,

On behalf of New England Forestry Foundation, thank you for the opportunity to comment on the draft reports of the Governor's Council on Climate Change working groups. Attached are New England Forestry Foundation's comments on the Progress on Mitigation Strategies, Science and Technology, Infrastructure and Land Use Adaptation, and Forests Sub-group reports. The PDF documents have been separated out for distribution to their respective work groups to simplify reading. A single PDF that combines all of these comments is attached as well.

Sincerely,

**Connor Rockett** | Forest Policy Fellow

T 978.952.6856 ext. 117

crockett@newenglandforestry.org

newenglandforestry.org

New England Forestry Foundation

Conserving Forests for Future Generations

**5 attachments**

**Progress on Mitigation Strategies Report Comments - NEFF.pdf**
599K

**Science and Technology Report Comments - NEFF.pdf**
727K

**Infrastructure and Land Use Adaptation Report Comments - NEFF.pdf**
494K

**Forests Sub-Group Report Comments - NEFF.pdf**
497K

**Combined NEFF Public Comments on GC3 Reports.pdf**
785K

NEW ENGLAND FORESTRY FOUNDATION

October 21, 2020

Dear Members of the Governor's Council on Climate Change,

New England Forestry Foundation (NEFF) is grateful for the work of the various committees reporting to the Connecticut Governor's Council on Climate Change (GC3) and thankful for the opportunity to submit public comment on draft climate policy reports. Please find below public comment in reference to the following draft reports:

- Progress on Mitigation Strategies (see pages 1-4)
- Science and Technology (see pages 4-7)
- Infrastructure and Land Use Adaptation (see page 8)
- Forests Sub-Group (see page 8)

NEFF owns and manages more than 140 community forests covering 30,000 acres throughout New England, including four in Connecticut. Through the application of our core expertise in conserving forestland and advancing Exemplary Forestry, NEFF's mission is to help the people of New England to sustain their way of life, protect forest wildlife habitat and ecosystem services, and mitigate and adapt to climate change.

Consistent with that mission, NEFF advances a holistic, systems approach to addressing climate change that includes forest conservation (both wildlands and working woodlands), improved forest management and substitution of long-lived wood products for other building materials whose production creates significant carbon emissions, as part of a suite of strategies to achieve natural solutions from the forest sector.

**NEFF respectfully submits the following public comments in reference to the draft report of the Progress on Mitigation Strategies Working Group:**

These comments are divided between, 1) specific additions and adjustments to wording in the Buildings Sector chapter of the Progress on Mitigation Strategies draft report and, 2) a more comprehensive argument for further investigation on the part of DEEP and GC3 through 2021 of the benefits of modern wood products, such as mass timber, to minimize embodied carbon in state-funded construction.

**1.** The Buildings Sector Chapter in the Progress on Mitigation Strategies Report makes promising recommendations to address embodied carbon emissions and to build with lower-embodied carbon materials. In order to maximize the climate mitigation impact of these recommendations, NEFF recommends incorporating the following specific points of emphasis and additions into the final version of the report:

1.1. NEFF strongly supports the chapter's recommendations to be proactive with the adoption of building codes, described in the Enhancement section on page 8. In particular, Connecticut can make an important leap forward in facilitating low-embodied carbon construction by adopting the 2021 edition of the International Building Code (IBC), which includes provisions for building

with low-embodied carbon materials. Adopting the latest version of the IBC code should be a preliminary step towards implementing the new embodied carbon and stretch codes called for elsewhere in the chapter. NEFF therefore recommends adding the following strategy to the list on page 8: "Strategy 5: Department of Administrative Services prioritizes the adoption of the 2021 International Building Code." California, Oregon, Washington, and Utah have already adopted the 2021 IBC ahead of schedule, and Massachusetts is scheduled to adopt it on January 1, 2021. NEFF hopes that the buildings chapter will push Connecticut to prioritize this important update as well.

1.2. To ensure that embodied carbon accounting is applied to the full scope of state-funded construction, NEFF recommends making the following additions (highlighted in yellow) to Strategy 4 on page 8: "The state adopts a protocol for state-sponsored construction, affordable housing, school construction or renovation, and infrastructure projects that establishes goals, actions, and accounting and reporting procedures on minimizing embodied carbon."

1.3. NEFF recommends including the following additions to the fourth bullet point on page 9, which describes the Zero Carbon sustainability measure, for reasons explained further in the second portion of these comments on the benefits of wood construction: "Buildings designed to come close to carbon neutral (net zero) can become carbon negative through careful selection of carbon sequestering building materials, such as massive (mass) timber from sustainably harvested wood. In an optimal situation, this wood would come from working forests in Connecticut or at least the northeastern U.S."

1.4. On page 11, NEFF recommends that a bullet point be added to the New Strategy titled "Create a Building Performance Office," along the lines of the following: "The BPO would be charged with:… maintaining a data clearinghouse on embodied emissions in line with the embodied carbon codes and standards recommended in this chapter; and assisting individuals, developers, and other state agencies with strategies to reduce embodied carbon and to meet these standards in new construction projects of all types."

1.5. The concern for embodied carbon data reporting should also be folded into the New Strategy on page 12, titled, "Harness the power of data to guide, initiate, and track change." Collecting and administering data and information on embodied carbon will help stakeholders involved in new construction to reduce the climate impacts of building material selection. Specifically, this strategy should extend the same data gathering and reporting procedures that it currently describes for operations and retrofitting to the embodied emissions of new construction.

1.6. NEFF commends the Buildings Sector work group for including State Embodied Carbon Standards in Appendix 3B, "Strategies for Achieving High Performance Standards." Public leadership on reductions in embodied emissions will be crucial for developing familiarity with low-carbon construction materials and techniques, and thus their adoption more broadly. NEFF suggests strengthening the strategy on page 27 by making the following changes and additions: "We recommend that State agencies require the reduction of embodied carbon of materials and construction as a criterion when contracting for state-funded projects such as buildings, affordable housing, school construction or renovation, and infrastructure projects. Under this policy, new construction and infrastructure projects will be incentivized or required to reduce their embodied emissions by a certain amount below a baseline reference, which can be

tailored to various measures, for example the number of occupants, the building's size, its use, or a typical building from a certain year. This policy could be structured as a direct requirement for state-funded construction, or a greater cost share or lower interest rate financing as embodied emissions decrease. Moreover, we recommend that new state-funded building and infrastructure projects report their embodied emissions for public distribution, using specified state-approved methodologies. This informational policy can help to raise familiarity with embodied emissions among developers, architects, builders, and sustainability managers and serve as a data resource for future reductions efforts. Finally, the state's accounting and reporting procedures for embodied carbon should consider impacts across the entire lifecycle of construction materials, from the initial emissions associated with their extraction, harvesting, and/or production to the end-of-life impacts due to their disposal or, in an optimal situation, their recyclability."

**2**. While the Buildings Sector chapter currently takes a neutral stance towards the selection of materials in its embodied carbon recommendations, NEFF believes that Connecticut has much to gain from further investigating the benefits of sustainably harvested wood building elements, such as mass timber, as part of embodied carbon policies for state-funded construction. By recommending further study of the relationship between wood procurement for public buildings and forest management, Connecticut will be better positioned to explore the broader, systemic implications of individual materials. To efficiently tie embodied carbon policies to the necessary pre-cursor of improved forest management as part of nature-based solutions, NEFF recommends that the Buildings Sector chapter include the following: "We recommend that DEEP and GC3 investigate the co-benefits across GC3 sector priorities that could be realized by a policy that supports long-lived wood products, such as mass timber, sustainably harvested from Connecticut or nearby working forests, in state-funded buildings and affordable housing."

Wood procurement is an increasingly common tool for low-carbon public construction (deployed in various policies in California, British Columbia, and France, to name a few jurisdictions). A recommendation to investigate mass timber as an option for Connecticut should include pro-active public engagement of residents, neighbors, employees and small business people to review design elements and development impacts during community planning. Beyond the question of pursuing the most efficient policies, a preference for local, sustainably harvested wood could provide environmental justice and equity co-benefits:

- It is less expensive to build with massive (mass) timber at the mid-rise level (6-12 stories) of construction than with steel and concrete. This makes the wood materials a good candidate to go along with urban planning for fairer, denser development patterns. When mid-rise affordable housing is situated near transportation and community resources, it increases the number of low- and middle-income (LMI) individuals with equitable access to these resources including transportation options to employment that are not dependent on private automobiles; well-planned mid-rise housing can provide homes for more people in desirable locations than low-rise affordable housing. By improving access to necessary resources and services, such as public transit, grocery markets, schools, and job opportunities,

mid-rise mass timber development can foster more equitable and stronger communities, at a reasonable price point.

- Exposed mass timber can establish an additional connection with nature for urban residents, bringing some of the qualities of green spaces and forests into areas that may have reduced access to these amenities. When left exposed, mass timber also brings visual and aesthetic variety to urban landscapes and interiors. The colors and patterns of natural wood create a unique contrast with traditional urban construction materials. These attributes of mass timber augment and diversify the experience of the urban built environment. Finally, the field of environmental psychology has established the mental and physiological benefits of living spaces that include natural materials and patterns, such as those of wood. The findings of this discipline demonstrate that mass timber can provide significant advantages for the wellbeing of occupants, a key consideration that should be factored into state-funded affordable housing planning.

- Construction with mass timber requires far less time and heavy equipment on-site than construction with steel and concrete. It takes a crew of a few workers and a crane to construct a mass timber building in a fraction of the time required for a building made with traditional materials. These advantages decrease pollution from traffic obstructions and incoming construction vehicles. Communities where mass timber projects take place are thus less impacted by the construction process, both in terms of pollution exposure and noise and traffic disturbances. These features of mass timber construction minimize the negative impact on the quality of life for residents in surrounding areas – another important environmental justice consideration for any public development project.

**NEFF respectfully submits the following public comments in reference to the draft report of the Science and Technology Working Group:**

The GC3 Draft Report of the Science and Technology Working Group includes scientifically unfounded references to a new and untested approach to forest management on pages 12, 16 and 37 of the draft report PDF. The draft report claims that:

"Proforestation (growing existing natural forests) has recently been identified as the most powerful, low cost, and immediate mitigation opportunity with multiple immediate co-benefits and proven long-term resilience."

As evidence for this broad statement, the report first cites the 2019 paper that defined proforestation, coauthored by the committee's co-chair.[1] This report has since been cited 26 times since publication according to a Google Scholar search on the term "proforestation." By contrast, a search on scholarly articles for "sustainable forestry" and "climate change" yields 22,600 results. At this point in time, proforestation is not a well-established term with a history and track record of scientific study that provide an adequate basis for public policy. It is, at best, a hypothesis.

[1] William R. Moomaw et al., "Intact Forests in the United States: Proforestation Mitigates Climate Change and Serves the Greatest Good," *Frontiers in Forests for Global Change* 2 (2019): 1-10.

The cited paper also provides no data on costs and only compares the power of the mitigation opportunity to afforestation, reforestation, and biomass energy use—not to the full suite of forest management approaches or forest products. Thus the statement as worded is a substantial exaggeration of the claims of the cited paper.

The article that first put forward "proforestation" defines the term as "growing additional existing forests as intact ecosystems." Their definition of, proforestation seems to imply leaving forests unharvested forever for carbon build up opportunities. Unfortunately, the authors of the paper do not acknowledge the potential for improved forest management under the umbrella of the proforestation term and have made repeated public appearances and comments to this effect. The language in the report itself does the same thing. The term "proforestation," through the efforts of these authors, has come to mean a no-harvest, forest reserve scenario. The term has divided the forest community at a time when we should be promoting both the creation of forest reserves and the improvement of forest management to meet the climate crisis. Consequently, we believe the term should be eliminated from the report and replaced with appropriate language and citations supporting the creation of reserve areas for climate change.

According to supporters of the proforestation approach, the goal is to mitigate climate change by reducing forest harvest in existing forests. At a regional or state level, reductions in harvest have repeatedly been shown to result in leakage—the transfer of harvest to other locations, which may consume or cancel out 90% or more of any carbon accumulation locally. The article does not address either this leakage problem, or the global equilibrium economic effects of reducing harvest at a scale that would matter for carbon accounting; specifically, reducing forest harvest globally. Reducing harvest on a global scale will raise the prices of wood, causing increased use of alternatives such as plastics, steel and concrete—all of which have much higher carbon footprints. The net effect on a global scale could be a perverse increase in atmospheric carbon dioxide levels. In short, in their 2019 paper, Moomaw et al. present a strong case that growing additional existing forests as intact ecosystems could sequester more carbon than afforestation or reforestation, but they do not compare the effect of securing more intact forests to the effect of improving forest management on those same parcels, and they do not include the impacts of leakage or substitution on any carbon savings—both of which terms have been recognized as important principles of forest carbon accounting for 20 or more years.

For a report on science and technology, a more sophisticated analysis is both necessary and appropriate. Specifically, beyond the critique above the draft report also includes inappropriate and inaccurate citations of the studies it cites in support of proforestation. For example, it claims that proforestation "is one of three main strategies featured by the International Union for the Conservation of Nature." But the citation leads to an opinion blog, not a policy statement of the IUCN. The opinion blog focuses not on proforestation, which is briefly mentioned, but on the importance of conserving primary forests. The Working Group draft report next cites the Committee on the Environment, Public Health and Food Safety to the European Parliament; again the citation is exaggerated. The amendments referenced were proposed amendments to a draft opinion on the European Forest Strategy, which were ultimately omitted from the final resolution passed by the European Parliament on October 8th. The resolution as

actually adopted repeatedly cites sustainable forest management and use of wood products as carbon sequestration methods of choice.[2] Next the report claims that recent research shows that "older forests are best able to withstand (and young trees are more vulnerable to) the stresses of climate change." The article cited to support this statement focuses on the effects of warming and rainfall on growth of seedlings of six deciduous tree species, and in fact *only measured seedling mortality in its experimental framework.* No results relevant to distinguishing sensitivity of older versus younger forests are reported.

In contrast, McDowell and others (2020)[3] analyzed global data sets and determined, "Ongoing changes in environmental drivers and disturbance regimes are consistently increasing mortality and forcing forests toward shorter-statured and younger stands, reducing potential carbon storage." They also noted that "Large trees are the most susceptible to die from LUC-induced forest fragmentation (112, 113), drought (26), rising temperature or VPD (54, 62) (Fig. 4), windthrow (114, 115), biotic attacks (116), and lightning (101), with variable size impacts of fire (117). The abundance of size-dependent mortality drivers and disturbances should logically push stands toward younger and smaller distributions of trees and shorter statured species assemblages (118)."

These results are echoed in:

- Brodribb and others (2020)[4] who analyzed tree response to water stress and concluded that trees, like coral reefs, may face inflexible damage thresholds associated with water availability that are likely to be exceeded in the face of climate change with older, larger trees more vulnerable.
- Anderegg and others (2020)[5] who document increasing risks to forest carbon permanence over time and asserted that "nonstationary permanence risks must be rigorously assessed using the best available scientific tools and datasets and be included in policy and project planning."

These recent studies place new urgency on lessons from New England history. For example, the 1938 hurricane blew down 2.6 billion board feet in a single day. As this wood broke down it would release approximately 7.2 million metric tons of CO2, plus perhaps an equivalent additional amount of CO2 from leaves, branches and roots. Some of the best work on hurricane and wind disturbance has been done in New England, for example Boose et al 2001[6], Foster and Boose 1992[7] and Foster 1988.[8] Particularly significant is that Foster 1988 showed that increasing stand age, particularly in hardwood stands, results in progressively greater probability of blowdown. Thus, as Connecticut's primarily hardwood forests

[2] See paragraphs 5, 10, 13, and 24 of *European Parliament resolution of 8 October 2020 on the European Forest Strategy - The Way Forward*, available here: https://www.europarl.europa.eu/doceo/document/TA-9-2020-0257_EN.html

[3] Nate G. McDowell et al., "Pervasive shifts in forest dynamics in a changing world," *Science* 368, (May 2020).

[4] Timothy Brodribb et al., "Hanging by a thread? Forests and drought," *Science* 368 (2020): 261–266.

[5] William Anderegg et al., "Climate-driven risks to the climate mitigation potential of forests," *Science* 368, (2020).

[6] Emery R. Boose, Kristen E. Chamberlin, and David R. Foster, "Landscape and Regional Impacts of Hurricanes in New England," *Ecological Monographs* 71, no. 1 (2001): 27-48.

[7] David R. Foster and Emery R. Boose, "Patterns of Forest Damage Resulting from Catastrophic Wind in Central New England, USA," *Jounral of Ecology* 80, no. 1 (Mar. 1992): 79-98.

[8] David R. Foster, "Species and stand response to catastrophic wind in central New England, USA," *Journal of Ecology* 76 (1988): 135-151.

grow over the next 30 years, they will be at progressively greater risk of catastrophic blowdown from any given wind event. Exacerbating this trend is research showing the increasing strength of Atlantic hurricanes; for example, Holland and Bruyere (2014)[9] report "the proportion of Category 4 and 5 hurricanes has increased at a rate of ~25–30 % per °C of global warming after accounting for analysis and observing system changes." The combined effect is that each year the forests of New England are at greater risk of large-scale blowdown due to both greater age- and size-related vulnerability and growing hurricane intensity. Other disturbances also are widely reported to be growing in risk with climate change, including invasive insects and diseases; severe thunderstorms, microbursts, and derechos; and drought and the potential for large-scale fire.

Highlighting that increased windthrow is not the only risk to older forests is forest response in Europe over the last several decades. Following the severe summer 2018 European drought, which provides an interesting analogue for potential drought impacts on New England forests, Schuldt et al. (2020)[10] reported widespread mortality across genera common in New England including *Quercus, Pinus, Fagus,* and *Picea*. In particular, they note "unexpectedly strong drought-legacy effects were detected in 2019. This implies that the physiological recovery of trees was impaired after the 2018 drought event, leaving them highly vulnerable to secondary drought impacts such as insect or fungal pathogen attacks. As a consequence, mortality of trees triggered by the 2018 events is likely to continue for several years. Our assessment indicates that many common temperate European forest tree species are more vulnerable to extreme summer drought and heat waves than previously thought. As drought and heat events are likely to occur more frequently with the progression of climate change, temperate European forests might approach the point for a substantial ecological and economic transition." Other research suggests this transition is already underway. Senf et al (2020, preprint)[11] show that canopy mortality across temperate European forests increased steadily from 1985 to 2018, and projected future mortality. Their results project that "a continued increase in canopy mortality will strongly alter forest demography, with the median forest age falling below 30 years in more than 50% of Europe's countries by 2050."

To summarize, the most recent literature on forest disturbance does not support the hypothesis that proforestation would produce forests more resistant to increasing disturbances associated with climate change, and strongly suggests the opposite conclusion. By contrast, high quality forest management would allow foresters to accelerate adaptation of Connecticut forests to future climate by selecting tree species adapted to projected conditions, which could reduce unexpected carbon loss in forests and store some existing forest carbon as long-lived forest products. The report of the Science and Technology Working Group mischaracterizes the very literature it cites to attempt to make a case for the proforestation hypothesis, and ignores the vast body of other work supporting alternative approaches to using forests to mitigate the climate crisis.

[9] Greg Holland and Cindy L. Bruyere, "Recent intense hurricane response to global climate change," *Climate Dynamics* 42 (2014): 617-627.
[10] Bernhard Schuldt et al., "A first assessment of the impact of the extreme 2018 summer drought on Central European forests," *Basic and Applied Ecology* 45 (2020): 86-103.
[11] Cornelius Senf et al., "Increases in canopy mortality and their impact on the demographic structure of Europe's forests," (2020). Preprint, available at: https://www.biorxiv.org/content/10.1101/2020.03.30.015818v2.

**NEFF respectfully submits the following public comments in reference to the draft report of the Infrastructure and Land Use Adaptation Working Group:**

NEFF strongly supports the report's recommendations to update the state's building codes, described on page 23. In particular, Connecticut can make an important leap forward in facilitating low-embodied carbon construction by adopting the 2021 edition of the International Building Code (IBC), which includes provisions for building with low-embodied carbon materials. NEFF therefore recommends adding the following phrasing to the action description on page 23: "The Department of Administrative Services should prioritize the adoption of the 2021 International Building Code." Currently, Connecticut relies on the 2015 edition of the IBC. California, Oregon, Washington, and Utah have already adopted the 2021 IBC ahead of schedule, and Massachusetts is scheduled to adopt it on January 1, 2021. NEFF hopes that the Infrastructure and Land Use Adaptation report will push Connecticut to prioritize this important update as well.

**NEFF respectfully submits the following public comments in reference to the draft report of the Working and Natural Lands – Forests Sub-Group:**

NEFF joins the Connecticut forestry community in calling for the removal of the term "proforestation" from the Forests Sub-Group draft report. Proforestation is at times portrayed by its small group of supporters as the creation of appropriate forest reserves where no or minimal management takes place, an approach which NEFF in principal supports. However, the proforestation position has in reality taken on a much more extreme connotation through the discourse and advocacy behind it, becoming associated with a drive to end sustainable, multi-use management of forests in New England. This approach ignores much of the systemic complexity of forests and their role in climate change mitigation, as it is based on a narrow embrace of in-forest carbon sequestration; carbon leakage and the social benefits and burdens associated with natural resource production are excluded from the proforestation analysis. In contrast, NEFF and its partners across the Connecticut forestry community support a science-based, systemic approach to sustainable forest management and forest-based climate change mitigation. NEFF strongly believes that the implementation of the proforestation concept would be detrimental for the people of Connecticut, its forests, and state and regional efforts to mitigate climate change, and could well result in a perverse increase in atmospheric carbon dioxide levels. We recommend that this term be removed from the draft report.

Thank you again for considering these comments. NEFF is grateful for the dedicated work of GC3 members and DEEP staff. We look forward to continuing our engagement with you all to help Connecticut mitigate and adapt to climate change.

**Sincerely,**

**Robert T. Perschel, Executive Director**

**Frank Lowenstein, Chief Operating Officer**

**New England Forestry Foundation**
**32 Foster St,**
**Littleton, MA 01460**

**Bob Perschel** joined NEFF as Ex. Dir. in April 2012. In his 35 years as an environmental professional he has worked on forestry, large landscape conservation, and wilderness issues. Previously Eastern region director for the Forest Stewards Guild, Bob worked for the forest industry before establishing his own forestry consulting business, including work in Connecticut, and founding the Land Ethic Institute. He is an original co-founder of the Forest Stewards Guild. Bob has a master's degree in forestry from the Yale School of Forestry and Environmental Studies and a psychology degree from Yale College.

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NEW ENGLAND FORESTRY FOUNDATION

October 21, 2020

Dear Members of the Governor's Council on Climate Change,

New England Forestry Foundation (NEFF) is grateful for the work of the various committees reporting to the Connecticut Governor's Council on Climate Change (GC3) and thankful for the opportunity to submit public comment on draft climate policy reports. Please find below public comment in reference to the Infrastructure and Land Use Adaptation draft report.

NEFF owns and manages more than 140 community forests covering 30,000 acres throughout New England, including four in Connecticut. Through the application of our core expertise in conserving forestland and advancing Exemplary Forestry, NEFF's mission is to help the people of New England to sustain their way of life, protect forest wildlife habitat and ecosystem services, and mitigate and adapt to climate change.

Consistent with that mission, NEFF advances a holistic, systems approach to addressing climate change that includes forest conservation (both wildlands and working woodlands), improved forest management and substitution of long-lived wood products for other building materials whose production creates significant carbon emissions, as part of a suite of strategies to achieve natural solutions from the forest sector.

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NEFF strongly supports the report's recommendations to update the state's building codes, described on page 23. In particular, Connecticut can make an important leap forward in facilitating low-embodied carbon construction by adopting the 2021 edition of the International Building Code (IBC), which includes provisions for building with low-embodied carbon materials. NEFF therefore recommends adding the following phrasing to the action description on page 23: "The Department of Administrative Services should prioritize the adoption of the 2021 International Building Code." Currently, Connecticut relies on the 2015 edition of the IBC. California, Oregon, Washington, and Utah have already adopted the 2021 IBC ahead of schedule; NEFF hopes that the Infrastructure and Land Use Adaptation report will push Connecticut to prioritize this important update as well.

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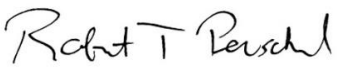

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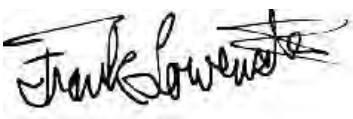

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Dear Members of the Governor's Council on Climate Change,

New England Forestry Foundation (NEFF) is grateful for the work of the various committees reporting to the Connecticut Governor's Council on Climate Change (GC3) and thankful for the opportunity to submit public comment on draft climate policy reports. Please find below public comment in reference to the Progress on Mitigation Strategies draft report.

NEFF owns and manages more than 140 community forests covering 30,000 acres throughout New England, including four in Connecticut. Through the application of our core expertise in conserving forestland and advancing Exemplary Forestry, NEFF's mission is to help the people of New England to sustain their way of life, protect forest wildlife habitat and ecosystem services, and mitigate and adapt to climate change.

Consistent with that mission, NEFF advances a holistic, systems approach to addressing climate change that includes forest conservation (both wildlands and working woodlands), improved forest management and substitution of long-lived wood products for other building materials whose production creates significant carbon emissions, as part of a suite of strategies to achieve natural solutions from the forest sector.

**NEFF respectfully submits the following public comments in reference to the draft report of the Progress on Mitigation Strategies Working Group:**

These comments are divided between, 1) specific additions and adjustments to wording in the Buildings Sector chapter of the Progress on Mitigation Strategies draft report and, 2) a more comprehensive argument for further investigation on the part of DEEP and GC3 through 2021 of the benefits of modern wood products, such as mass timber, to minimize embodied carbon in state-funded construction.

**1.** The Buildings Sector Chapter in the Progress on Mitigation Strategies Report makes promising recommendations to address embodied carbon emissions and to build with lower-embodied carbon materials. In order to maximize the climate mitigation impact of these recommendations, NEFF recommends incorporating the following specific points of emphasis and additions into the final version of the report:

1.1. NEFF strongly supports the chapter's recommendations to be proactive with the adoption of building codes, described in the Enhancement section on page 8. In particular, Connecticut can make an important leap forward in facilitating low-embodied carbon construction by adopting the 2021 edition of the International Building Code (IBC), which includes provisions for building with low-embodied carbon materials. Adopting the latest version of the IBC code should be a preliminary step towards implementing the new embodied carbon and stretch codes called for elsewhere in the chapter. NEFF therefore recommends adding the following strategy to the list on page 8: "Strategy 5: Department of Administrative Services prioritizes the adoption of the 2021 International Building Code." California, Oregon, Washington, and Utah have already adopted the 2021 IBC ahead of schedule, and Massachusetts is scheduled to adopt it on January 1, 2021. NEFF hopes that the buildings chapter will push Connecticut to prioritize this important update as well.

NEW ENGLAND FORESTRY FOUNDATION

1.2. To ensure that embodied carbon accounting is applied to the full scope of state-funded construction, NEFF recommends making the following additions (highlighted in yellow) to Strategy 4 on page 8: "The state adopts a protocol for state-sponsored construction, affordable housing, school construction or renovation, and infrastructure projects that establishes goals, actions, and accounting and reporting procedures on minimizing embodied carbon."

1.3. NEFF recommends including the following additions to the fourth bullet point on page 9, which describes the Zero Carbon sustainability measure, for reasons explained further in the second portion of these comments on the benefits of wood construction: "Buildings designed to come close to carbon neutral (net zero) can become carbon negative through careful selection of carbon sequestering building materials, such as massive (mass) timber from sustainably harvested wood. In an optimal situation, this wood would come from working forests in Connecticut or at least the northeastern U.S."

1.4. On page 11, NEFF recommends that a bullet point be added to the New Strategy titled "Create a Building Performance Office," along the lines of the following: "The BPO would be charged with:… maintaining a data clearinghouse on embodied emissions in line with the embodied carbon codes and standards recommended in this chapter; and assisting individuals, developers, and other state agencies with strategies to reduce embodied carbon and to meet these standards in new construction projects of all types."

1.5. The concern for embodied carbon data reporting should also be folded into the New Strategy on page 12, titled, "Harness the power of data to guide, initiate, and track change." Collecting and administering data and information on embodied carbon will help stakeholders involved in new construction to reduce the climate impacts of building material selection. Specifically, this strategy should extend the same data gathering and reporting procedures that it currently describes for operations and retrofitting to the embodied emissions of new construction.

1.6. NEFF commends the Buildings Sector work group for including State Embodied Carbon Standards in Appendix 3B, "Strategies for Achieving High Performance Standards." Public leadership on reductions in embodied emissions will be crucial for developing familiarity with low-carbon construction materials and techniques, and thus their adoption more broadly. NEFF suggests strengthening the strategy on page 27 by making the following changes and additions: "We recommend that State agencies require the reduction of embodied carbon of materials and construction as a criterion when contracting for state-funded projects such as buildings, affordable housing, school construction or renovation, and infrastructure projects. Under this policy, new construction and infrastructure projects will be incentivized or required to reduce their embodied emissions by a certain amount below a baseline reference, which can be tailored to various measures, for example the number of occupants, the building's size, its use, or a typical building from a certain year. This policy could be structured as a direct requirement for state-funded construction, or a greater cost share or lower interest rate financing as embodied emissions decrease. Moreover, we recommend that new state-funded building and infrastructure projects report their embodied emissions for public distribution, using specified state-approved methodologies. This informational policy can help to raise familiarity with embodied emissions among developers, architects, builders, and sustainability managers and serve as a data resource for future reductions efforts. Finally, the state's accounting and reporting procedures for embodied carbon should consider impacts across the entire lifecycle

of construction materials, from the initial emissions associated with their extraction, harvesting, and/or production to the end-of-life impacts due to their disposal or, in an optimal situation, their recyclability."

**2**. While the Buildings Sector chapter currently takes a neutral stance towards the selection of materials in its embodied carbon recommendations, NEFF believes that Connecticut has much to gain from further investigating the benefits of sustainably harvested wood building elements, such as mass timber, as part of embodied carbon policies for state-funded construction. By recommending further study of the relationship between wood procurement for public buildings and forest management, Connecticut will be better positioned to explore the broader, systemic implications of individual materials. To efficiently tie embodied carbon policies to the necessary pre-cursor of improved forest management as part of nature-based solutions, NEFF recommends that the Buildings Sector chapter include the following: "We recommend that DEEP and GC3 investigate the co-benefits across GC3 sector priorities that could be realized by a policy that supports long-lived wood products, such as mass timber, sustainably harvested from Connecticut or nearby working forests, in state-funded buildings and affordable housing."

Wood procurement is an increasingly common tool for low-carbon public construction (deployed in various policies in California, British Columbia, and France, to name a few jurisdictions). A recommendation to investigate mass timber as an option for Connecticut should include pro-active public engagement of residents, neighbors, employees and small business people to review design elements and development impacts during community planning. Beyond the question of pursuing the most efficient policies, a preference for local, sustainably harvested wood could provide environmental justice and equity co-benefits:

- It is less expensive to build with massive (mass) timber at the mid-rise level (6-12 stories) of construction than with steel and concrete. This makes the wood materials a good candidate to go along with urban planning for fairer, denser development patterns. When mid-rise affordable housing is situated near transportation and community resources, it increases the number of low- and middle-income (LMI) individuals with equitable access to these resources including transportation options to employment that are not dependent on private automobiles; well-planned mid-rise housing can provide homes for more people in desirable locations than low-rise affordable housing. By improving access to necessary resources and services, such as public transit, grocery markets, schools, and job opportunities, mid-rise mass timber development can foster more equitable and stronger communities, at a reasonable price point.

- Exposed mass timber can establish an additional connection with nature for urban residents, bringing some of the qualities of green spaces and forests into areas that may have reduced access to these amenities. When left exposed, mass timber also brings visual and aesthetic variety to urban landscapes and interiors. The colors and patterns of natural wood create a unique contrast with traditional urban construction materials. These attributes of mass timber augment and diversify the experience of the urban built environment. Finally, the field of environmental psychology has

established the mental and physiological benefits of living spaces that include natural materials and patterns, such as those of wood. The findings of this discipline demonstrate that mass timber can provide significant advantages for the wellbeing of occupants, a key consideration that should be factored into state-funded affordable housing planning.

- Construction with mass timber requires far less time and heavy equipment on-site than construction with steel and concrete. It takes a crew of a few workers and a crane to construct a mass timber building in a fraction of the time required for a building made with traditional materials. These advantages decrease pollution from traffic obstructions and incoming construction vehicles. Communities where mass timber projects take place are thus less impacted by the construction process, both in terms of pollution exposure and noise and traffic disturbances. These features of mass timber construction minimize the negative impact on the quality of life for residents in surrounding areas – another important environmental justice consideration for any public development project.

**Sincerely,**

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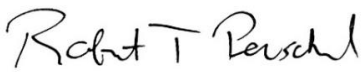

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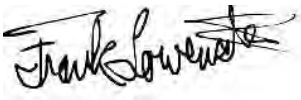

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**NEFF respectfully submits the following public comments in reference to the draft report of the Science and Technology Working Group:**

The GC3 Draft Report of the Science and Technology Working Group includes scientifically unfounded references to a new and untested approach to forest management on pages 12, 16 and 37 of the draft report PDF. The draft report claims that:

"Proforestation (growing existing natural forests) has recently been identified as the most powerful, low cost, and immediate mitigation opportunity with multiple immediate co-benefits and proven long-term resilience."

As evidence for this broad statement, the report first cites the 2019 paper that defined proforestation, coauthored by the committee's co-chair.[1] This report has since been cited 26 times since publication according to a Google Scholar search on the term "proforestation." By contrast, a search on scholarly articles for "sustainable forestry" and "climate change" yields 22,600 results. At this point in time, proforestation is not a well-established term with a history and track record of scientific study that provide an adequate basis for public policy. It is, at best, a hypothesis.

The cited paper also provides no data on costs and only compares the power of the mitigation opportunity to afforestation, reforestation, and biomass energy use—not to the full suite of forest management approaches or forest products. Thus the statement as worded is a substantial exaggeration of the claims of the cited paper.

The article that first put forward "proforestation" defines the term as "growing additional existing forests as intact ecosystems." Their definition of, proforestation seems to imply leaving forests unharvested forever for carbon build up opportunities. Unfortunately, the authors of the paper do not acknowledge the potential for improved forest management under the umbrella of the proforestation term and have made repeated public appearances and comments to this effect. The language in the report itself does the same thing. The term "proforestation," through the efforts of these authors, has come to mean a no-harvest, forest reserve scenario. The term has divided the forest community at a time when we should be promoting both the creation of forest reserves and the improvement of forest

[1] William R. Moomaw et al., "Intact Forests in the United States: Proforestation Mitigates Climate Change and Serves the Greatest Good," *Frontiers in Forests for Global Change* 2 (2019): 1-10.

management to meet the climate crisis. Consequently, we believe the term should be eliminated from the report and replaced with appropriate language and citations supporting the creation of reserve areas for climate change.

According to supporters of the proforestation approach, the goal is to mitigate climate change by reducing forest harvest in existing forests. At a regional or state level, reductions in harvest have repeatedly been shown to result in leakage—the transfer of harvest to other locations, which may consume or cancel out 90% or more of any carbon accumulation locally. The article does not address either this leakage problem, or the global equilibrium economic effects of reducing harvest at a scale that would matter for carbon accounting; specifically, reducing forest harvest globally. Reducing harvest on a global scale will raise the prices of wood, causing increased use of alternatives such as plastics, steel and concrete—all of which have much higher carbon footprints. The net effect on a global scale could be a perverse increase in atmospheric carbon dioxide levels. In short, in their 2019 paper, Moomaw et al. present a strong case that growing additional existing forests as intact ecosystems could sequester more carbon than afforestation or reforestation, but they do not compare the effect of securing more intact forests to the effect of improving forest management on those same parcels, and they do not include the impacts of leakage or substitution on any carbon savings—both of which terms have been recognized as important principles of forest carbon accounting for 20 or more years.

For a report on science and technology, a more sophisticated analysis is both necessary and appropriate. Specifically, beyond the critique above the draft report also includes inappropriate and inaccurate citations of the studies it cites in support of proforestation. For example, it claims that proforestation "is one of three main strategies featured by the International Union for the Conservation of Nature." But the citation leads to an opinion blog, not a policy statement of the IUCN. The opinion blog focuses not on proforestation, which is briefly mentioned, but on the importance of conserving primary forests. The Working Group draft report next cites the Committee on the Environment, Public Health and Food Safety to the European Parliament; again the citation is exaggerated. The amendments referenced were proposed amendments to a draft opinion on the European Forest Strategy, which were ultimately omitted from the final resolution passed by the European Parliament on October 8th. The resolution as actually adopted repeatedly cites sustainable forest management and use of wood products as carbon sequestration methods of choice.[2] Next the report claims that recent research shows that "older forests are best able to withstand (and young trees are more vulnerable to) the stresses of climate change." The article cited to support this statement focuses on the effects of warming and rainfall on growth of seedlings of six deciduous tree species, and in fact *only measured seedling mortality in its experimental framework.* No results relevant to distinguishing sensitivity of older versus younger forests are reported.

In contrast, McDowell and others (2020)[3] analyzed global data sets and determined, "Ongoing changes in environmental drivers and disturbance regimes are consistently increasing mortality and forcing forests toward shorter-statured and younger stands, reducing potential carbon storage." They also noted that "Large trees are the most susceptible to die from LUC-induced forest fragmentation (112, 113), drought (26), rising temperature or VPD (54, 62) (Fig. 4), windthrow (114, 115), biotic attacks (116), and lightning (101), with variable size impacts of fire (117). The abundance of size-dependent mortality drivers and disturbances should logically push stands toward younger and smaller distributions of trees and shorter statured species assemblages (118)."

These results are echoed in:

[2] See paragraphs 5, 10, 13, and 24 of *European Parliament resolution of 8 October 2020 on the European Forest Strategy - The Way Forward*, available here: https://www.europarl.europa.eu/doceo/document/TA-9-2020-0257_EN.html

[3] Nate G. McDowell et al., "Pervasive shifts in forest dynamics in a changing world," *Science* 368, (May 2020).

- Brodribb and others (2020)[4] who analyzed tree response to water stress and concluded that trees, like coral reefs, may face inflexible damage thresholds associated with water availability that are likely to be exceeded in the face of climate change with older, larger trees more vulnerable.
- Anderegg and others (2020)[5] who document increasing risks to forest carbon permanence over time and asserted that "nonstationary permanence risks must be rigorously assessed using the best available scientific tools and datasets and be included in policy and project planning."

These recent studies place new urgency on lessons from New England history. For example, the 1938 hurricane blew down 2.6 billion board feet in a single day. As this wood broke down it would release approximately 7.2 million metric tons of CO2, plus perhaps an equivalent additional amount of CO2 from leaves, branches and roots. Some of the best work on hurricane and wind disturbance has been done in New England, for example Boose et al 2001[6], Foster and Boose 1992[7] and Foster 1988.[8] Particularly significant is that Foster 1988 showed that increasing stand age, particularly in hardwood stands, results in progressively greater probability of blowdown. Thus, as Connecticut's primarily hardwood forests grow over the next 30 years, they will be at progressively greater risk of catastrophic blowdown from any given wind event. Exacerbating this trend is research showing the increasing strength of Atlantic hurricanes; for example, Holland and Bruyere (2014)[9] report "the proportion of Category 4 and 5 hurricanes has increased at a rate of ~25–30 % per °C of global warming after accounting for analysis and observing system changes." The combined effect is that each year the forests of New England are at greater risk of large-scale blowdown due to both greater age- and size-related vulnerability and growing hurricane intensity. Other disturbances also are widely reported to be growing in risk with climate change, including invasive insects and diseases; severe thunderstorms, microbursts, and derechos; and drought and the potential for large-scale fire.

Highlighting that increased windthrow is not the only risk to older forests is forest response in Europe over the last several decades. Following the severe summer 2018 European drought, which provides an interesting analogue for potential drought impacts on New England forests, Schuldt et al. (2020)[10] reported widespread mortality across genera common in New England including *Quercus, Pinus, Fagus,* and *Picea*. In particular, they note "unexpectedly strong drought-legacy effects were detected in 2019. This implies that the physiological recovery of trees was impaired after the 2018 drought event, leaving them highly vulnerable to secondary drought impacts such as insect or fungal pathogen attacks. As a consequence, mortality of trees triggered by the 2018 events is likely to continue for several years. Our assessment indicates that many common temperate European forest tree species are more vulnerable to extreme summer drought and heat waves than previously thought. As drought and heat events are likely to occur more frequently with the progression of climate change, temperate European forests might approach the point for a substantial ecological and economic transition." Other research suggests this transition is already underway. Senf et al

[4] Timothy Brodribb et al., "Hanging by a thread? Forests and drought," *Science* 368 (2020): 261–266.
[5] William Anderegg et al., "Climate-driven risks to the climate mitigation potential of forests," *Science* 368, (2020).
[6] Emery R. Boose, Kristen E. Chamberlin, and David R. Foster, "Landscape and Regional Impacts of Hurricanes in New England," *Ecological Monographs* 71, no. 1 (2001): 27-48.
[7] David R. Foster and Emery R. Boose, "Patterns of Forest Damage Resulting from Catastrophic Wind in Central New England, USA," *Jounral of Ecology* 80, no. 1 (Mar. 1992): 79-98.
[8] David R. Foster, "Species and stand response to catastrophic wind in central New England, USA," *Journal of Ecology* 76 (1988): 135-151.
[9] Greg Holland and Cindy L. Bruyere, "Recent intense hurricane response to global climate change," *Climate Dynamics* 42 (2014): 617-627.
[10] Bernhard Schuldt et al., "A first assessment of the impact of the extreme 2018 summer drought on Central European forests," *Basic and Applied Ecology* 45 (2020): 86-103.

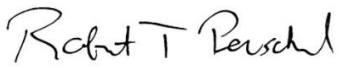
(2020, preprint)[11] show that canopy mortality across temperate European forests increased steadily from 1985 to 2018, and projected future mortality. Their results project that "a continued increase in canopy mortality will strongly alter forest demography, with the median forest age falling below 30 years in more than 50% of Europe's countries by 2050."

To summarize, the most recent literature on forest disturbance does not support the hypothesis that proforestation would produce forests more resistant to increasing disturbances associated with climate change, and strongly suggests the opposite conclusion. By contrast, high quality forest management would allow foresters to accelerate adaptation of Connecticut forests to future climate by selecting tree species adapted to projected conditions, which could reduce unexpected carbon loss in forests and store some existing forest carbon as long-lived forest products. The report of the Science and Technology Working Group mischaracterizes the very literature it cites to attempt to make a case for the proforestation hypothesis, and ignores the vast body of other work supporting alternative approaches to using forests to mitigate the climate crisis.
Thank you again for considering these comments. NEFF is grateful for the dedicated work of GC3 members and DEEP staff. We look forward to continuing our engagement with you all to help Connecticut mitigate and adapt to climate change.

Thank you again for considering these comments. NEFF is grateful for the dedicated work of GC3 members and DEEP staff. We look forward to continuing our engagement with you all to help Connecticut mitigate and adapt to climate change.

**Sincerely,**

**Robert T. Perschel, Executive Director**



**Frank Lowenstein, Chief Operating Officer**

**New England Forestry Foundation**
**32 Foster St,**
**Littleton, MA 01460**

**Bob Perschel** joined NEFF as Ex. Dir. in April 2012. In his 35 years as an environmental professional he has worked on forestry, large landscape conservation, and wilderness issues. Previously Eastern region director for the Forest Stewards Guild, Bob worked for the forest industry before establishing his own forestry consulting business, including work in Connecticut, and founding the Land Ethic Institute. He is an original co-founder of the Forest Stewards Guild. Bob has a master's degree in forestry from the Yale School of Forestry and Environmental Studies and a psychology degree from Yale College.

**Frank Lowenstein** joined New England Forestry Foundation as Deputy Director in December 2013, and is now COO. He has played a critical role in overseeing and advancing NEFF's climate change mitigation and adaptation work, policy

[11] Cornelius Senf et al., "Increases in canopy mortality and their impact on the demographic structure of Europe's forests," (2020). Preprint, available at: https://www.biorxiv.org/content/10.1101/2020.03.30.015818v2.

engagement and strategic planning. He also leads NEFF's Exemplary Forestry Center, which seeks to maximize the contributions of New England forests to mitigating damaging climate change. Prior to joining NEFF, Frank worked for more than 20 years for The Nature Conservancy, where he led programs ranging from community-based conservation in the Berkshires to the organization's global climate adaptation work. He is a Switzer Fellow, a former Senior Fellow in the U.S. Department of State's Energy and Climate Partnership of the Americas, author of three books including Clothed in Bark, and adjunct faculty in Environmental Studies at both Brandeis University and Harvard Extension School.

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Alec Shub <alec.shub@uconn.edu>

# FW: Audubon Connecticut comments on the draft report of the GC3 Forest Sub-Group

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 12:23 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Folsom-O'Keefe, Corrie <Cfolsom.OKeefe@audubon.org>
**Sent:** Wednesday, October 21, 2020 12:12 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Audubon Connecticut comments on the draft report of the GC3 Forest Sub-Group



To whom it may concern,

Please accepted the attached comments from Audubon Connecticut, the state office of the National Audubon Society, on the Forests Sub-Group Draft Report. We thank the Sub-Group for all their work in drafting the report, but feel that active management of Connecticut forested lands has considerable value for birds and is also a tool that can be used to increase the resilience and carbon sequestration abilities of our forests. Please, reconsider the push for passive management of our Connecticut forest lands.

Most Sincerely,

**Corrie Folsom-O'Keefe**

Director of Bird Conservation

203.405.9116

**Audubon Connecticut**

1207 Prospect Drive

Stratford, CT 06615

www.ct.audubon.org

**Audubon Connecticut Forests Sub-Group report comments_10_21_20.pdf**
387K

Audubon | CONNECTICUT

185 East Flat Hill Rd.
Southbury, CT 06488
ct.audubon.org

Oct. 21, 2020

Comments on the Forests Sub-Group Draft Report completed by the Forests Sub-Group, Working and Natural Lands Working Group on 9/10/20.

Thank you for opportunity to submit comments on behalf of the National Audubon Society through its affiliate state office, Audubon Connecticut. The National Audubon Society protects birds and the places they need, today and tomorrow, throughout the Americas using science, bipartisan advocacy, education, and on-the-ground conservation. Our conservation network extends statewide and includes nearly 30,000 members, five Connecticut chapters, and many partners along the Atlantic Flyway.

Audubon's Healthy Forests Initiative, which includes Audubon Connecticut's Forest for Birds program, integrates science, education, public policy, and land management expertise to ensure the continued existence of healthy, diverse, and resilient forests that provide flood protection, water quality benefits, carbon sequestration, and other services, while also providing high-quality breeding habitat for forest songbirds along the Atlantic Flyway. One primary way we work toward this goal is to provide bird habitat assessments for landowners, land managers, and communities who wish to protect and enhance habitat for breeding forest birds on the properties they own and/or manage.

One of the lessons we teach landowners, foresters, and others about managing woodlands for birds is that diversity is key. Forested landscapes with greater age class diversity harbor a greater number of bird species, as do forest stands with a greater variety of both living and dead structure in the understory, mid-story, and canopy (Forest Management For New York Birds: A Forester's Guide). Scientific research also confirms that a forest with a variety of age classes, complex structure at the stand level, and a diversity of tree and shrub species is also more resilient in the face of climate change.

While we applaud the Forest Sub-Group in their efforts to identify policy, funding, conservation, research, and stewardship actions which would both make forests more resilient and enhance their potential for sequestering and storing carbon, the report contains a number of statements that are concerning and unsupported by the preponderance of the scientific evidence.

Our biggest concern is that the report pushes for an increase in state forested lands under passive management. In addition, the report recommends updating the Natural Area Preserves

statute to incorporate the management model of the USDA Research Natural Areas where commercial harvest and salvage logging are excluded.

The report states, "*net growth* (in Connecticut) *exceeds net removal from timber harvests or salvage operations by more than 500%*". If net removal is so limited in comparison to growth, the push for passive management seems unnecessary especially when you consider the benefits of active management to birds as well as forest resilience. Also, while Audubon supports protection of old growth forests where they still exist and recognizes the need for both older and younger forests to diversify the age classes of our forests, that doesn't mean active management should be or needs to be disallowed per policy in order to achieve that.

Active management comes in many forms from low intensity small group and single tree selection cuts to shelterwoods with reserves to clear-cuts. These different harvest strategies can increase diversity from the stand to the landscape level which in turn improves habitat for birds and increases the number of bird species that can utilize a stand or landscape.

For example, crop tree release is a strategy that gives one to a few trees space to grow by removing adjacent trees. In response, the trees that are released produce more seeds or fruit that can be food for birds or take root on the forest floor. The removal of adjacent trees also allows more light to reach the understory, promoting growth of seedlings and saplings as well as a dense shrub layer. This benefits the many forest birds that are ground nesters or that nest just a few feet off the ground in dense understory.

At the other end of the spectrum, where young forest habitat is limited, clear-cuts or clear-cuts with reserves are methods that can be used to create habitat for wildlife which require early successional habitat, such as Blue-winged Warbler, Prairie Warbler, American Woodcock (listed as "most important" in Connecticut Widlife Action Plan), and New England Cottontail. The New England Cottontail was considered for federal listing in 2006; the decision was made to not list the species in 2015 but a critical factor in reaching that decision was that conservation efforts – clear-cuts – continue. Forest interior birds also use these open areas with abundant berries and insects for foraging during the nesting season as well as in migration. The bird-banded data collected in shrubland fields maintained for early successional species at the Bent of the River Audubon Center confirms this. Clear-cutting is not a practice that needs to be used everywhere, but it is an important strategy where young forest is limited.

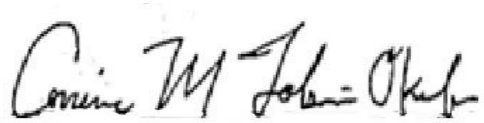
It is worth noting that young forest does not stay young forest for very long (5-10 years), so "*allowing currently non-forested land that historically supported forest to regenerate*" will only provide additional habitat for early successional species temporarily. Management is required to maintain young forest across a landscape (Audubon recommends 10%), as most of the natural disturbances that created it in the past (fires, beaver activity) are more limited today (Askins, 2000). Also, clear-cuts are not land-use conversion. Forests regenerate in these areas (in fact, that is usually the point of implementing a clear-cut), unlike when forest is cleared for development.

The report recommends "*Implementing active forest management approaches that can increase structural, age class, and species diversity in low-diversity second growth forests*" and "*promote regeneration of mid-tolerant and intolerant* (to shade) *species such as oaks and hickories"* as a means of increasing forest resilience. It would seem that restricting management in forests by increasing acres under passive management and updating statute to preclude commercial harvest and salvage operation in Core Forest NAPs would result in a drop in diversity and would hinder regeneration of shade tolerant tree species. Both oaks and hickories are incredibly important to birds and other wildlife. Large birds (Wild Turkey, Wood Ducks, etc.) and a variety of mammals consume their nuts; while the caterpillars that they host are an important source of food for songbirds during the nesting season. Oaks in particular are the host plant for 557 species of lepidoptera (Tallamy, 2019). Considering how intolerant oaks are to shade, if we want this genera to continue to be a part of Connecticut forests, active management in is a necessity. Loss of this long-lived native hardwood would have an impact on Connecticut's carbon storage potential and dramatically influence forest bird species diversity and abundance.

One threat to oak regeneration that deserves greater attention (mentioned only twice in the report) is the overabundance of deer. Over browsing by white-tailed deer can reduce or eliminate forest regeneration, alter forest composition and structure, eliminate or reduce other wildlife species through direct or indirect competition, and drive some local plant species to extinction (Shissler, 1999). White-tailed deer are widespread in Connecticut and are an increasing threat to forest health, diversity, habitat value, resilience, and the ability of a forest to sequester carbon.

Thank you for the opportunity to comment. We hope that you have a better understanding of how active management is used to improve habitat for birds as well as to increase forest resilience and will reconsider the push for passive management of our forested state lands.

Most Sincerely,



Director of Bird Conservation
Cfolsom.okeefe@audubon.org
203.405.9116

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 7:52 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: Dan Mudgett <danmudgett1@icloud.com>
Sent: Wednesday, October 21, 2020 7:10 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change,

Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit.

Nature is essential for the future, for evolution and for everything we need, and serves the public good now and for the long term.

We have so many beautiful natural areas, and some need to be protected for nature study, hiking, and places that people can count on. This has never been more important.

Meanwhile - we are burning and exporting our public forests? Who benefits? This is beyond disturbing.

We need systems that support good jobs, local resource use, AND natural areas.

Our public land is held in the public trust.

We need your leadership.

Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

Sent from my iPad

**Comments on the GC3 Science and Technology Sub-Group Report**
**By: Daniel Evans**

10/21/2020

Science and Technology Sub-Group,

I appreciate your time and efforts on this committee and value many of the thoughtful recommendations your efforts generated. Allow me to focus my comments on the more concerning aspects of your report, and suggest some of the content should be evaluated under different working groups.

My comments will focus on the concept of proforestation. Its inclusion in the science and technology sub-group is confusing, as its merits seem better-explored in the Forests sub-group to allow for a greater nuanced understanding of the all-encompassing impacts of such a drastic forest management strategy and scale. The concept is ultimately an opinion, published in the perspective section of a scientific journal. In fact, application at the scale suggested directly contradicts science-guided principles of adaptive forest management for climate change. The strategy threatens to make our forests less adaptable, compromises the persistence of both common and rare forest types and habitat structures, and threatens further declines to Connecticut's locally grown, sustainably harvested forest product industry.

Proforestation after all, is not a new concept. We use to call them forest reserves, and their designation was and is routine forest planning policy upheld by State agencies, water authorities, conservation organizations, municipalities, and the countless private forest landowners which the forests report documents to believe a '"hands off, let nature take its course" is the best approach'. These points illustrate that CT does not lack forest reserves. Adoption at the scale recommended assumes a position of rigid resistance to the impacts of climate change rather than fostering the ecological elasticity introduced through climate-informed improved forest management. In dealing with the uncertainties of climate change we need to embrace a balanced portfolio of carbon management strategies, rather than the "most-of-your-eggs-in-one-basket" approach the proforestation recommendation implies. Let's evaluate this concept further in the forest sub-group where it belongs.

Respectfully,

Daniel Evans
CT Certified Forester

**Comments on the GC3 Forests Sub-Group Report**
**By: Daniel Evans**

10/12/2020

Forests Sub-Group,

I appreciate your time and efforts on this committee, and champion many of the thoughtful recommendations it generated. I am writing however, with concern regarding some of the specific content and recommendations cited in your draft report. First-off, I question the limited representation of Connecticut Certified Foresters, and would have expected broader representation from practicing forestry professionals in Connecticut on the Forest Sub-Group. There is no representation from CT DEEP, CT TIMPRO, and scant representation from any CT certified-foresters. I recommend better utilization of input from professional foresters and land managers with education, experience and expertise studying and managing the forests which make-up the subject of this report.

After reading the report I grew additionally concerned about the over-emphasis on promoting a single forest management objective over, and at the expense of the myriad of multiple-use benefits forests provide. Forests are critical carbon sinks, and carbon management is one of the many considerations professional foresters make when weighing forest management alternatives. Other considerations involve ensuring the persistence of under-represented forest types, enhancing declining habitat structures, and providing for long-term forest sustainability, to meet the contemporary wood demands of society without compromising the ability to do so in the future. These are principles which have guided scientific forest management in Connecticut for well-over 100-years. The report seems to overlook the importance of multi-resource forest management with its over-emphasis on a sole management objective, and a primary means (proforestation) of attaining that objective.

The inclusion of the term 'proforestation' so frequently and prominently (12 times) in this report is concerning to me as a forestry professional, and CT certified-forester. The term silvicultutre, in contrast was used 3 times in the report. Proforestation is a made-up term, first introduced last year in the Opinion section of a publication. The term essentially means leaving sections of forest alone in perpetuity to accumulate and store high volumes of forest carbon. This practice already occurs on our landscape as common forest planning policy upheld by State agencies, water authorities, conservation organizations, municipalities, and the countless private forest landowners which this report documents to believe a '"hands off, let nature take its course" is the best approach'. These points illustrate that CT does not lack forest reserves. Establishing 60% of our State Forest land base as a reserve, is not science, it directly contradicts principles of adaptive silviculture for climate change, and will have further forest composition, habitat, and economic implications. Let's not limit our forest management options, and the options of educated professionals who will need to address the issue of forest adaptation to climate change into the extended future.

The report documents conditions and suites of findings about Connecticut forests, and often contradicts them with its emphasis on a management practice which will, at best, fail to effectively prepare our forests to adapt to climate change. At worst; we will threaten the sustainability of currently common

forest types, allow continued decline in underrepresented habitat structures, harm our locally-grown sustainable forest product industry, spur increased harvesting on private land, and force increased wood demand to countries without environmental regulation. The report documents forests challenged by regeneration failures, invasive species, low compositional and age-class diversity, and a private woodland owner base which generally doesn't see the benefits of active forest management. It also cites CT's carbon stocks among the highest in the region given current management practices, and suggests Connecticut's forests must be resilient to adapt to and help mitigate climate change. Elsewhere the report seems to imply a mis-guided focus on 'timber management' while suggesting current forest management techniques need improvement. If improving forest practices is a desired outcome, requiring management plan's be adopted and followed for enrollment in PA 490, or introducing heavy-cutting legislation to curb high-grading, may be effective. Prohibiting management on 100,000 acres of some of the most thoughtfully-managed forest land in the State will negatively affect practices on private land, harm Connecticut's forest products industry, and harm Connecticut's public forests. Furthermore, I would like to see the sub-group and the resulting report embrace the role of long-lived forest products as a means of storing carbon. Our consumption of wood products, their carbon footprint when imported, their environmental impact at their point of origin, and the value of locally grown, processed, and marketed forest products, received scant representation in this report, as if to suggest the carbon cycle is closed at the time a tree is harvested. Connecticut needs to utilize a balanced portfolio of carbon management strategies, and take an active approach in helping our forests adapt to the impacts of climate change.

Forest management after all, is inherently designed to increase the quantity and quality of wood in the forest. Through improved forest management, low value trees are harvested, allocating resources and growing space to higher quality trees with higher carbon storage capacity. Those residual trees increase their growth rates, sequestering and storing more carbon annually until the forests collective stocking grows too dense and growth again slows. Over time this practice directs the forest growing stock to support higher percentages of high-value trees. Someday, when harvested to allocate growing space for an even-better tree, those high-quality trees yield high-quality boards. The boards end-up in increasingly high-value end products which hold high value to humans, remaining in our homes and businesses for decades and longer. This whole process, and the way it plays out on the landscape, including the vast forest reserve acreages, are planned by foresters who have spent countless hours in pursuit of this knowledge for the greater good of our contemporary society and generations to come.

Sincerely,

Daniel Evans

Please allow specific response to the following **points raised in the sub-group's draft report**;

***Page 5 – larger blocks of forest that are generally more important for wildlife habitat***

- Wildlife habitat is determined largely based on the structure and composition of vegetation and its spatial arrangement to other habitat features on the landscape. Although certain wildlife

species require large home-ranges, it's misleading to suggest bigger areas are inherently better for wildlife. It depends on what's there.

***Page 11 – Healthy forests often include a variety of tree species of varying age classes***

- Scientific forest management guided by silviculture is the most timely and effective method of introducing or improving compositional and age-class diversity in a forest. The report comes to imply that tree species and age-class diversity (and its resulting wildlife habitat) will appear on our landscape as a result of infrequent and unpredictable storm-events.

***Page 12 – Connecticut consumes an estimated 80.4 million board feet of roundwood or about 22.77 board feet per person each year.***

***Harvesting timber grown sustainably in our own region can help to reduce transport emissions and global deforestation by avoiding a shift of pressure to harvest primary forests in other nations with less stringent environmental policies.***

- While acknowledging the importance, and carbon benefits of local forest management, the report state's "private landowners suggest a relatively low interest in timber harvests on their land…" Please clarify the recommendation to so drastically, and permanently halt management on public lands, especially given the data documenting such robust carbon accruals under already-thoughtful forest management planning.

***Page 13 - Lumber can also be reclaimed from old structures and recycled into new uses for furniture or building materials, keeping carbon out of the atmosphere longer***

- Recycled wood is a great concept, but Connecticut is already a net-importer of wood. Reducing management potential in our local forests while implying that a measureable percentage of our wood needs will come from lumber reclaimed from demolished structures may be misleading.

***Page 13 - By maintaining Connecticut's existing forests, and significantly increasing the acreage of permanently protected forest land, we can help ensure our state's natural and human communities can continue to thrive in the face of climate change.***

- The report uses the words 'protect', 'protected', and 'protection' (78 times) without offering definition. Permanent protection from land-use conversion is important. Protecting 100,000 acres of State Forest from scientifically-guided forest management will have drastic impacts on the ecology of both common and rare forest types, our local forest product economy, and leave managers helpless to fostering forest adaptation to climate change.

***Page 17 - removal of multiple species will reduce or eliminate redundancy and will have a dramatic impact in a forest's resilience. Evidence suggests this is beginning to happen, for example with the functional elimination of chestnut, elm and ash and the decline in beech, hemlock, and oak.***

***The resilience of Connecticut's forests is currently declining.***

- These statements seems to acknowledge that tenuous forest health makes our forests less resilient and more vulnerable to the impacts of climate-change. Climate-guided forest management introduces both species and age-class diversity, and builds resilience, enabling our forests to better adapt to change. Sustaining oak forest (and other forest types) on our landscape will require either; 1) active forest management, or 2) a catastrophic hurricane. It will not happen in the recommended core forest natural area preserves. We do not have an ecologically functional replacement for oaks on our landscape, so we better manage to keep them.

***Page 17 - chronic selective logging***

- This is cited as one threat to forest resilience. If this is a problem in Connecticut, it's a problem affecting private lands. Strategies to limit high-grading may include; modifications to PA 490 to require management plan preparation and adherence to receive tax benefits, State agency sign-off on PA 490 associated cutting plans, or State-vetted silvicultural requirements legislatively mandating silvicultural approval of harvest plans for tax-incentive enrollment.
- By limiting harvests on 100,000-acres of State Land you will force the private sector to produce more wood to keep the industry alive – that will exacerbate the high-grading issue on private lands. Public land management is silviculturally vetted on multi-disciplinary levels. High grading does not occur on State land. Introducing core forest natural area preserves at the recommended scale will increase high-grading on private land. The concept is also redundant on the Connecticut landscape given common Forest Planning policies, and a private landowner group documented to already believe in a hands off approach.

***Page 17 - The pattern of a large proportion of forests in the landscape simultaneously reaching maturity has the potential to reduce resilience as maturing forests are more susceptible to multiple stressors (e.g. insects, disease, pollutants, and drought). Old growth forests have enormous ecological and social value, are rare in the modern landscape, and can have substantial resilience to disturbance. Also disturbances in mature forests can promote the age and structural diversity missing from the forest landscape***

- The preceding points seem to acknowledge maturing forests are less resilient and vulnerable to climate change, yet disturbances (presumably like improved forest management) in mature forests can promote age and structural diversity and increase resilience. Foresters use harvesting to emulate natural disturbances which cannot be scheduled, located, or timed to provide reliable habitat and structural diversity across the landscape. There are also forestry treatments designed to create old-growth characteristics through modified techniques.
- It's important to try and recreate portions of the old growth forest our European ancestors encountered, but transitioning 60% of the State Forest base to that condition may be unrealistic given land-use, habitat, and resource needs in contemporary society.

***Page 17 - Permanent edge exists because of persistent and continuous disturbance from: i) farming and agricultural activities; ii) development and suburban expansion through roads, lawns, and lots; and iii) through continuous activities in the forest such as recreation (e.g. trails), frequent rather than episodic timber harvesting, and the chronic imbalance of predator-prey in wildlife populations (e.g. deer).***

- Footpaths, and forest management are not considered fragmenting features in the UCONN Forest Fragmentation / Core Forest analysis that the report rests so heavily on. Changes in forest structure and composition brought on by management does not introduce permanent edge.

***Page 19 - Increase the reserve (passive management) acreage in the state to promote local and landscape/regional resilience***

- I support well-intentioned calls to increase the acreage of forest reserves in Connecticut. I reject the continued implication that these reserves will be more resilient to the effects of climate change. Any old-growth structure which we attain in our forests will be ushered in by changes in a stand brought on by; 1) improved forest management, or 2) natural disturbance. We need resilient forests now, not 100-years from now, after they've been affected by disturbance and potentially recovered numerous times. Again, consider a balanced portfolio of carbon management strategies, rather than the "most-of-your-eggs-in-one-basket", "let's hope this works after the storms come", approach implied through the recommendations.

***Page 19 - limited salvage harvesting where appropriate (e.g., not in reserves and to a very limited extent on public lands where public safety including wildfire risk is not increased)***

- Please refer to comments on page 31.

***Page 20 - Promote regeneration of native and future-adapted tree species (especially oaks and hickories) across forest types, stand conditions, and ownership types. …planting initiatives to promote regeneration of mid-tolerant and intolerant species***

- Promoting oak reproduction requires precise timing of both regeneration establishment, and regeneration release treatments. It the absence of severe natural disturbance, it requires tree cutting. It will be impossible to promote oak and hickory (as well as; white pine, quaking aspen, tulip poplar, paper/gray birch, black cherry, and others) under a core forest natural area preserve scenario.
- Planting shade intolerant species in a shaded forest reserve would likely be unsuccessful.

***Page 22 - Strengthen local markets for long-lived forest products to promote a local rural economy***

- The reports recommendation to prohibit active forest management on over 100,000-acres of public land will significantly and detrimentally impact local markets and suppliers for long-lived forest products in Connecticut's rural economy.

***Page 24 & 28 - Proforestation (natural forest growth in areas protected from timber harvesting) is likely the most effective solution to preserve and foster further growth of accumulated carbon storage in woodlands.***

- The concept of proforestation was recently introduced in the opinion section of a reputable journal. Forest reserves are not a new concept, and didn't require a new name. Their designation is a historic, current and common practice in Connecticut. Reserve acreage is always increasing, and Connecticut has already demonstrated above-average carbon accruals, and high carbon stocks given current practices. Applying the concept at the scale recommended in the report will inadvertently compromise our remaining forest-product based economy, threaten disturbance dependent forest types and habitat structures, and compromise the ability of our forests to adapt to the impacts of climate change.

***Page 24 - Connecticut's Forest Carbon Storage Connecticut's forests are, on average, the most carbon dense – in aboveground carbon stored per acre – of the nine Northeastern US states***

- While this point demonstrates that business-as-usual forest management is accruing high volumes of carbon in our forests – it's somewhat misleading to compare carbon stocks in one forest type against another. Each forest type (oak-hickory, northern hardwood, spruce-fir, white pine) has a different inherent capacity to store carbon. This is an apples to oranges comparison.

***Page 25 - However, there is some concern that Connecticut's forests are being high-graded (i.e., the largest and most valuable trees are being harvested.***

- If occurring in CT, this practice is only occurring on private land where forest management is not vetted from a multi-disciplinary resource management perspective, and preceded by significant planning. Concluding to prohibit harvesting on such scale will force increased forest product removals onto these private lands, and exacerbate high-grading. The industry will have to cut more, everywhere else, or face further decline. Given the carbon footprint and environmental-impact of imported wood, Connecticut should be supporting the role improved forest management, and our local sustainable forest product economy.

***Page 26 - statewide goal to permanently protect at least 50% of medium (>250 ac.) and large (>500 ac.) core forests by 2040.***

- Please refer to previous questions about use of the term permanently protect.

- The core forest designation is an important concept, and it's important to keep large tracts of contiguous land undeveloped, as forest. But the concept of core needs to be analyzed a bit more closely. All 'core' means is more than 300-feet from another land use. 'Core' is not influenced by ecological complexity, land-use history, species diversity, structural heterogeneity, and should not be taken to mean inherently more worthy of protection. Many more variables affect

ecological complexity and conservation value than solely distance from non-forest. We should explore those.

***Page 27 - In fact, reforestation is the single most effective forest-based solution to increase the sequestration rate on a per-acre basis in Connecticut.***

- I'm all for establishing more forest on currently non-forested land, but there is a limited capacity for this on our landscape. We should pursue silviculturally-guided improved forest management strategies designed to maximize forest growth and sequestration rates. 30-70 year old forests sequester co2 at faster rates than old forests, I support pursuing age-class diversity, and stand-level vigor to maximize sequestration rather than an optimistic reforestation approach.

***Page 28 – Short term actions…***

- Reduce reliance on imported wood products by incentivizing active forest management which incorporates consideration for climate adaptation planning, while supplying locally-grown and sustainably harvested forest products.

  (Commentary) The people inhabiting regions blessed with forested landscapes have a social, global responsibility to manage those forests for a multitude of benefits, including sustainably harvested forest products. We all use wood, and locally harvested forest products have a substantially lighter carbon, and environmental footprint than wood imported from around the globe. Consider the transportation costs of wood imported from South America. Consider the environmental consequences; the harvest may have facilitated land-use conversion away from forest, and/or the wood could have been outright stolen and certainly not harvested with the environmental oversight foresters provide in Connecticut. Forest reserves are important for many reasons. 100,000 acres of forest reserves in Connecticut will hurt markets, hurt private sector business, hurt private forestlands, and further increase wood imports at great environmental and climate cost.

***Page 28 - Greatly reduce clear-cutting of mature forests as a habitat management practice benefiting young forest species.***

- Waiting for storm impacts, relying on replanting fields, and hoping for increased forest mortality events to create suitable habitat for disturbance-dependent species with declining population trends, are not defensible wildlife management strategies. What about clear-cutting to sustain non-self-sustaining and under-represented forest types?

***Page 29 - There is uncertainty about how climate change will impact forests because there are so many variables. That necessitates employing various strategies at the same time– avoided conversion, reforestation, mitigation-focused forest management, and Proforestation***

- Avoided conversion is a constant in this equation. Reforestation is great, but impractical at scale on this landscape. No one questions the need for lands which are designated as forest reserves.

This is not a new concept, professional land managers apply those designations all the time. The difficulty is with the strategy and scale at which the concept is being recommended. It discounts the myriad of other researched and vetted benefits which come from managed forests, which would be lost under a – call it what you want – proforestation management system. Are we expected to rely on the whims of storms, or private landowners to; sustain our oak forest, provide for the habitat needs of over 50-species of young forest dependent wildlife, enhance the ability of the forest to adapt to climate change, perpetuate disturbance dependent plants like pitch pine, tulip poplar, oak, pine, and showy aster?

- With the documented uncertainty about the specific effects of climate change the report is recommending an all-your-eggs-in-one-basket approach for over 100,000-acres of the most peer-vetted and thoughtfully managed woodland in the State.

***Page 31 - Reduce salvage harvests and establish policies to help retain dead trees in managed forests hit by insects***

- Salvage harvests are poorly-named. There is always a silvicultural prescription (salvage is not one of them) applied to harvesting in response to stand mortality. Dead tree removal is not the goal, and significant volumes, and all sizes of dead trees are retained in these so-called salvage harvests. So-called salvaging in CT is about restoration of the forest community affected by catastrophic mortality. Without so called salvage harvesting recent gypsy moth induced mortality would have (and in places, have) perpetuated age-classes of historically suppressed trees consisting of species with lower ecological value, and remarkably slower growth rates, than the oaks which we've lost. Slower growth rates, after all, equate to lower carbon sequestration and storage rates. In dealing with catastrophic mortality in a forest community already-threatened by a lack of landscape-level regeneration and age-class diversity, so called salvaging gives professional resource managers a tool to replace a non-self-sustaining shade-intolerant ecological community like the one that was lost from the site.

Thank you for the opportunity to comment on the report.

Respectfully,

Daniel Evans

**Daniel Evans' Brief Forestry Bio**

- B.S. – Forestry – University of Vermont – 2005
- Work Experience: Forestry Technician (VT – 2004), (CA – 2005), Consulting Forester (VT/NH – 2006-2007) CT (2013-2016), Norcross Wildlife Foundation (2007-2008, 2013-2015), GIS Technician (2009), US Forest Service (2009), University of Rhode Island (2010), CT DEEP Forestry (2011-2013, 2016-Present)

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Support for GC3 recommendations

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 8:36 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Del Puppo, Dario <Dario.DelPuppo@trincoll.edu>
**Sent:** Wednesday, October 21, 2020 8:00 AM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Support for GC3 recommendations

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To Whom It May Concern at DEEP:

As you are well aware, only 1% of CT's land is "protected". We need to increase that as recommended by the Governor's Council on Climate Change. Every day when I check the weather report online, I look to see what the air quality is like in CT and, most of the time, it is "moderate". In other words, we've chosen to live with "moderate" air quality, not "good" or "great". Consistent exposure to pollutants has long term devastating effects on our health, the quality of life, but also on the economy. Can it get better? Only if the state acts now, quickly and boldly.

By increasing the amount of "protected" lands in CT, we will help purify the air and also create spaces that improve our mental and physical wellbeing.

So, please heed the GC3's report and do the right thing!

Thank you for your attention.

Sincerely,

Dario Del Puppo

Professor, Language & Culture Studies

Trinity College

Hartford, CT 06106

(Pronouns: *he, him, his*)

The opportunity to provide comments for the Science and Technology Sub-Group Draft Report is greatly appreciated. A much longer narrative was provided for the Forest Sub-Group, since that is the focus of my comments. But proposals for forests as climate change mitigation are also discussed to a lesser degree in the Science and Technology draft.

I have been a professional forester for 30 years, 24 of which have been in Connecticut. I have a B.S. degree in Forest Resource Management from the University of Tennessee, and I am a Connecticut Certified Forester, #F-176.

I am a bit surprised and disturbed by what I have been reading regarding our state's public lands in these draft reports.

Decisions on how public land is managed should only be made by professionals on the ground who are trained to understand what they are seeing, can recognize forest health issues and priorities, and have learned the silvical characteristics of native tree species, their limitations and both short-term and long-term forest composition trends and the challenges specifically associated with them. A forester can only make sound decisions regarding tracts of land after extensive and detailed inventory data is collected on the ground. That a committee can make a decision for this draft without consideration of individual forests, stands, and acres is incredibly naïve and flawed in judgment. If a natural resource manager based decisions in this broad brush-stroke manner, needless to say, he or she would not be employed or licensed very long.

"Proforestation" should not be prominently discussed in this document, as this is a politically-charged "fad" term to the entire natural resource management community. While the silvicultural and biological considerations in a forester's planning "toolbox" have decades of scientific backing from research, journals, college training programs, licensing programs, textbooks, and national professional organizations, "proforestation" is a relatively new term and movement, whose purpose seems to vary from support of forests for improved mental health to climate change mitigation, but not much else. It is a term chosen for a symbolic representation that no one could be against, for fear it should indicate one who is against forests. Using the same logic, the forestry community could easily refer to it as the "Anti-Forestry" movement, which is actually more descriptive. Prominence of Proforestation in a document of this importance and stature is insulting.

Removal of state forest land that has been actively and consistently managed for many decades, if not more than a century in some cases, solely for the sake of carbon is a grave mistake. Our forests are valuable and managed for many purposes, including providing sustainable forest products, critical wildlife habitat, and planning to create a healthier and more diverse forest that is therefore more resilient in the face of climate change. We need to manage for more resilience, not less, while all our forests are roughly around the same age (80-120 years). By removing forest management, you are removing all management for disturbance dependent regimes, and these are the species and ecosystems in most decline in our state. By leaving the forests alone,

you are by default claiming that only shade tolerant species matter, it doesn't matter that we will be losing our oak forests this century, and that early successional habitat doesn't matter.

There seems to be no legitimate concern of "leakage". I believe this is precisely what will happen if all forest products are removed from state land. Products demanded by society are going to come from somewhere, and I would much rather see them come from well-managed local forests than from parts of the world that may not be managed with our same care. In particular, this committee should be very concerned about large-scale harvesting in the northern boreal forest (Canada, Siberia) and equatorial tropical regions. The former possesses a tremendous amount of underground stored carbon and the latter has the most above-ground carbon. These regions are particularly critical to preserve. The most important thing we can do in Connecticut is maintain and increase forest land, reduce development pressure that threatens forests, reduce emissions, and convert to *non*fossil fuels as much as possible. The work of silviculture and forest management is not a threat to our climate and carbon storage abilities.

Leaving large areas of forest alone for strictly natural processes can easily have unintended or unexpected consequences. Are we fighting wildfire there? That can be labeled as management. Are we maintaining the public trails in there? Removal of state forest acres from recreation would put increased pressure on the fewer areas left open to recreation in the state, degrading those parcels more quickly. This year of increased pressures during COVID-19, I believe, has been an appropriate sneak preview of what would happen on a reduced public land trail base.

Active management by DEEP foresters is not a threat to climate mitigation goals. Harvesting on state land is typically 450-800 acres annually right now, out of 170,000 acres. Only an average of 17% of new annual growth is included in the total annual harvest, incredibly well below sustainability. That's just 17% of growth, not all the carbon that is already standing. Approximately 33% of DEEP land is already set aside without active intervention, but this is something that needs to be determined by foresters on the ground, not by arbitrary percentages without regard for forest types, condition, and local habitat concerns.

I thank you for your respectful consideration.

David Irvin

The opportunity to provide comments for the Forest Sub-Group Draft Report is greatly appreciated.

I have been a professional forester for 30 years, 24 of which have been in Connecticut. I have a B.S. degree in Forest Resource Management from the University of Tennessee, and I am a Connecticut Certified Forester, #F-176.

It is apparent that a lot of work and preparation has gone into this comprehensive forest report, including many important points that I completely agree with, such as the importance of providing incentives for private landowners to retain forest, and preventing the further loss of forest to nonforest. But I must admit that I am a bit surprised and very disturbed by what I have read regarding our state's public lands. I am incredulous at the degree that DEEP Forestry, the forestry profession, the state timber industry, and wildlife biology have apparently been disregarded and dismissed during the process of *major* land management decisions that directly impact them and their important roles in our state.

In transitioning over 60% of state forests that have been a part of an agency mission of active forest management for decades, and in some cases for over a century, it seems only prudent to include input from the State Lands Management Program of the Forestry Division. The blindly arbitrary nature of simply grabbing core forests over 250 acres and removing from management because it seems easy to do, is grossly insulting to foresters and alarmingly unscientific for any document of this profile, which is purportedly based on science. Decisions on how public land is managed should only be made by professionals on the ground who are trained to understand what they are seeing, can recognize forest health issues and priorities, and have learned the silvical characteristics of native tree species, their limitations and both short-term and long-term forest composition trends and the challenges specifically associated with them. A forester can only make sound decisions regarding tracts of land after extensive and detailed inventory data is collected on the ground. That a committee can make a sound decision for this draft without consideration of individual forests, stands, and acres is incredibly naïve and flawed in judgment. If a natural resource manager based decisions in this broad brush-stroke manner, needless to say, he or she would not be employed or licensed very long.

Here is a rundown of some details and discussions that stand out to me in the document:

- Page 6 provides two graphs, one showing the forest types predominantly found in Connecticut, the other showing existing age classes. Obviously, cover types in the state are overwhelmingly oak/hickory, at approximately 70%. Also obvious is that most of the state's forests are hovering around a century old. What this says to a forester is that we have a coming crisis unless we are intentionally transitioning to completely different forest types in our state. Oak forests are disturbance-dependent regimes that regenerate through harvesting heavily enough to provide full sunlight to the ground, often through multiple phases of disturbance that include harvests and even controlled burning.

Clearcutting for charcoal, large fires, the sudden death of American chestnut, and a lack of deer led to our current oak overstory to begin with. The graphs tell me that we have a state of oak forests that are going to begin declining and if not actively managed to start a new generation, they will be replaced by other species. In fact, this is the scenario that the forestry community is largely expecting during the 21st Century, as oak is replaced by black birch and red maple. Unless active management is more widely INCREASED, decline and loss of oak forests seem inevitable. A lot of a public forester's time involves *management for disturbance regimes*, as these cover types and ecosystems require the most work and intervention today, and are in trends of the most decline. **Private landowners do not usually want to practice regeneration cutting for even-aged systems, so this puts even more pressure on public land to work at this objective.** By ignoring the need for species and types that require intensive management across very large blocks of land, this committee is indirectly stating that these specific types and the species associated with them are unimportant. All future forests would overwhelmingly be dominated by shade tolerant species, not intolerants.

- The table showing total acres vs. passive management acres on page 10 is flawed, by the authors' own admissions: On page 8, it was admitted that it "has been difficult for DEEP to keep its Forest Management Plans up-to-date due to inadequate staff resources to stay on top of this ongoing planning need." 35% of state forest land has completely expired and has inactive plan status. There are forests and forest blocks that have never been fully inventoried or had a management plan. Therefore it is questionable how accurate the low acreage of passive management can truly be in the table. There are state forests with one-quarter to one-third of their area in passive management. Were you aware that Wyantenock State Forest, which is 4,000 acres in size, has more than 75% of its area in passive management? At present, Mohawk State Forest nearby is being assigned passive management acres that have never been designated in previous management plans. Both of these properties are in core forest areas of high priority in Litchfield County. DEEP planning results in increases in permanent passive areas wherever the plans are developed, increasing the acreage left alone to naturally mature to older growth. But this type of determination is being made by foresters on the ground who are very familiar with the resource. I believe what is really needed are more foresters to provide much more data about these forests and more educated management decisions, not broad decisions about large areas to satisfy a document quickly or to push through rushed legislation that we will soon regret. This report also suggests the need to hire more service foresters to engage private landowners to become stewards of their land. I would like to suggest that what we really need are more State Lands Management foresters to continue an intensive evaluation of state lands, including better decisions inclusive of carbon sequestration and storage. I find it ironic that foresters are considered necessary within the document for private landowners to make sound management decisions on

private land, but where public land is involved, foresters are practically ignored and advised to back off.

- On page 25, it is mentioned that Connecticut's forests are harvested at a low intensity of 17% of the state's annual forest growth. I think that this figure actually refers to harvests in state forests specifically, not in total harvests that are inclusive of all private land work.
- On page 9, note that there are now 33 state forests and active management over the past decade has actually averaged closer to 450-850 acres per year, rather than the higher range provided. William Hochholzer, State Lands Management Supervisor in the Forestry Division can confirm this information.
- "Proforestation" should not be prominently discussed in this document, as this is a politically-charged "fad" term to the entire natural resource management community. While the silvicultural and biological considerations in a forester's planning "toolbox" have decades of scientific backing from research, journals, college training programs, licensing programs, textbooks, and national professional organizations, "proforestation" is a relatively new term and movement, whose purpose seems to vary from support of forests for improved mental health to climate change mitigation, but not much else. It is a term chosen for a symbolic representation that no one could be against, for fear it should indicate one who is against forests. Using the same logic, the forestry community could easily refer to it as the "Anti-Forestry" movement, which is actually more descriptive. Prominent definition and description of Proforestation in a document of this importance and stature is insulting, as is the definition of Proforestation on page 28 as protecting areas from timber harvesting. Why do we need to "protect" areas from timber harvesting? The intent behind this definition is very clear. Timber harvesting is not an enemy of healthy forests, habitats, or climate change mitigation. Sustainable and well-planned harvests with specific silvicultural objectives do not present a threat to forests.
- The discussion of "Natural Areas" and "Natural Area Preserves" is erroneous and shows a lack of understanding of the Natural Area system in DEEP and the uniqueness of some of these areas. The document repeatedly indicates that Natural Areas are not actively managed, but are simply preserved. On the contrary, some Natural Areas require a great deal of active intervention in order to maintain their character and enhance the rare species sometimes associated with them. As an example, any Natural Areas that exemplify the Pitch Pine Sand Plain cover type require tree cutting and very often, prescribed fire. This is a highly disturbance-dependent ecosystem and is regularly associated with 11 state listed species. Without management, the pitch pine will vanish, as it has already in most of the state, making this the most imperiled single ecosystem in Connecticut. Even the Gold's Pines Natural Area Preserve within Housatonic State Forest has required thinning in order to contribute to the large tree growth that defines the most majestic pines on that property. There is discussion of pitch pine elsewhere in the document, which provides a direct conflict to other passages indicating that Natural

Areas are unmanaged. It has the appearance of having been written by another party on the committee and lacks a consistent, fluid message.

- A key message that has been used by DEEP again and again in public outreach and publications has been that most of our forests in Connecticut are older forests, varying typically from 80-120 years-old, depending on where one may be at a given time. What we are really lacking is YOUNG forest, and the lack of early successional habitat has led to a decline in the wildlife species associated with the habitat. This includes the highly publicized New England cottontail, which has been critical enough that the federal government has provided financial incentive to create early successional habitat for this species. It also includes a great many migratory birds, as any of our biologists in the DEEP Wildlife Division will tell you. The list is very long but includes whip-poor-will, white-throated sparrow, yellow-billed cuckoo, eastern kingbird, willow flycatcher, brown thrasher, hermit thrush, northern shrike, blue-winged warbler, golden-winged warbler, yellow warbler, eastern towhee, indigo bunting, and yellow-breasted chat. It includes the game birds ruffed grouse and woodcock, numerous hawk and owl species, and many of our state's reptile and bat species. Most of these wildlife species will be actively using these early successional areas within the first 5 years following harvest, if not in the very first year. To say we are going to stop management for young forest habitat across most of our largest expanses of forest is saying we don't care about these species anymore. It is not a logical or ethical management decision in light of all the data we have collected over decades on our native wildlife.
- In most state forests managed by DEEP, there are not only Endangered, Threatened and Special Concern species, but a number of these species require some form of active management or can expand their occurrence if improved habitat is provided. This is incorporated into management plans and operation plans. If these areas are suddenly removed from future management, it will only renew the decline of these species.
- What is a "large tree"? If promoting larger trees is important, perhaps it is also important to define this. When is a tree "large" or large enough? Why does it seem to be assumed that a DEEP managed forest stand does not have large trees, but unmanaged areas do? That is also an erroneous assumption to someone who spends a lot of time working in the Connecticut woods. It depends partly on the forest type, history, and composition of any given stand or tract. A stand composed of short-lived species such as aspen may not make a great large tree/old growth area! Even in the case of an oak stand, what is the composition? Scarlet oak and black oak may normally live to 80-100 years. If there is a stand composed specifically of those shorter-lived and lower quality species (lower quality in terms of wood *and* the acorn crops provided for wildlife), maybe management would be better than leaving it alone.
- Eliminating salvage cutting is a strange position to support in a document that proposes older and larger trees to maximize carbon storage. A dead tree is no longer going to

retain its carbon. Why not salvage the trees to use as forest products that will retain the carbon intact for much longer than decaying organic matter in the woods?

- The concern of "leakage" was first mentioned on page 3. I believe this is precisely what will happen if all forest products are removed from state land. Products demanded by society are going to come from somewhere, and I would much rather see them come from well-managed local forests than from parts of the world that may not be managed with our same care. In particular, this committee should be very concerned about large-scale harvesting in the northern boreal forest (Canada, Siberia) and equatorial tropical regions. The former possesses a tremendous amount of underground stored carbon and the latter has the most above-ground carbon. These regions are particularly critical to preserve. The most important thing we can do in Connecticut is maintain and increase forest land, reduce development pressure that threatens forests, reduce emissions, and convert to *non*fossil fuels as much as possible. The work of silviculture and forest management is not a threat to our climate and carbon storage abilities.
- Leaving large areas of forest alone for strictly natural processes can easily have unintended or unexpected consequences. Are we fighting wildfire there? That can be labeled as management. Are we maintaining the public trails in there? I seriously doubt it. Recreational trails can fragment habitat and impact ecosystems even more than a timber harvest that is very short duration and only occurs years or decades apart. Because trails are sources of continual disturbance. Trails would likely be abandoned as part of the wilderness ethic, reducing many continuous trails maintained by the Connecticut Forest and Park Association. Removal of state forest acres from recreation would put increased pressure on the fewer areas left open to recreation in the state, degrading those parcels more quickly. This year of increased pressures during COVID-19, I believe, has been an appropriate sneak preview of what would happen on a reduced public land trail base.
- On page 30, the document refers to "the emerging science about the role of forests in climate mitigation". So it is admitted that this is a new and emerging science. If this is the case, I am not sure how a committee can back a report with so many specifics and details that will result in such dramatic change to management, when a lot of what is known is still in its infancy. As a forester, I have been through recent training on the value of forests in this era of climate change, and a common thread that I have seen is that managed forests are healthier and more productive, and therefore both collecting carbon at a faster rate and storing more carbon for longer periods. A managed forest is a more resilient forest, and one that provides a greater diversity of forest types, species, age and size classes, and wildlife habitat. This resiliency is as critical as storing carbon, as one of the side effects of climate change are more extreme weather patterns and severe storms. We need a forest able to withstand this more challenging climate regime.

Our state forests have always been managed for a diversity of uses, including forest products for our economy, wildlife diversity, watershed protection, recreation, research, and

demonstration. The state has been including the newest use, climate mitigation, as the latest in its increasingly more complex series of objectives. One consistently challenging charge of a forester is to provide for many different needs and purposes at the same time to achieve the important balance of societal demands on our natural places. No one use should fully dominate and control the spectrum. Foresters are not going to manage thousands of acres just to satisfy mountain bikers who want trails, or to satisfy only game hunters. By the same token, forest managers cannot be expected to remove all other benefits and uses in favor of just carbon storage/climate change mitigation, particularly when the science is still growing. But this is exactly what this document proposes.

I thank you for your respectful consideration.

David Irvin

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:44 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: jamesgang7@everyactioncustom.com <jamesgang7@everyactioncustom.com>
Sent: Wednesday, October 21, 2020 10:26 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.
Especially relevant is the the testimony submitted by LCV under the heading 'Natural Lands'. There is no reason we cannot begin to utilize solutions to environmental problems inherent in the environment itself.

Thank you again for the opportunity to submit comments.

Sincerely,
Mr. David James
11 Carl St  Meriden, CT 06451-3762
jamesgang7@cox.net

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:45 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: jamesgang7@everyactioncustom.com <jamesgang7@everyactioncustom.com>
Sent: Wednesday, October 21, 2020 10:30 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Rebecca French,

Releasing such a critical piece of regulation for public comment on such short notice within  such a narrow window does a disservice to the state.

Thank you again for the opportunity to submit comments.

Sincerely,
Mr. David James
11 Carl St  Meriden, CT 06451-3762
jamesgang7@cox.net

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**Written contribution on Governor's Climate Change Council (GC3)'s Draft Reports**

October 21, 2020

The undersigned are scholars and researchers affiliated with the Engineering for Human Rights Initiative (ENGR-HR) at the University of Connecticut, USA. This group of academics is actively working to understand and solve societal and engineering challenges following human rights and sustainable development principles. As members of the ENGR-HR initiative, we want to express our support for the Governor's Climate Change Council (GC3)'s critical work to reduce greenhouse gas emissions and adapt to climate change impacts in Connecticut. We believe this work is very timely and necessary in order to support equitable development that respects the human rights of Connecticut's people and the natural environment in which we live.

Taking note of the points mentioned above, we submit the following comments on a set of GC3 draft reports:

1. **Equity and Environmental Justice Draft Report**
   *[Contributors: Marisa Auguste, Davis Chacon-Hurtado, Shareen Hertel, Michael Rubin]*

   The document defines equity and equitable programs largely in terms of intent and in process. Key to achieving equitable *outcomes* will be to define and measure equity in outcomes and to build in an evaluation of program impacts on those outcomes into the design and monitoring and evaluation components from the beginning of implementation. The current section on assessing/evaluating impact (briefly on pg. 19) discusses post-implementation information campaigns and solicitation of feedback. These may be important, but to assess program impact on equity outcomes requires a *clear and observable set of criteria for equitable outcomes* and a *program design* that allows for identifying the program impact on those outcomes.

   Overall, the recommendations are very robust, especially when discussing the principles needed for equity. A recommendation in that area would be to discuss the inter-generational implications of equity, sustainable development, and adaptation to climate change more extensively. The future generations are not at the negotiating table, so there must be a way to consider their needs as a part of the strategies recommended. Although the future is uncertain, it is essential to explore future scenarios and their impacts on environmental justice within Connecticut communities.

   In addition, pages 8-9 and page 12 offer an excellent conceptual framework for equity (i.e., distributive, procedural, contextual, and corrective) but we recommend considering the use of the term "restorative" rather than "corrective" because of the regenerative nature of environmental sustainability is better captured therein. There is also ample human rights literature on "restorative justice" (see, for example, Vermont Law School).

[1] There are also UN frameworks for criteria for food justice that might be applicable here (i.e., available, accessible, adequate, and sustainable[2]) when evaluating the relative advantages/disadvantages of proposed policy approaches. Also, it may be useful to consider the core elements of the Boston Human Rights City initiative as a comparable model for civic engagement and participatory planning [3]

Similarly, when considering disparities in health and the additional impacts climate change will have on this, it is important to remember that the disparities that exist for minorities in particular exist because of systemic racial/ethnic/cultural inequality, not because of any inherit differences or deficiencies in biology that predispose them to certain illnesses. Hence, stakeholders, leaders, and others involved in projects may need to be made aware of this, as there may be a lack of understanding among people outside public health and some social science disciplines which could in turn affect viewpoints.

In the transportation area, regarding strategies related to electric vehicles for low and middle-income households, there needs to be a discussion of how current and planned infrastructure (including infrastructure financed by the private sector) is distributed in Connecticut and how it matches areas of Environmental Justice (EJ) populations. Also, when referring to public transportation, it is important to note that its usage depends not only on the availability of infrastructure, hit also on the preferences of commuters. Public transit (especially between towns in Connecticut) is very deficient compared to cars, so it will take considerable planning and investment to convince commuters to switch modes.

Similarly, innovation from new providers such as Uber and Lyft could be adding more vehicle miles traveled (VMT) to Connecticut roadways. However, there is a significant limitation with data to assess these new transportation services' positive and negative impacts. We recommend that the Connecticut Department of Transportation require the disclosure of data that could be used to evaluate the implications of these services on access, congestion, and equity. Other locations such as New York City and the City of Chicago report data on ridership from these services.

A final recommendation is relates centrally to accessibility of the consultative process: while inclusion has been at the forefront of the EEJ report, the document's formatting itself may not be fully accessible for the EJ communities (including people with disabilities). For example, the document has an *accessibility score* of 9% (i.e., organization of the report's content, tags, and contrast create challenges for visually impaired people who rely on computerized readers). In addition, considering that in 11% of households in Connecticut, Spanish is spoken at home, the absence of a Spanish version of the report is problematic; the report has not been translated into any other main language(s) spoken across minority communities in Connecticut). We recommend that

[1] https://vermontlaw.edu/ncrj
[2] https://www.ohchr.org/EN/Issues/ESCR/Pages/Food.aspx
[3] https://www.umb.edu/humanrights/projects/boston

the documents be reformatted for visual accessibility and that at least the executive summaries be translated into Spanish or other relevant languages spoken by members of Connecticut's minority communities.

Some additional minor recommendations include:

- When discussing resilience to climate change, additional aspects related to the economic workforce could be considered. For example, the COVID-19 outbreak and related lock-down measures have added a new dimension to the notion of vulnerability: these, in turn, relate to the type of occupation and incomes experienced by a particular type of worker category (e.g., home care workers, Gig economy workers, and other highly flexible/vulnerable workers).
- The BIPOC denomination may be problematic if minority groups do not identify themselves with this term. Were the people from EJ communities or minorities consulted about being called BIPOC? This term could have the same issues that denominations, such as BAME, has in Europe. There is so much diversity *within* these communities that it would be worth checking as to whether they agree with this nomenclature.
- On page 7, one of the causes of disparities is associated with political representation and participation, however, no recommendations are made on this topic. This point is essential because providing agency to people is a key tool for overcoming poverty and social disparities. This is also related to the issue of inequitable distribution mentioned in the last paragraph of page 7. Similarly, on the same page, the historical roots of inequality in CT are mentioned. It would be helpful to explore the most critical roots and to analyze whether they represent any major problem today intrinsic to social inequality.
- On page 11, the recommendation that "*[p]olicies should prioritize the most vulnerable communities by targeting resources to vulnerable communities first and then expanding statewide*" needs to be complemented with methodologies and strategies related to these investment. For example, infrastructure projects tend to favor areas with the best economic return (based on cost/benefit analysis). Other methods and techniques to maximize other performance measures based on equitable outcomes need to be recommended.
- On the notion of corrective equity (i.e., restorative equity), in order to do more then simply rhetorically hold people accountable, there should be a mechanism by which EJ groups can consult and reach out to people in order to make decisions on how the process should happen.
- On the "*environmental justice public participation guidance"* section, there is a need for specific criteria and mechanisms to assess whether those who attend GC3 consultations are actually representative of the EJ communities and to engage grassroots participants more fully. Given that 15% of Connecticut households do not have internet access and more than 10% do not have access to a computer or smartphone (in 2016),[4] it would be helpful to print and mail hard copies of documents and to use conventional phone numbers in order to reach these communities. In

[4] https://nces.ed.gov/programs/digest/d17/tables/dt17_702.60.asp

addition, there needs to be a process to ensure that the community preferences regarding projects and policies are considered. Also, is there a process (page 13) to verify that the decisions made are consistent with public opinions?
- On the subtitle *Mitigation Subcommittee Recommendations* (Page 40), additional strategies could include telecommuting and other technological alternatives. In addition, how is commercial (freight) considered as part of these strategies?
- On page 41, how will the overburdened communities be identified? This should be tied to the equity mapping effort. Specific thresholds could be suggested to identify low, medium, and high levels of burden within communities.
- For theme 4 on workforce development, there need to be studies looking at Connecticut workers' skills gaps. Based on these results, joint efforts with local schools and corporations will be needed to match the skills necessary for green jobs.
- A final missing element relates to interstate coordination; perhaps this is integral to theme 5 within the adaptation strategies. Climate change actions need to be scaled up to regional levels.

2. **Progress on Mitigation Strategies Draft Reports**
*[Contributors: Mike Rubin]*

**Expand consumer education and awareness efforts to increase the uptake of zero- and low- carbon technology measures**

The program's stated goal is to increase uptake of zero- and low-carbon technology, but it seems as though the outcomes observed in the assessment are primarily the expansion of messaging strategies and the population exposed to these messages. The key question is, what has been the change in adoption of lower-emissions technologies attributable to these activities? If there is a clear research design to assess the impact of these information campaigns on adoption of technologies for lower emissions, it is not clear in this document.

The group might consider designing an evaluation that would measure individual- or neighborhood/other geographic unit-level emissions technology behavior and assess the extent to which it responds to these information campaigns. This could take a variety of forms. Lab experiments exposing subjects to various messaging and measuring some behavioral response may be the easiest to implement, and could provide some clues, but would have limited external validity to actual technology uptake in the broader community. The group might vary where, or through what media, they distribute certain information campaigns and follow up with individuals exposed and unexposed to elicit their uptake. The key would be to design an impact evaluation that allows us to determine whether, and to what extent, these information campaigns change behavior and investment in the alternative technology.

The document highlights that the LMI communities are key, and attributes lack of resources to the lagging uptake or implementation of transitions to lower-emissions

technology. It may very well be the case that limited access to information represents a barrier to progress, but precisely because resources are a constraint that information campaigns may be of limited value. In order to assess the impact of the information campaigns, alongside the policies that provide incentives for technology uptake, requires an evaluation design that allows tracing changes in behavior to exposure to the campaign. This would allow documenting the effectiveness and cost-efficiency of the campaign. Steps forward might include evaluating the combination of information with complementary policies that aim to resolve these resource constraints as well, to determine which combination of strategies works best to encourage uptake of low-emissions technology.

A clear evaluation of the impact of current strategies is a crucial first step to motivate the questions regarding whether additional strategies mentioned (e.g., door-to-door, town-based, etc.) are needed. We also need an evaluation of existing strategies (for their impacts on behavioral outcomes) to compare to the assessments of these alternative strategies if and when they are implemented. The introduction of new strategies should be accompanied by an implementation that takes the evaluation of outcomes into account.

The document notes that real estate professionals have resisted voluntary action. Though not stated explicitly, it seems as though this is a matter of financial and business incentives, structural features of the industry. Therefore, it is not clear why or how training real estate professionals would result in a desirable or sufficient change in behavior to promote efficient emissions. The document alludes to policy options that have been blocked or delayed that would require reporting emissions information, which would, it seems, address these industry fundamentals (though there remains the question of whether those transparency initiatives are sufficient or effective in yielding actual changes in consumer behavior and in emissions!). But, if legislation avenues are blocked politically, it may be worth considering alternative ways to alter these incentives. Of course, it may be the case that training real estate professionals would work, but it may be useful to establish empirical evidence for this before expanding or continuing to invest resources in those efforts, given that incentives may dominate. And if possible, it would be ideal to design a pilot program to compare the effects of training to alternative strategies that address incentives.

What is the mechanism for change in emissions associated with changing real estate professionals' behavior? Is the information on energy efficiency supposed to drive changes in consumer behavior? Is there evidence that it would, in fact, make meaningful changes sufficient to motivate owners to invest in energy-efficient technology in their properties? Given the dominance of resource constraints in housing considerations, I would suspect there are multiple links in the causal chain that could break down between training real estate professionals and the desired outcomes of increased rates in investment in low-emissions technology.

The new strategy providing a one-stop-shop concierge to advise owners provides an opportunity to build in an evaluation component from the beginning. Each of the identified barriers may require different strategies for addressing that source of under-investment in lower-emissions technologies. The changing and varied nature of the incentives for upgrades seems the most direct opportunity to engage for evaluation. Streamlining and simplifying the incentives programs coupled with an information campaign in certain jurisdictions but not others, to compare changes in behavior, for example.

The issues surrounding the fact that upgrades are usually taken up to address immediate concerns as building components fail seems a more difficult problem rooted in the fundamentals of owners' behavior that generates opportunities to promote lower-emissions alternatives. What are the kinds of interventions that would encourage owners to devote attention or identify incentives to upgrade more regularly, or during time periods that do not immediately respond to building component failures? Again, this may come down to thinking about incentives rather than simply access to information.

To engage with the equity initiative highlighted in other areas of the GC3 documents, these evaluations might build in assessment of the distributional and migration consequences of these campaigns. Most directly, we may expect that promoting upgrades and adoption of new technology in buildings in LMI communities may contribute to rises in housing prices that displace those currently resigning in these communities and prevent their equitable access to the benefits of these programs. What complementary policy, information campaigns, and incentive programs may be necessary and effective in protecting these communities and securing their access to benefits from the programs? These outcomes should be clearly defined and measured and incorporated into the monitoring and evaluation of program impacts from the very beginning.

3. **Rivers Sub-Working Group Draft Report**
*[Contributor: Guiling Wang]*

On Page 4, "According to the Connecticut Physical Climate Science Assessment Report (2019), the observed and projected annual total precipitation in Connecticut is projected to increase by 4-5 inches by the midcentury and by 4.5-5.5 inches by the late century (2070-2099)."

On Page 16, "Based on Connecticut Physical Climate Science Assessment Report (2019), the observed and projected annual total precipitation in CT is projected to increase by 4-5 inches (approximately 8.5%) by the midcentury (2040-2069) and by 4.5-5.5 inches (approximately 10%) by the late century (2070-2099)."

I have one editorial comment (actually a correction, since these sentences cite numbers I produced) and one scientific comment:

1. Edits: "observed and projected" should be deleted. The sentences should read as "…. (2019), the annual total precipitation in Connecticut is projected to increase by …." If you would like, you can include information on how observed annual total precipitation has been changing by including additional information, but the numbers cited here are purely for projected future changes.

2. Given that the focus here is on rivers, mentioning the projected precipitation increase alone might be misleading. I believe the projected decrease of potential water availability is highly relevant. A decrease of potential water availability in summer (by 2.4 inches by the midcentury) is projected due to a strong increase of potential evapotranspiration in a warmer climate. This has enormous impact on summer base flow with greatly enhanced risk of streams running dry.

4. **Science and technology Draft report**
*[Contributors: Marisa E. Auguste and Diego Cerrai]*

The component related to engaging and educating leaders, businesses, and advocates regarding the importance of climate change action is critically important. Indeed, the report is accurate in stating that "education is not just for children." Even seasoned transportation experts need new tools to fully apprehend and reflect the human element and the necessity of behavior modification in transportation. For example, research demonstrates the involvement of human error in crash outcomes; more fulsomely reflecting the benefits of new approaches has been a crucial first step in advancing traffic safety initiatives through the Connecticut Transportation Safety Research Center (CTSRC).

In the report, it is written: "Climate impacts to energy reliability are underscored by recurring and recent storm events. A pernicious cycle of power outages and recovery efforts (at all levels) risks serious economic and health impacts, lost mitigation, and cumulative impacts. Some factors:

- **Extensive vegetative management releases stored carbon and decreases ongoing mitigation, increases local temperatures, and fosters a network of invasive plants."**

Beyond the fact that no references are found to support this opinion[5], I believe that the reasons why vegetation management is performed are entirely missing in the sentence. Vegetation management is performed for many reasons by different entities (for details on vegetation management, see the USDA website: https://www.fs.fed.us/forestmanagement/vegetation-management/. In the energy field, vegetation management is performed to increase the resilience of the system to weather and climate extremes (which is actually the subject of the main sentence above). This need becomes even more pressing in a changing climate, due to an increase of storms intensity, as discussed earlier in the document:

- *9. Though it is unclear whether the frequency or intensity of extratropical storms in Connecticut will change, they will likely bring more precipitation. There will be less snow and more rain, but high snowfall events will be more probable.*
- *10. Projection of changes in the frequency of tropical cyclones in a warmer climate are uncertain. However, it is likely that they will have higher winds and lead to more precipitation. Since 1980 there has been an increase in the frequency of hurricanes in category 3 or greater.*

Since it is demonstrated that utility vegetation management increases the system resiliency to extreme events (see [6]), I believe that the above sentence in bold needs to be either supported or replaced with a more comprehensive explanation of the pros and cons of vegetation management.

5. **Infrastructure and land-use Draft report**
*[Contributors Marisa E. Auguste]*

I would like to highlight non-driving teenagers and young adults as an additional vulnerable population with regards to publicly funded transit and the built environment for non-motorist travel. I conducted a retrospective survey of CT teenagers' travel behavior and mobility issues (in press in *Transportation Research Interdisciplinary Perspectives*) and discovered that because of age and financial restrictions (i.e., GDL, ride-share age requirements), teens in rural areas who do not drive or otherwise have access to a personal vehicle, face specific challenges. Their environments typically lack reasonable access to public transit, lessening their exposure to businesses and commodities outside their immediate area and their potential for employment. There is also a noticeable absence of built sidewalks and bike paths in rural areas and many pedestrians and cyclists are left having to traverse narrow, dimly lit roadways with high-speed vehicle traffic, increase their risk for injury and death. If these areas were to become flooded as a result of climate change, it could greatly exacerbate these issues.

[5] It looks like the document refer to “vegetation mismanagement” instead of "vegetative management”
[6] https://www.sciencedirect.com/science/article/pii/S0378779619302287

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> Considering the income disparities in the state and that nearly a quarter of CT's population is under the age of 21, this may be something to consider.

We appreciate the opportunity to provide input on the draft reports and we look forward to participating in future discussions on its content and implementation.

The undersigned,

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 5:39 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: Diane G. Nash <dianegnash@gmail.com>
Sent: Wednesday, October 21, 2020 5:29 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change,

CT is a beautiful state, abundant in natural areas.
Too many of these areas , particularly our public forests are being over managed and are supplying timber to be exported and burned.
This provides no benefit to CT, and the burning of trees provides no benefit to the environment.
The opposite is in fact, true.

Some of our land must be preserved and protected, allowing us to study how nature manages and survives.
We need these natural spaces, for our physical and mental health.
CT citizens, intrinsically, know and understand this, and it is the citizens, embracing this knowledge, this science, that will have the largest impact on mitigating the climate change crisis.

Our public land is held in the public trust, a trust that must be honored.

We depend on your leadership in this regard.

Diane Nash

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Comments for Science and Technology

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 1:39 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Diane Hoffman <hoffmandiane30@gmail.com>
**Sent:** Wednesday, October 21, 2020 12:58 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Comments for Science and Technology



**Diane Hoffman**

**190 Wilmot Rd.**

**Hamden, CT 06514**

**Dear Science and Technology Working Group,**

**Thank you all for your long hours, hard work and very informative report. I appreciated and support your report.**

**I urge you to support the Forestry working group call for "No Net Loss of Forests" which includes urban and suburban forests, which I believe is in line with your findings and addresses many of the basic health needs of vulnerable communities.**

**I also ask that you support the EEJ Top Priority Action: Develop and fund a community engagement strategy to inform the 2021 GC3 planning process and implementation, including support in the form of grants for partnering community-based, non-governmental organizations to design the community engagement process, receive training, and co-develop recommendations to ensure meaningful input and equitable approaches to mitigation and adaption. Both public and private funding should be pursued.**

**In addition, please support carbon pricing to seriously address the cost of carbon producing activities and meaningfully reduce them and "Ensure that the revenues generated are invested in programs that reduce the pollution burden on LMI communities and address any potential adverse economic impacts of the program" as called for on page 44 of the EEJ report. Please also see:**

**https://www.ucsusa.org/resources/carbon-pricing-101#:~:text=The%20resulting%20interaction%20between%20the,sector%20or%20the%20whole%20economy.**

**Here are my additional comments on your report. I have not commented unless I disagreed, have a question or a suggestion. Thank you for your attention and consideration of these comments.**

**Page 6** #2. Mean sea level in Long Island Sound could be up to 20 inches above the National Tidal Datum Epoch (1983-2001) by 2050 (O'Donnell, 2018). This projection is not sensitive to future trends in CO2 emissions. ***** It would be helpful if you could describe what our coastline will look like If this happens. What neighborhoods will be gone?**

**Page** 7 Average temperatures in Connecticut could increase by 5 oF (2.7 oC) by 2050 *****starting from when?**

**Page 8** #8. Drought risk is also expected to increase. The probability of unusual events (extremely low annual and summer water availability, and extremely high 1-day and 5-day. *****Trees also play an important role in addressing drought.** https://www.americanforests.org/blog/no-trees-means-no-rain/

**Page 9** Stewarding, managing and upgrading our natural and built environment and energy systems to reduce risk and increase resilience is a priority for planning and action. Impacts to state-wide and community-based lifelines of infrastructure (ranging among water, food, transportation, communication, shelter, resource distribution, disaster resilience) and energy (i.e. reducing demand; clean, affordable options; distributed local energy) demand a multisolving approach to identify gaps, priorities and opportunities. *****include trees in the list above along with water and all the others.**

**Also please endorse and encourage the use of engineered soils especially in the towns and cities where street trees and sidewalks are in close proximity.** https://en.wikipedia.org/wiki/Structural_Soil

**When it comes to design, building geometry should be mentioned to maximize energy efficiency.**
**https://www.researchgate.net/publication/322727624_Influence_of_the_building_geometry_on_energy_efficiency_of_timber-glass_buildings_for_different_climatic_regions**

**Page 11. I strongly support** "A strategic plan to bury power lines and prioritize resilient, distributed, clean energy prevents impacts, protects health and solves multiple problems. - Judicious evidence-based tree removal or pruning represents harm reduction: reducing negative impacts on mitigation, adaptation, equity, biodiversity and public health. **Also, please encourage the Governor to establish a commission to investigate undergrounding of our utilities to move the state forward with this technology which is used all over Europe and many sectors of the US and can be employed successfully in locations throughout CT. No other industry has been allowed to stay entrenched in the 1900's.**

**Page 12-** Regarding "Clean energy does not come out of a smokestack***** Please support the call to stop the Killingly Power Plant. This is not a radical request but rather a recognition that the fossil fuels this plant would produce would negate the beneficial effects of everything the GC3 is trying to accomplish.** https://www.courant.com/opinion/op-ed/hc-op-scott-killingly-power-plant-0917-20200917-mk3zuau5h5bp5pksnklxn5xy2y-story.html

**Page 14 "**Protecting nature where possible, and within urban, suburban and rural communities, is a first principle in a resilient future." ***** The role of trees in protecting nature should be stated as often as the importance of having drinkable water. Trees also give us food- fruits and nuts. Please strengthen your recognition of the critical need to protect bio-diversity.**

**https://www.royalparks.org.uk/parks/the-regents-park/things-to-see-and-do/gardens-and-landscapes/tree-map/why-trees-are-important#:~:text=Trees%20are%20vital.,materials%20for%20tools%20and%20shelter.!**

**https://www.unenvironment.org/explore-topics/resource-efficiency/what-we-do/cities/biodiversity-and-ecosystems**

**Page 15** Dr. Rebecca Shaw, Chief Scientist at World Wildlife Fund (WWF), put a spotlight on the core issue: "One of the things that science has told us in the last decade so clearly is that we depend on intact natural systems and intact natural ecosystems, in all its component parts, to deliver those things we count on every day: clean air, clean water, pollination, a stable climate, food, healthy soils to produce the foods we eat" and "that health is declining and declining fast." The recent WWF report - Living Planet 202058 builds on previous reports and does not equivocate: "Our relationship with nature is broken." ***** This cannot be stressed enough! The report makes no additional mention of the importance and critical need for diversity of life-fish animals, insects etc. in the natural world. This deserves some additional mention.**

**Page 23** Examples of data essential to characterizing impacts might include: air quality, temperature, and humidity in places people live; water level in flood zones, stream flow rates, water temperature, salinity and pH in streams and

estuaries; ground water levels and salinity; soil health and carbon storage and sequestration in natural systems; comprehensive biodiversity (including insects). ***** Please include net gain or loss of tree canopy to this list.**

Characteristics of communities or hyperlocal areas that might be vulnerable to consequences of climate change, or mitigation and adaptation strategies, should also be tracked. These data are also recommended by other working groups and should include: access to food, water, transportation, energy, education, health care, recreation, parks and beaches. Epidemiological data should be able to be linked to information about local climatology and exposure to hazards (toxins). *****Please include net gain or loss of tree canopy to this list.**

**Page 25** Climate Change Communication for Public Engagement Develop professional certification program for unified messaging of Climate Change Impacts and Actions

Implementation Entities ***** Please include professional representatives of vulnerable communities if no representatives from Green LEAF schools in these communities get involved.**

**Page 35** Implementation Entities: ***** Please Include professionals who live in the vulnerable communities**

**Page 37** Recommended Implementation Action Title: Prioritize proforestation on public land; ensure old-growth forest and remnants are protected.

Recommended Implementation Action Description: Allow suitable existing natural public forests to grow to maximizes carbon accumulation and ecological complexity. Protect old-growth forests and remnants as they are essential to protecting the full range of native species, including species still to-be-discovered. ***** I strongly support this**

Implementation Entities- DEEP ***** Can DEEP do this by themselves?**

**Page 38** Encourage adaptation strategies that will ameliorate the effects of water inundation. *******
**https://www.americanforests.org/why-it-matters/water/#:~:text=Forests%20act%20like%20a%20sponge,also%20act%20like%20a%20filter.**

**Page 43** Identify research needs and disseminate current climate change adaptation research and technical resources to the appropriate stakeholders, and encourage future efforts through state grants.

Recommended Implementation Action Description: ***** please include research and technical assistance to address pest infestations of trees.**

**Page 45** Comprehensive Place-Based Implementation of Mitigation, Adaptation and Resilience.

Select and establish pilot region(s) to quantify and demonstrate the benefits of implementing a comprehensive climate resilience plan that is risk-based. At least one region should be an urban/suburban watershed in order to take advantage of the co-benefits of climate mitigation and adaptation, ecosystem services, and equity and community resilience. Identify and mobilize actions with a range of costs and timelines and leverage diverse stakeholders and funding sources

Implementation Entities *****Please include residents of the vulnerable communities!**

**Lastly, I have the following requests:**

**Please Call on the Governor to issue a strong definitive statement on the critical need for our forests, including our town/city street trees, and the need to protect our trees. This is needed to address and overcome the fear of trees that the utility companies are actively promoting. Please call upon him to repeat this consistently especially after extreme weather events.**

**Lastly, please call on the Governor to require that the CT Siting Council embrace the goals of the GC3 and Executive order #3 when considering all projects brought before them.**

**Thank you VERY much for your consideration.**

**Sincerey,**

**Diane**

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Alec Shub <alec.shub@uconn.edu>

# FW: Letter to GC3 Forestry Working Group

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 6:24 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Diane Hoffman <hoffmandiane30@gmail.com>
**Sent:** Wednesday, October 21, 2020 6:19 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Letter to GC3 Forestry Working Group

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

**Diane Hoffman**

**190 Wilmot Rd.**

**Hamden, CT 06514**

**10/21/2020**

**Dear Forestry Working Group**

**Thank you all for your long hours, hard work and your extraordinary report which I appreciate and overwhelmingly support.**

**In Page 1 of your summary report you write: Climate change is an enormous threat to Connecticut's forests and people, and we must respond boldly with urgent action." I submit the following comments in that spirit and belief.**

1. **On page 1 the report states: "We are all forest dwellers" This includes all of the diverse life that exists in the forest. This report should strongly acknowledge the diversity of life living in the forest that must also be considered in your planning. I do not believe it is appropriate to sanction hunting in this report.**

2. **Page 3. I completely endorse your call to Adopt a "No Net Loss of Forest" policy for Connecticut in support of all of your recommendations. I urge you to ensure that this includes our urban/suburban forests/street trees.**

**On page 15 #5 of your 'No Net Loss of Forests" please call for local communities to adopt their own local policy of No Net Loss of Trees or canopy.**

**3. Page 18. I strongly support your Top Priority Actions especially Keep Forests as Forests**

**It is the diversity of life that keeps our ecosystem alive and functioning.**

**https://www.roundsquare.org/ideals-challenge/round-square-environmentalism-sessions/task-five/biodiversity-and-deforestation/#:~:text=Deforestation%20can%20directly%20lead%20to,plant%20species%20in%20an%20environment.**

**4. Pages 20, & 38. Create and fund a Connecticut Youth Conservation Corps. I think this is an excellent suggestion and I advised the EEJ working group and the financing group that Forestry had recommended this and urged them to support it.**

**5. Page 22. Changing Laws and Regulations- I respectfully request consideration of the following:**

**A. Call for tree wardens to be certified arborists.**

**B. All Trees should be viewed as a public asset. The services trees provide benefit the entire neighborhood/ community. Private property owners should be required to submit a request for a permit to remove a tree to the tree warden and the tree should only be approved for removal if approved by a certified tree arborist. If approved, a permit fee should be charged to the property owner.**

**In addition, realtors should be required to disclose tree regulations that affect trees on private property that is being purchased. This will have several co-benefits: property owners will learn tree regulations for their town and state; far fewer trees will be destroyed after the property is purchased thus protecting the character and ecology of the neighborhood; needed funds will be collected by the town if regulations are violated.**

***Require realtors to get a signed disclosure form fr*om new property owners* that informs the buyer of state and local regulations regarding trees on their property before the closing. Buyer receives a copy of the disclosure when signed and a copy is included in the closing papers.**

***Copy of signed disclosure form given to town tree warden.**

***Fine realtors who don't disclose and fine property owners who don't obey regulations. All fines should be used for tree planting and care.**

***Tree Warden responsible for enforcement of tree regulations.**

**C. Please encourage the Governor to establish a commission to make undergrounding of our utilities happen and move the state forward with this technology which is used all over Europe and many sectors of the US and can be successfully installed in locations throughout CT. No other industry has been shielded from advancement as this industry has been.**

**6. Page 28. Establish Criteria and Designate Core Forest Natural Area Preserves on State Lands. I understand there is a great deal of opposition to this action. I strongly urge you to NOT abandon this action and if necessary, create pilot project areas for this action to unfold.**

**7. Page 31 "Do not permit aggressive pruning and removals of healthy street trees, and focus (or target) pruning and removals to trees in hazardous poor condition that are imminent threats to people or electric infrastructure."**

**Require that pruning of a non-hazardous tree only allows for cutting back of branches so they do not touch the wires and such pruning does not damage the health or structural integrity of the tree.**

**Also please call for town leaders to work with their local tree commission (or other active tree friendly, focused group) and together reach out to their local utility company to create a relationship that provides for cooperation to ensure respectful, responsible stewardship of our local street trees.**

**8. Page 36. Support Community Interest in Tree-Planting, Green Spaces, and/or Gardens.**

**I ask that you please support the EEJ Top Priority Action: Develop and fund a community engagement strategy to inform the 2021 GC3 planning process and implementation, including support in the form of grants for partnering community-based, non-governmental organizations to design the community engagement process, receive training, and co-develop recommendations to ensure meaningful input and equitable approaches to mitigation and adaption. Both public and private funding should be pursued.**

**9. Page 45. Incentivize the Siting of Renewable Energy Infrastructure to Avoid Loss of Forests, Farmland and Other Sensitive Lands**

**Thank you for this! Please also call on the Governor to require that the CT Siting Council embrace the goals of the GC3 and Executive order #3 when considering all projects brought before them.**

**Also, please call on the Governor to issue a strong definitive statement on the critical need for our forests including our town/city street trees and the need to protect our trees to overcome the fear of trees that the utility companies are promoting. Call upon him to repeat this consistently especially after extreme weather events.**

**10. Finally, on page 1 your report states "In 2018, Connecticut joined with over 25 states in accepting the U.S. Climate Alliance's Natural and Working Lands Challenge with a commitment to the following actions:**

**One of the actions is "Advance programs, policies, and incentives to reduce GHG emissions…"**

**In that spirit I encourage this working group to oppose the Killingly Power Plant which is now being actively considered and if approved will negate all of the good work, effort and hopes of the GC3. This is not a radical request. Stopping the Killingly gas-powered plant is a critical step if CT is serious about achieving our GHG goals for 2030 and 2050.**

**Thank you once again for this thorough report.**

**Sincerely,**

**Diane Hoffman**

UCONN
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Alec Shub <alec.shub@uconn.edu>

# FW: Letter to GC3 Equity and Environmental Justice Working Group

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 1:40 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

**From:** Diane Hoffman <hoffmandiane30@gmail.com>
**Sent:** Wednesday, October 21, 2020 1:05 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Letter to GC3 Equity and Environmental Justice Working Group

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

**Diane Hoffman**

**190 Wilmot Rd.**

**Hamden, CT 06514**

**10/21/2020**

**Dear Equity and Environmental Justice Working Group,**

**Thank you all for your long hours, hard work and very informative report which I appreciate and support.**

**I especially appreciate your recognition of the critical importance of trees in vulnerable communities and urge you to support the Forestry recommendation of No Net loss of Forests in CT. which includes urban and suburban trees.**

**Trees help vulnerable communities deal with increased flooding and increased high heat days by absorbing rainwater, shading and cooling walkways and streets which will aid walkers and cyclists. Trees will provide medical benefits by cleaning the air, and improving mental health by reducing stress and road rage. Trees will increase property values by providing beauty, reducing noise and hiding unsightly items in the neighborhood. They will increase local business and pride in their neighborhoods. This will attract investment and increase engagement by residents in the planning process and will help to create a greater vision for these neighborhoods. Lastly forests impact the health and safety of vulnerable communities because of their influence on weather that affects all of us. https://www.arborday.org/trees/treefacts/ and** https://www.americanforests.org/blog/no-trees-means-no-rain/ and

**In support of your report I would like to make the following comments:**

**1.I strongly support the EEJ Top Priority Action: Develop and fund a community engagement strategy to inform the 2021 GC3 planning process and implementation, including support in the form of grants for partnering community-based, non-governmental organizations to design the community engagement process, receive training, and co-develop recommendations to ensure meaningful input and equitable approaches to mitigation and adaption. Both public and private funding should be pursued.**

**1. Page 44 thank you for addressing this; Theme 1: Carbon Pricing • Regardless of whether a jurisdiction adopts a straight carbon fee or a cap-and-trade system, both approaches can exacerbate or ameliorate impacts on LMI communities. • Ensure that the revenues generated are invested in programs that reduce the pollution burden on LMI communities and address any potential adverse economic impacts of the program.**

**2. Page 45 Thank you for focusing on this! : Theme 6: Natural and Working Lands • Trees in urban areas can improve air and water quality, mitigate the heat island effect, and help alleviate noise. Residential and urban trees and forests also shade and cool buildings in summer and insulate them in winter, which significantly reduces energy use (and costs) of air conditioning and heating. And, generally, forests provide excellent recreational opportunities for all of Connecticut's residents. Please also see: Saveatree.com/whytrees.html and https://www.americanforests.org/why-it-matters/water/#:~:text=Forests%20act%20like%20a%20sponge,also%20act%20like%20a%20filter and https://www.unenvironment.org/explore-topics/resource-efficiency/what-we-do/cities/biodiversity-and-ecosystems**

**3. Page 46 Non-Energy-Thank you for noting tree benefits . ***Trees also assist with CSO over-flow. https://www.americanforests.org/magazine/article/trees-the-new-sewers/**

**4. I have the following requests: Page 46 electricity- Please call for PURA and the CT Siting Council to participate in the GC3. These 2 bodies make critical long-lasting decisions that significantly affect our climate and should be accountable and accessible to the people of Connecticut.**

**Please call on PURA to require that Utility companies work with local tree commissions to ensure careful, respectful and responsible stewardship of our street trees. (please see attachment)**

**Please call upon the Ct Siting Council to be accountable to the people of the community when deciding the appropriateness of a facility. Currently in Hamden there is an effort to remove 15 acres of trees to build a solar facility. https://www.newhavenindependent.org/index.php/archives/entry/solar_farm_15_acres_of_forest/**

**Please call for an end to the Killingly Gas Power plant which will negate all of the effort the GC3 is making to reach our carbon goals by 2030. .https://www.courant.com/opinion/op-ed/hc-op-scott-killingly-power-plant-0917-20200917-mk3zuau5h5bp5pksnklxn5xy2y-story.html**

5. **Page 48 Transportation- Trees along our streets are essential for the safe travel of walkers and bicyclists on hot days by providing shade, creating oxygen and working to clean the air. Trees also calm drivers which reduces road rage, resulting in safer streets. https://www.streettreesforliving.org/benefits-of-street-trees**

**6. Page 50 Electricity- I attended almost all Utility Infrastructure meetings. Initially there was no mention of trees or Equity and Environmental Justice concerns. Fortunately, a member of another working group attended some of the meetings and brought the EEJ lens to the meeting and helped them focus on the needs of vulnerable communities.**

**7. Lastly, Page 20 of the Forestry Working Group report calls for the creation and funding of a Connecticut Youth Conservation Corps. I believe this is an excellent suggestion and should be funded. Members of our vulnerable communities should be recruited to participate in this conservation corp. It will provide paying employment and will provide an incredibly satisfying and educational experience that will serve all participants throughout their lives as well as provide an important service to our communities.**

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Working Group Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:51 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Diane Lauricella <dlauricella24@yahoo.com>
**Sent:** Wednesday, October 21, 2020 11:58 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** GC3 Working Group Comments



Commissioner Katie Dykes

Rebecca French

It has been an honor to participate in this process and I hope to continue following the progress of this challenging study. Participation was not easy , as I , like many in our state, lost work due to COVID19-related work reduction. Many of us, including CTDEEP and CT DPH staff, really stretched in order to create these reports during a pandemic and economic downturn. We all showed that we cared enough to stick with it!

I participated in many online meetings of the other Working Groups and Sub-Committees, and offered my suggestions and ideas when I had the time. I was inspired by the terrific thoughts that were shared among the participants.

**Equity and Environmental Justice Working Group Report:**

I am a Member of the Equity and Environmental Justice Working Group, and was impressed with the efforts undertaken by our Co-Chairs Marianne Edelman-Lado and Lee Cruz. I spent time offering ideas in the Mapping and Public Participation Sub-Working Groups.

1. I should be listed in **Appendix A** in the following manner: **Diane Lauricella, Norwalk** not IREJN.

2. Page 3 Wholly support Identifying Communities that are most vulnerable to climate change and allow these neighborhoods priority resource allocation. Also, wherever possible, use graphics, including Mapping overlays, to clearly illustrate vulnerable areas so that those very same vulnerable communities can understand the risks and the respective towns can plan for the extra attention.

3. Also, utilize Census data to overlay demographics and determine which languages to include.

4. Mandate Climate Change Education at every level of public school. Urge CGA to implement the Bill that was passed.

5. Map , identify and prioritize which Brownfields sites could be used for energy projects.

6. Ask that CT OPM add an EEJ lens in writing to each Town's mandated POCD (Plan of Conservation and Development).

7. **Create an EEJ Legal Defense Fund**, fashioned after the NAACP National Legal Defense Fund, to include other Experts that would be needed for legally proving Climate change and energy problems. Environmental Legal Clinics now available at Yale, UConn and Quinnipiac often have limited scope and their timing is based upon student schedules , therefore limiting their use.

8. **Create an EJ and Climate Change-related CLEAR program** in order to expedite municipal official's' understanding of EEJ in addition to all of the other Working Group's categories. This will bring the issue of Climate Change management and preparation to the "table" of local budgets, land use, health and safety and emergency response much more quickly.

I plan to continue reviewing the other Working Groups' reports and will offer thoughts when we approach the public hearing stage. On occasion I participated in the online meetings of many of the Working Groups and especially enjoyed the work done by the Public Health Group.

Regards

**Diane Lauricella**

**203-858-1537**

# Public Comments on Select G-3 Draft Reports

Elanah Sherman, Norwich, CT

Introduction: My comments and suggestions are all directed toward creating greater consciousness of people with disabilities as a distinct class protected by civil rights law. Although sometimes people with disabilities do have medical problems, whether they do or do not does not diminish their primary political identity when considered in terms of civil rights.

I read the Draft Reports of the Forests Sub-Group and Equity and Environmental Justice. Unfortunately, I did not have time to do a line-by-line analysis, but I think I provide sufficient critique to aid the writers in broadly re-examining when, where and how it would be beneficial and appropriate to include disability in at least parts of the analysis. In other words, I hope my comments are helpful, but I know they are not comprehensive.

## FORESTS SUB-GROUP

Pg. 13, Sections in Green.
Specify activities and environments that would support use by people with disabilities. Ensure that creation of shade canopies do not present obstructions for people with disabilities, including people with visual disabilities.

Pg. 15, Protect Urban Forests
“Access to parks” needs to be augmented by ‘accessibility of parks,’ as they mean very different things.

Pg. 20, Education and Outreach
Seek participation among all underserved, marginalized youth, including youth with disabilities.

Pg. 22, funded program for municipalities
Mention that planting design, in terms of both height and width, should be cognizant of both vertical and horizontal obstruction.

Pg. 31, Pruning
Pruning is sometimes necessary to create a safe path of travel for people with disabilities, often those with visual disabilities, by removing branches that protrude both vertically and horizontally.

Pg. 32, Priority Actions
The word ‘vulnerable’ appears frequently in the report, and for understandable reasons. The writers need to know, however, that many people with disabilities resent the term, believing that it indicates helplessness and dependence. Having historically suffered for having to accept unnecessary and unwanted help and direction foisted upon them, the word ‘vulnerable’ often makes them cringe. Sometimes, ‘marginalized’ is a better choice. (Just something to think about.)

Pg. 33, Climate-Related Health Stressors
Disability and poor health do not necessarily conflate, but both healthy people with disabilities and those with poor health are negatively affected by climate change. Better to separate out these categories in some way, rather than simply list examples of disabilities with health corollaries.

Pg. 34, Each italicized item has disability resonance.

Pg. 36, Support Community Interest
‘Community’ should explicitly include people with disabilities as a constitutionally defined constituency.

Pg. 43 (bottom) – 44 (top),
On a non-disability note: Change statute to allow private nonprofits to apply directly for funding under the Urban Green program. Also, expand kinds of projects that are fundable. (Safeguards should already be in place for Urban Green projects to meet accessibility requirements.)

Pg. 52 (bottom). Target marginalized students for participation.

October 21, 2020

DEEP Climate Change
Ten Franklin Square
New Britain, CT 06051
Via email: deep.climatechange@ct.gov

Re: Kolmar Americas, Inc. and American GreenFuels, LLC Comments to Draft Report of the Progress on Mitigation Strategies Working Group

To Whom It May Concern:

Kolmar Americas, Inc. ("Kolmar") appreciates this opportunity to provide written comments to the Governor's Council on Climate Change (the "GC3") Draft Report of the Progress on Mitigation Strategies Working Group on its own behalf and on behalf of its wholly owned subsidiary, American GreenFuels, LLC ("American GreenFuels"). Kolmar urges the State of Connecticut to fully embrace the environmental, economic, and in-state employment benefits of biodiesel in efforts to reduce greenhouse gas ("GHG") emissions in both the thermal and transportation sectors.

American GreenFuels is a biodiesel production facility located at the Port of New Haven, Connecticut. Kolmar acquired this start-up facility in late 2015 and has invested millions of dollars in upgrades and additional hiring and training of skilled workers. Since Kolmar's acquisition of the facility, American GreenFuels has more than doubled both the name plate capacity and the number of employees. The facility now has a nameplate capacity of 40 million gallons annually and employs 50+ workers directly with hundreds more employed as contractors, truck drivers, and other service producers. The facility converts feedstocks, predominately used cooking oil and other waste oils, into biodiesel, which has been independently certified to result in up to a 93% reduction in greenhouse gas emissions compared to traditional petroleum diesel.

Kolmar has a twenty plus year history of employment in Connecticut and now directly employs more than 100 people in the state. Kolmar is a marketing, trading, and manufacturing company, whose products range from renewable fuel, renewable fuel feedstocks, blended diesel fuels, petroleum products, and petrochemicals. Kolmar has been marketing biodiesel since 2006 and now owns biodiesel production assets in New Haven, CT (American GreenFuels, LLC), and Port Arthur, TX (American GreenFuels Texas, LLC). Kolmar has extensive experience as not only a producer of biodiesel, but also an active importer and exporter of renewable fuels, including ethanol, biodiesel, and renewable diesel, with extensive knowledge of regulatory regimes both within the United States and internationally. Such regulatory regimes include the federal Renewable Fuel Standard, low carbon fuel standards in California, Oregon, and British Columbia, and various programs in the Europe Union consistent with its Renewable Energy Directive, referred to as the "RED" directive. Kolmar has a deeply vested interest in the success of the renewable fuels industry and is a highly active participant in all aspects of the renewable fuels industry.

Kolmar appreciates the GC3's recognition that biodiesel can be an important component to decarbonizing the thermal sector in addition to reducing particulate and hydrocarbon emissions. Kolmar is very supportive of a thermal portfolio standard to reduce GHG emissions from the thermal sector and believes biodiesel can be an

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important and valuable energy source to achieve such a program's goals. Kolmar also appreciates the GC3's recognition that the biodiesel portion of any heating oil should not be subject to a carbon or fossil fuel tax, so as to promote increased blending of valuable renewable fuels, such as biodiesel, that can reduce the carbon footprint of heating oil in Connecticut. Kolmar also notes that the GC3 report notes that some members of the GC3 expressed some concerns about embracing biodiesel and hopes these comments will help alleviate those concerns.

About Biodiesel

Biodiesel is a cleaner burning, domestic and renewable fuel that is refined from both virgin vegetable oils and waste oils, such as animal fat, distillers/inedible corn oil, and recycled cooking oil. It is a "drop-in" fuel that can be used in compression-ignition (diesel) engines and oil-fired heating systems with little or no modifications. With energy efficiency comparable to conventional petroleum-based diesel, biodiesel provides similar mileage in road-use engines and similar heating efficiency in heating oil burners. Primarily marketed as a blend component along with conventional diesel fuel or heating oil (i.e., 5% biodiesel and 95% heating oil referred to as "B5" and 20% biodiesel and 80% heating oil referred to as "B20"), biodiesel is distributed via existing fuel distribution infrastructure with blending occurring both at terminals and by individual fuel marketers.

Biodiesel Offers Significant Reductions in Greenhouse Gas Emissions

Study after study has confirmed the substantial reductions in greenhouse gas emissions resulting from the replacement of traditional petroleum diesel with biodiesel, including independent assessments by the National Renewable Energy Laboratory (NREL); Environmental Protection Agency; the Department of Agriculture; and California's Air Resources Board. Most recently, a joint, peer-reviewed study by the Argonne National Laboratory; the U.S. Department of Agriculture (USDA); and Purdue University (the "Joint Study") found biodiesel, on average, reduces GHG emissions by 72 percent and fossil fuel use by 80 percent compared to petroleum diesel.[1] Additionally, ICF International compared the greenhouse gas emissions of biodiesel to natural gas and found a 70% reduction associated with replacing natural gas with biodiesel.[2]

Biodiesel Offers Significant Other Environmental Benefits, Especially for Low-Income Neighborhoods

Biodiesel contains virtually no sulfur or aromatics, and use of biodiesel in a conventional diesel engine results in substantial reduction of unburned hydrocarbons, carbon monoxide and particulate matter. The American Lung Association has labeled biodiesel a Clean Air Choice® because it's use can reduce overall health care costs by lowering the risk of asthma and other respiratory diseases. This is particularly true for many low-income neighborhoods across Connecticut, which are disproportionately affected by air pollution. Biodiesel is a ready-made solution to this problem.

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[1] Chen, Rui, Zhangcai Qin, Jeongwoo Han, Michael Wang, Farzad Taheripour, Wallace Tyner, Don O'Connor, and James Duffield, "Life cycle energy and greenhouse gas emission effects of biodiesel in the United States with induced land use change impacts," *Bioresource Technology* 251 (2018) 249-258.

[2] "Assessment of New York City Natural Gas Market Fundamental and Life Cycle Fuel Emissions," LCF International, Prepared for New York City Major's Office of Long-Term Planning and Sustainability.

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Connecticut Can Benefit From Embracing Existing Thermal REC Frameworks

Connecticut should embrace existing thermal REC program frameworks to both provide regional consistency to market participants and to streamline implementation of a program. In particular, Connecticut should consider (i) incorporating a thermal REC program into an existing portfolio standard, (ii) utilize the reporting forms and methodology adopted by the Massachusetts DOER in implements the liquid biofuel portion of its thermal REC program, and (iii) use stipulated boiler efficiencies and mega-watt hour to BTU conversions. The Massachusetts program in particularly has been successful in quickly increasing biodiesel blend rates in its heating oil, by providing a consistent but simple reporting and compliance mechanisms. Kolmar urges Connecticut to incorporate these existing systems, which can more quickly achieve policy goals and save the state substantial funds by not developing a novel portfolio standard and compliance system.

Conclusion

In conclusion, Kolmar and American GreenFuels believe biodiesel is essential to Connecticut meeting its environmental goals. The substantial reduction in greenhouse gas emissions this fuel provides, in addition to the ease of its implementation, makes it the perfect "now" solution for Connecticut to meet its greenhouse gas reduction targets in the thermal sector. By quickly embracing existing frameworks for a thermal REC program, Connecticut can create additional, local jobs, and move the state towards utilizing more renewable, locally produced energy, and help meet global policy goals in reducing GHG emissions.

Please advise us of any specific concerns the GC3 may have with biodiesel and Kolmar will be happy to respond or connect the GC3 with exports who can.

Sincerely,

**Elias Petersen**
Senior Attorney
**Kolmar Americas, Inc.**

To: Governor's Council on Climate Change

From: Elizabeth Gara, Connecticut Water Works Association

Date: October 21, 2020

Re: Draft Reports: Climate Change Recommendations

The Connecticut Water Works Association (CWWA), which represents municipal, private and regional water utilities, appreciates the opportunity to comment on the draft recommendations of the Governor's Council on Climate Change (GC3).

Connecticut's water utilities are committed to protecting the public health and safety of their customers by ensuring the continued availability of safe, high quality public water supplies at a reasonable cost. In addition to complying with extensive state and federal laws and regulations, water utilities are proactively responding to the impact of climate change on water systems and water quality as well as the need for greater resiliency due to more severe storm events.

CWWA respectfully submits the following comments for your consideration:

## INFRASTRUCTURE INVESTMENT

***GC3 Recommendation:***

- ***Identify and prioritize funding for critical infrastructure (UI-10)***

A reliable water infrastructure that delivers a safe supply of water to residents and businesses is critical to the public health and safety of our communities. Investing in infrastructure replacement allows water companies to meet the needs of current customers while protecting systems and resources for future generations. It also improves water quality, strengthens system resiliency and reliability and helps preserve precious water resources by minimizing breaks and leaks in aging distribution systems.

In addition, water companies must invest in infrastructure to comply with new and pending state and federal regulatory requirements, including revisions to the Lead and Copper Rule, addressing emerging contaminants, such as PFAS and upgrading dams and systems to comply with the state's stream flow regulations.

As Connecticut utilities' investments are reflected in customer rates, it is important to have funding mechanisms in place to assist water companies in funding infrastructure projects. Connecticut's Drinking Water State Revolving Fund (DWSRF) administered by the state Department of Public Health Drinking Water Division relies on federal funds to

assist water companies in financing drinking water infrastructure projects. In addition, the Clean Water Fund (CWF), administered by the state Department of Energy & Environmental Protection, provides financial assistance to municipalities for projects addressing wastewater needs.

The importance of maintaining grant/loan forgiveness as a component of DWSRF and CWF with availability for all Connecticut utilities regardless of form of ownership, must also be acknowledged. Over the last decade the grant portion of DWSRF projects has frequently been reduced to ten percent or less, which reduces investment in infrastructure across water industry and makes less funding available for the investments outlined in this report.

Additionally, DWSRF funding has previously excluded funding for work on water supply dams. The increase in rainfall intensity and flooding may require the upgrade of water supply dams to withstand flooding and a state funding mechanism would help to complete these upgrades and maintain the safety of drinking water reservoirs. CWWA also supports efforts to ensure that DWSRF or other funding is available to support interconnections.

In addition, CWWA supports the creation of an Infrastructure Bank to fund infrastructure improvements, including projects related to water supply dams, well fields, water treatment plants, distribution systems pumping stations and storage tanks, wastewater treatment plants, collections systems and pumping stations, environmental infrastructure, green technology, and photovoltaic facilities, which are of particular importance to public water suppliers.

## WATER SUPPLY AND WATER QUALITY

***GC3 Recommendation:***

- ***Update Safe Daily Yield Calculations and assess current drinking water quality measures/testing to understand and address climate change impact.***

Currently, water companies serving more than 1,000 customers are required to develop comprehensive water supply plans, which are submitted to the state Department of Public Health and updated on a regular basis. The plans are reviewed by the state Department of Public Health to ensure the adequacy of a system's safe yield (the amount of water needed to meet the current public health and safety needs of customers) and margin of safety (supplies sufficient to meet current and future demands). This, in addition to other laws and regulations, ensures that a water company has sufficient public water supplies to meet the current and future needs of its customers.

Water companies are required to follow safe yield methodologies defined in regulations administered by the Department of Public Health. Although climate change is a critical factor to take into account, historical hydrological data is and will continue to be relied upon for modeling safe yield. Given the potential impact on available public water supplies, any changes in the data and assumptions used to calculate safe daily yield must be subject to expert review and modeling to ensure reasonable accuracy in estimating the adequacy of water supplies necessary to meet public health and safety needs. In addition, regulators must consider how any changes in safe daily yield calculations in the context of how it may affect the need for development of additional water supply sources and currently required stream flow releases.

## INTERCONNECTIONS

***GC3 Recommendations:***

- ***Develop emergency interconnections between public water suppliers to ensure that multiple sources and interconnections are available for mutually beneficial sharing of water during emergencies.***
- ***Identify and incentivize construction of high-priority water supply interconnections to improve resiliency (UI-6).***

CWWA supports efforts to provide for redundancies in water supplies by developing emergency interconnections and constructing water supply interconnections, which are critical to addressing potential water supply disruptions and environmental concerns. CWWA notes however that such interconnections are subject to regulatory review, including provisions under the Water Diversion Policy Act, and further recommends that the report calls for streamlining the process for approving interconnections, diversion permits and new water supply sources.

The GC3 report acknowledges the three regional Water Utility Coordinating Committees (WUCCs) in its recommendation and cites the Coordinated Water System Plan developed through the WUCC process, but it does not include the WUCCs in the Implementation Entities. CWWA recommends that the WUCCs be added to this category.

## DROUGHT MANAGEMENT & RESPONSE

***GC3 Recommendations:***

- ***Update planning guidelines, drought triggers and drought response protocols at least once per decade***

- ***Develop water conservation measures & communication guidelines to manage droughts***

Connecticut's current drought situation underscores how vital drought management and response activities are to protecting the availability and reliability of public water supplies to meet the state's public health and safety demands. As precipitation levels continue to fall below normal and climate conditions change, additional stress is being placed on our water systems.

CWWA supports the GC3 recommendations to 1) update planning guidelines, drought triggers, and drought response protocols and 2) develop water conservation measures and communication guidelines to manage droughts.

Connecticut's Interagency Drought Work Group updated the Drought Management Plan in 2018 to further improve the coordination and enforcement of drought management and response activities. The updated plan places a greater emphasis on the consideration of regional differences in drought status. The plan also establishes a new initial drought stage which ensures that state, regional, and local officials and water utilities are alerted earlier to worsening drought conditions, which will better position them to respond.

Typically, there is significant variability in the types of drought and the relative severity of the drought experienced in different regions of the state and in different areas served by water utilities. As such, drought management and response activities must be flexible and adjusted to address local conditions and circumstances.

In addition to the state's Drought Management and Response Plan, Connecticut's public water suppliers have long been required to develop comprehensive drought management plans as part of their water supply plans. The plans reference the various drought stages and the water use restrictions that are triggered by each stage, including a 20% reduction in water use during the drought warning stage.

Connecticut's ongoing drought situation has highlighted the need for the state and municipalities to strengthen mechanisms for enforcing water use restrictions during periods of drought and other water supply emergencies. Water use restrictions on non-essential uses, such as lawn watering, car washing and filling up swimming pools, are in large part related to seasonal residential use and can have a dramatic impact on reducing water consumption without affecting essential uses or disrupting businesses that rely on a stable supply of water in their operations or processes.

However, enforcing water use restrictions on the local level has posed significant challenges. Although the state has developed a model ordinance to assist municipalities

in enforcing water restrictions, very few municipalities have adopted the ordinance, which can involve a time-consuming and costly process.

CWWA supports efforts to ensure that public outreach and/or water use restrictions are effectively implemented at the local level, such as drought communication plans or authorizing municipalities to enforce water use restrictions consistent with the water utility's drought management and response plan. CWWA also supports efforts to continue to encourage and promote public awareness regarding water conservation measures.

## RESILIENCY: SOURCE WATER PROTECTION AND WATERSHED PROTECTION

***GC3 Recommendations:***

- ***Use source water protection and the Drinking Water Quality Management Plans to encourage resiliency and support investment in watershed protection.***
- ***Identify and improve Community Water System wells that are located within flood zone to increase resilience and reduce risk of flooding.***
- ***Incorporate resiliency into the consideration of new laws, regulations, and policies and promote greater education of public water suppliers about the importance of resiliency.***
- ***Require that all utility sectors be subject to statutory and policy-based directives that require consideration of all projected climate change impacts in their planning.***

CWWA supports efforts to improve system resiliency and assist water utilities in incorporating climate change into planning, updating the sanitary survey resiliency metric, and providing more funding to support source water protection. In addition, promoting the conservation and protection of watershed and aquifer protection lands can protect the quality of water supplies while providing other benefits for Connecticut residents, including vulnerable populations.

Connecticut's water utilities have taken several important steps in addressing the need for greater resiliency, including:

- Developing more resilient water supply sources and resiliency solutions, such as hardening existing infrastructure;
- Maintaining redundant power supplies, such as emergency generators; and
- Providing for redundancies in water supplies, such as interconnections and back up wells.

Given the continued changes with the data and science, we have concerns about the practical implementation and would seek clarification on the recommendation that would require

consideration of **all projected** climate change impacts in their planning. Utilities will make all reasonable efforts but cannot be expected to reflect 'all' projected impacts.

## SOLAR INSTALLATIONS – WATERSHED LANDS

CWWA agrees with the concerns raised by the GC3 Forest Subgroup regarding the placement of solar energy installations on non-water company owned public water supply watershed lands.

The discussion was prompted by a 1.9 megawatt solar project proposed by a private entity within the Regional Water Authority's (RWA's) Lake Whitney watershed that would clear-cut 12 acres of mature forest adjacent to land preserved by the RWA for source water protection. The developer has submitted a petition to the CT Siting Council (CSC) seeking a declaratory ruling that a certificate for environmental compatibility and public need is not required. The Town of Hamden is opposing the project and the RWA has filed a Motion of Intervention with the CSC. Evidentiary and public hearings are scheduled for November 17.

CWWA supports the recommendation in the draft report which strongly discourages conversion of forest for the purpose of solar projects. Projects on water company-owned public water supply watershed lands require a Water Company Lands Permit from the state Department of Public Health to ensure that activities do not compromise water quality and quantity. However, no such approval is required for development activities by non-water company landowners.

## ENERGY EFFICIENCY

***GC3 Recommendation:***

- ***Develop an energy audit program for water and wastewater systems to increase energy efficiency and reduce greenhouse gas emissions across the water industry***

Water treatment and distribution systems are highly energy intensive inasmuch as energy is embedded in all stages of the water supply and treatment cycle: pumping, treatment, distribution, recycling. Recognizing that energy efficiency programs are critical to controlling costs and promoting water conservation, many water companies are incorporating renewable energy technologies into their operations, including solar technology, electric vehicles, wind power applications, energy efficient lighting, and other energy efficient programs.

Given the energy intensive nature of water distribution and treatment processes, CWWA recommends that the report expands upon this recommendation to assist water utilities in improving energy efficiency and reducing greenhouse gas emissions ensuring they have access to available programs and tools which support rate recovery and the financial viability of investments in alternative energy supplies

To achieve this goal, CWWA supports efforts to expand the state's Virtual Net Metering program to include private and regional water utilities and to increase the cap on net metering. Under current law, although municipal water and sewer departments are eligible to utilize virtual net metering to share the billing credit among their electric accounts, regional water authorities, metropolitan corporations and private water companies are not. Given the considerable benefits to the state, the environment and water utility customers in reducing energy costs and consumption, providing water system reliability and resiliency by developing renewable energy sources, authorizing all water utilities to utilize virtual net metering is an important public policy goal.

## CYANOBACTERIA ALGAL BLOOMS

***GC3 Recommendation:***

- ***Track harmful or potentially harmful cyanobacteria algal bloom data and provide technical assistance to community water suppliers to address and prevent these events.***

Cyanobacterial blooms are an increasing concern for water utilities because they can contaminate drinking water reservoirs by spreading from lakes and ponds located upstream. Fortunately, water utilities can utilize a variety of successful reservoir management approaches for the reduction, avoidance, or elimination of Cyanobacterial blooms.

The American Water Works Association and the Water Research Foundation published a "Utility Manager's Guide to Cyanotoxins", which includes a self-assessment tool to help utility operators understand whether they are prepared for a Cyanotoxin event. Utilities can also rely on early warning systems to: 1) identify early indicators, such as pH, water temperature, Secchi disk depth, location/extent of thermocline, turbidity, phycocyanin fluorescence, and microscopic examinations; 2) define trigger levels for increased monitoring; and 3) identify action thresholds that tie source water monitoring to operational decisions. There are also in-plant treatment options available, including intracellular and extracellular Cyanotoxins removal.

CWWA agrees that technical assistance to community water suppliers to address and prevent these events is essential.

**VULNERABLE UTILITY FACILITIES**

***GC3 Recommendation:***

- ***Inventory and geo-locate vulnerable utility facilities and their service areas***.

Connecticut's water utilities are required under federal law to develop and update vulnerability assessments to identify potential concerns with critical facilities. Recognizing the sensitive nature of information regarding vulnerable utility facilities, however, such information is protected from public disclosure. CWWA is concerned that this recommendation appears to promote sharing of such information which could compromise efforts to protect critical water utility infrastructure.

Thank you for the opportunity to comment on the draft reports. CWWA is continuing to review the draft reports and recommendations and will provide comments accordingly.

UCONN
UNIVERSITY OF CONNECTICUT

**Alec Shub <alec.shub@uconn.edu>**

# FW: Ducks Unlimited Comments on Governor's Council on Climate Change (GC3) Working Group Draft Reports

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 6:33 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Ellen Herbert PH.D. <eherbert@ducks.org>
**Sent:** Wednesday, October 21, 2020 6:27 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Cc:** Sarah Fleming <sfleming@ducks.org>
**Subject:** Ducks Unlimited Comments on Governor's Council on Climate Change (GC3) Working Group Draft Reports

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Commissioner Dykes,

On behalf of Ducks Unlimited, Sarah Fleming, Director of Conservation Programs, Great Lakes Atlantic Regional Office, and I are pleased to submit the attached comments on the GC3 Working Group Draft Report from the Wetlands Subgroup.

Ellen R. Herbert

www.ducks.org

**Ellen R. Herbert, Ph.D.**
Ecosystem Services Scientist
Ducks Unlimited
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**DU Climate Change Wetlands Comments.pdf**
195K

Commissioner Katherine Dykes
Connecticut Department of Energy and Environmental Protection
79 Elm Street
Hartford, CT 06106-5127

Governor Ned Lamont
State Capitol
210 Capitol Avenue
Hartford, CT 06106

RE: Ducks Unlimited's comments regarding the GC3 report for addressing the impact of climate change on people, nature, infrastructure and the economy of Connecticut.

Dear Commissioner Dykes,

Ducks Unlimited, Inc (DU) is the world leader in wetland conservation and our mission is to "conserve, restore, and manage wetlands and associated habitats for North America's waterfowl. These habitats also benefit other wildlife and people." To date, DU has invested more than $1.4 million to conserve over 1,600 acres of wetland habitat in Connecticut and has partnered on thousands of additional restoration acres with the Connecticut Department of Energy and Environmental Protection (CTDEEP). We count more than 2,700 Connecticut residents as members who are stewards of the state's natural resources and committed to the health and safety of their communities. We wish to express our support for the Governor's Council on Climate Change (GC3) and the Working and Natural Lands Working Group: Wetland Subgroup. We would also like to thank Governor Lamont for his goal to strengthen Connecticut's efforts to mitigate and adapt to climate change through the protection and restoration of critical wetland habitat.

As the world leader in wetland and waterfowl conservation, we are acutely aware of the critical role that both tidal and inland wetlands play in the health of a state's ecosystems, economy, and people. Wetlands have been shown to be important in both mitigating and adapting to climate change, whether through sequestering and storing carbon, improving water quality or defending coasts against sea level rise and storm surges. Wetlands also play a pivotal part in the lifecycle of a plethora of bird, fish and wildlife species important to recreational and commercial sectors of the economy. Wetlands are increasingly recognized for their role as natural Infrastructure that supplements or even replaces traditional grey flood or water treatment infrastructure. Wetlands have the added benefit of having lower delivery and maintenance costs while providing additional benefits such as improved public access to natural space, improved viewscapes, and critical habitat. DU enthusiastically supports the Governor's GC3 recognition of wetlands as a key component of any natural infrastructure and climate change mitigation strategy and we offer the below comments to highlight our support and identify additional resources:

**General Comments:**

- The draft wetland subgroup report appeared to be a comprehensive document that included broad goals with specific objectives and connected a diverse partner base. Connecticut is one of the most densely populated states in the US and has lost over 70% of its inland wetlands, and over 50% of its coastal wetlands making conservation of remaining coastal and inland wetlands imperative. Protection, restoration, and, in the context of tidal wetlands, planning for wetland migration, are critical to meeting long term goals for healthy wetlands that can provide refuge for wildlife and mitigate climate impacts by keeping wetlands healthy and resilient.
- DU has a scientific foundation that helps guide our priorities and conservation actions through the principles of adaptive management. We were pleased to see a strong connection to research and monitoring that will help advance and quantify conservation actions. We strongly encourage that research activities align with functional assessments relevant to adaptive management of ecosystems, regulatory policies, and funding mechanisms to maximize success and ensure the highest return on investment.
- We are pleased to see an emphasis not only on conservation and increased protection, but specific consideration of policies, recommendations, and actions that would contribute to the improved condition of existing Connecticut wetlands. DU has observed that wetland enhancements, for instance, through establishing grass or forested buffers to improve water-quality, can have a significant return on investment.
- The success of the climate actions will be contingent on community engagement and we are pleased to see accomplishments directly linked to education and program assistance for private landowners to protect, restore and manage private lands by reducing negative impacts to wetlands and prioritizing wetland protection. State and local resource managers will be critical to help identify sites where wetlands restoration and protection will provide the best options for flood mitigation, erosion control, and climate resiliency. We encourage the working group to continue to engage conservation partners to maximize adaptive management strategies and ensure final conservation priorities represent the best science, technologies, and policies.
- DU works closely with CTDEEP to leverage federal and state funding to maximize direct, on the ground deliveries. We use these funds to protect and preserve thousands of acres of sensitive lands and waters that support numerous Species of Greatest Conservation Need. To maximize the climate resiliency goals, funding will need to be leveraged through federal, state, and private match, such as, State Wildlife Action Grants and National Coastal grants. Similarly, it will be important to offer opportunities through new state funding mechanisms (i.e., general obligation bond funds) to advance grant programs dedicated to resiliency projects. We believe there is also a growing opportunity to leverage voluntary or regulatory ecosystem service markets to fund certain wetland restoration projects (detailed below in the Ecosystem Services section).
- We were pleased to see a strong connection to state/regional plans, such as the Connecticut State Wildlife Action Plan and Long Island Sounds National Conservation Planning documents. We recommend that the workgroup also review and include landscape level and national conservation planning documents into their strategic planning, such as the Atlantic Coast Joint Venture Salt Marsh Bird Conservation Plan (including the three focus species Plans for *Eastern Black Rails, Saltmarsh Sparrow, and American Black Ducks*) and the North American Waterfowl Management Plan (NAWMP). These plans identify regionally relevant pressures on wetland and migratory bird habitat and guide the distribution of federal level wetland conservation funds through the North American Wetland Conservation Act (NAWCA) funding that has resulted in

over 4,700-acres on 11 projects that invested $2.5M in federal funds and leveraged $17.5M in private match in Connecticut alone.

- NGOs such as DU, Audubon, The Nature Conservancy (TNC), local land trusts, etc., active in Connecticut conservation efforts, will play a key role in meeting goals established in the state and regional plans while addressing the impact of climate change on people, nature, infrastructure and the economy of Connecticut. Matching contributions provided by NGOs are critical in leveraging state and federal grants funds for on the ground conservation. Thus, we would encourage the workgroup to consider including a stronger emphasis on the role of NGOs.

**Ecosystem Services Comments:**

- DU has been working with many private and public entities to communicate the importance of the various ecosystem services wetlands provide and we are encouraged that this plan focuses on protecting and enhancing the net function of the state's wetlands. We also appreciate that the plan considers how these functions can accelerate wetland conservation through public interest and investment. In Connecticut, there are numerus opportunities to leverage these important wetland functions to generate economic incentives for wetland protection and restoration. These opportunities include direct payments for ecosystem services or indirect incentives through reducing operating costs to agencies or communities. An example of this would be reducing flood insurance costs through the Community Rating System or reducing dredge material disposal costs through thin layer placement or other beneficial uses.
- In our own ecosystem service work, DU has recognized the quantification of numerous functions in multiple different wetland systems can quickly overwhelm available resources. We have observed that using a combination of modeling, literature review, and expert opinion surveys can help rank wetland types by their likelihood to perform individual functions, as was done by Tiner et al.[1] for Connecticut. This in turn can help prioritize the allocation of funds for quantitative science and prioritize conservation planning around multiple functions. We suggest a preliminary exercise of this kind to help guide resource allocation.
- DU's experience in both ecosystem services markets and cost reduction strategies to benefit wetland conservation has led to the understanding that success is often predicated on planning at scale. For instance, our first large-scale sale of carbon credits generated for the voluntary market through wetland and grassland habitat conservation aggregated dozens of individual landowners and thousands of private lands acres. Another example is our work with the Texas Department of Transportation, US Army Corps of Engineers (USACE), and other state and federal agencies on the Texas Beneficial Use Master Plan. This was designed to streamline beneficial use projects through package permitting, site identification, and decision support tools to maximize environmental benefits, such as wetland resilience, and maximize cost savings. It is also clear that benefits like coastal storm surge reduction accrue only when substantial marsh habitat is protected or restored. We therefore suggest that as part of the regional scale research and planning efforts specific outcomes be considered at scales at which they are relevant to desired biophysical outcomes (e.g. km of marsh required to reduce storm surge by a desired %) or economies of scale (number of restored wetland acres necessary to generate a positive return on investment for carbon credit development).

[1] Tiner, R.W., J. Herman, and L. Roghair. 2013. Connecticut Wetlands: Characterization and Landscape-level Functional Assessment.Prepared for the Connecticut Department of Environmental Protection, Hartford, CT. U.S. Fish and Wildlife Service, Northeast Region, Hadley, MA.

- We believe key aspects of research and monitoring should link back to key policies, voluntary markets, and regulatory permits to ensure functional relevance. For instance, there is significant work needed to quantify the value of wetlands for flood reduction to quantify risk reduction, project lifespan, maintenance costs and other metrics routinely quantified with assessing and funding traditional grey infrastructure. Although the Federal Emergency Management Agency (FEMA) and other agencies have opened sources such as Building Resilient Infrastructure and Communities (pre-disaster mitigation) to natural infrastructure projects, it is still relatively difficult to conduct benefit-cost analysis due to the lack of quantitative research on wetlands and floodplains. The relevance of coastal freshwater Blue Carbon and inland wetlands Teal Carbon to carbon markets will also require additional research to demonstrate how in the absence of saltwater, methane emissions may completely negate carbon sequestration benefits. These are but a few examples of critical lines of inquiry that could connect research and monitoring to specific outcomes.
- We are glad to see the Regional Greenhouse Gas Initiative (RGGI) considered as a source of project funding for wetland conservation. DU is in various stages of planning and project delivery for several thousand acres of tidal wetland restoration funded though the California Air Resource Board and view funding Blue Carbon projects as a valuable mechanism to meet regional greenhouse gas targets while also providing many other benefits to people and wildlife. However, we suggest Connecticut also consider the existing legal framework might impact the development of voluntary greenhouse gas or other ecosystem services markets to fund restoration and conservation of public lands and work to clarify the states position and address any barriers identified. One recent example is the authorization granted to Virginia's Department of Environmental Quality to manage funds generated through carbon credits for seagrass restoration on state lands and direct the proceeds to future seagrass research and restoration. While significantly fewer barriers exist on private lands to accessing environmental markets, many state level policies and mechanisms could further accelerate the potential for these markets.

**Recreation and Public Use Comments:**

- We appreciate the attention paid to recreational use of river resources and increasing access for underserved communities. We would encourage a similar focus for wetlands. The end users of the resource help to create a positive feedback loop system of conservation where they are aiding, either directly or indirectly, in the conservation of wetlands. When access is increased, these users gain a greater appreciation for the resources and help with acquisition and maintenance of wetlands that will in turn play a pivotal role in combatting climate change.
- To ensure successive generations of recreationalists that will use and protect the resource, we encourage continued support for the R3 movement (recruitment, retention, reactivation). The importance of having future generations of land stewards who connect with nature by hunting, fishing, kayaking, birding, etc. cannot be overstated.
- We ask that the recreation strategy outlined in the river workgroup report be similarly reflected in the Wetlands Workgroup report. Indirectly, recreation stimulates the local economy around the areas of use, which in turn creates value that leads to increased land and water protection. Directly, hunters, anglers and others who pay for licenses provide funds used to acquire more wetland acres and provide funds for enforcement and maintenance activities by CTDEEP on lands already in the public trust. These consumptive users also play an outsize role in bringing federal funds to Connecticut, as their license fees are matched with money from the Pittman-Robertson and Dingell-Johnson funds.

Thank you again for the opportunity to comment on the Working and Natural Lands Working Group: Wetland Subgroup report. To tackle climate change and provide future generations with natural resources to enjoy and benefit from it is essential that the government work closely with conservation nonprofits to advance these goals. We would also like to offer our support and help in implementing the proposals laid out in the report and work towards a more secure future for the state's vital wetland resources.

Sincerely,

Dr. Ellen R. Herbert, Ph.D
Ecosystem Services Scientist
Ducks Unlimited, National Headquarters

Sarah Fleming
Director of Conservation Programs
Ducks Unlimited, Great Lakes/Atlantic Regional Office

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**Alec Shub <alec.shub@uconn.edu>**

# GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 8:34 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Ellie McCoin <elliemccoin@gmail.com>
**Sent:** Wednesday, October 21, 2020 1:31 AM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:**

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G

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Focus on the benefits of nature to quality of life, and new green job opportunities rather than planning infrastructure for the commuter culture.

- Pilot “Green Zone” interdisciplinary implementation to minimize silos of conflicting policies
- Protect the serenity nature for quality of life mental health
- Pro-forestaton: Allow trees and full life cycles (stop cutting trees)
- Clean water, including urban-suburban waterways, is a public trust
- Conserve and revitalize ecosystem service benefits to mitigate climate change

- Connect to natural and cultural history
- Prioritize and increase forest integrity and connectivity along riparian corridor

**Green Infrastructure Strategies:**

- Restore stream corridors
- Create urban open space
- Generate green jobs
- Increase real estate values
- Mitigate climate change
- Reduce summer heat deaths
- Improve urban quality
- Conserve energy and water
- Create recreational areas
- Strengthen flood controls
- Expand habitat corridors
- Renew urban forests

**Mature trees support community resilience:**

- Store carbon for decades
- Absorb CO2 + generate oxygen
- Absorb gaseous pollutants, such as sulfur
- Mitigate urban heat islands
- Host a biodiversity of species
- Provide critical habitat for endangered migratory birds
- Intercept air-borne dust
- Green infrastructure that reduces flooding
- Prevent soil erosion
- Increase property value

October 21, 2020

To the Forests Sub-Group for Working and Natural Lands – Governor's Council on Climate Change (GC3),

I want to express my gratitude to this sub-group for putting together a comprehensive set of recommendations. Forests are a critical part of everyone's lives here in Connecticut, whether they know it or not, and I am glad to see that the subject is getting attention.

I'm writing to express my views as a resident of Connecticut and also as a practicing, certified, consulting forester. I serve as Managing Partner at Ferrucci and Walicki, LLC where I have been active since 2012. Prior to my work in Connecticut, I served as the Rutland County Forester for the state of VT, where I actively managed municipal, state, and federal lands and provided outreach and consulting to landowners, conservation organizations, loggers, foresters and others. I have a B.S. in Forestry from the University of Massachusetts, and have been working as a natural resource manager in New England for over 15 years. I have worked with landowners and conservation organizations for many years to assess and manage their properties for wildlife habitat (especially songbirds), climate change mitigation, resiliency, timber production and other goals.

There are many important aspects of the Forest report which I hope will be embraced. However, I also believe there are some significant problems with the report which I am hopeful can be resolved during the upcoming editing process following the submittal of written public comments. Without significant revisions potential implementation of the recommendations presented in this draft could result in substantial negative impacts in the short- and long-term. Along with the high-level comments contained in this document, I am also submitting written comments to the PDF report using a line edit format for the sub-group's consideration.

## Forest Reserves

The report contains too little focus on active forest management and entirely too much focus on forest reserves as a major solution to climate change mitigation. I realize that part of the goal of this report and the GC3 process is to develop broad and sweeping changes to the way we think and interact with the world, but I want to make sure it's clear that Connecticut's forests and the management of them are not causes of climate change. The illusion of preservation is presented repeatedly in the report as the solution to our climate crisis, and aspects of it are attractive. However, as it is presented, the significant push toward reserves represents an abdication of our (society's) role as stewards of the land in exchange for what amounts to benign neglect, hoping that this will be a solution to a problem which is infinitely greater and more complex than Connecticut's woodlands.

Forests are both impacted by climate change and they can help with mitigation, but reserves should be a relatively small part of the solution. There are many reasons that forests (including publicly owned land) are actively managed. Carbon sequestration and storage is often one of the reasons and outcomes of management, which may become increasingly important moving forward. Abandoning so many other goals in favor of carbon held in forest reserves is myopic, unwise, and unnecessary. That approach is likely to limit the tools that natural resource managers and landowners have available, which in turn will limit future productivity, diversity, utility, and resilience of our forests.

The lands which have been discussed in this document for conversion to reserves are state-owned lands, the stewardship of which is generally very good. Long-term planning processes and silvicultural

techniques implemented in state forests prioritize ecological productivity, vegetative and structural diversity, resilience, wildlife habitat diversity, water quality and soil retention, and have the added benefits of providing employment and revenue generation from forest products. Carbon storage and sequestration are additional goals that can and should be included in long-term planning and implementation of associated activities, but in the vast majority of cases should not be prioritized over the other ecological, social and economic benefits generated by multiple-use management. Instead, we should utilize DEEP's existing frameworks for identifying and selecting areas as reserves based on specific criteria and make transparent how tradeoffs between various priorities are weighted.

It is important to note that forests do not become "unnatural" when active management occurs. Changes happen with human manipulation of forests, but those changes do not constitute the creation of artificiality. Instead, the changes created through active management seek to capitalize on the dynamic nature of the way in which our forests respond to disturbance to achieve desirable outcomes and ensure the future productivity of the forest.

Transitioning Connecticut's core forests (as defined in this report) into reserves at the scale currently presented will also have a detrimental impact on the entire chain of forest management infrastructure. This will in turn have immediate impact on people's lives and livelihoods. It is not realistic nor is it reasonable to expect that we can stop cutting trees in Connecticut, and that people will stop using wood. Timber will be harvested, and forest products generated somewhere else, likely in places that may lack the regulations, stewardship ethics, and management professionals that we have in our state.

## Wood Products: a critical part of Connecticut's economy and a climate change solution

Connecticut's forestry community has significant expertise, and regulations govern forest management that occurs the state. We produce some of the finest wood products in the world. The higher quality grades of timber that are harvested in Connecticut's forests (oak, pine, maple, birch, hickory etc.) are a tremendous asset to our economy and also provide carbon storage. Lower quality forest products, including locally used firewood, help to reduce our dependence on fossil fuels. The responsible use of our renewable wood resources should be promoted and celebrated, not presented as something from which our forests must be protected.

We have a responsibility and ability to be a part of the solution to climate change. High quality, long-lived wood products store carbon, and once harvested, allow regeneration and/or increased vigor of remaining trees, promoting additional carbon sequestration. A strong forest products industry also enhances Connecticut's rural communities and helps to limit the amount of wood that is harvested from parts of the world where oversight may not be as complete and ecological conditions not as productive. This report explicitly aims to discourage leakage. Intentionally reducing or eliminating sustainable harvesting on state owned or other lands in CT will force markets to procure their wood elsewhere, which again may have unintended negative consequences elsewhere.

Significant reductions of wood harvesting pose a threat to the forest products industry, which employs hundreds of professionals across our state. A loss of infrastructure for wood production (i.e., equipment, personnel, and institutions) and manufacturing is a security concern. Our ability to sustainably produce our own wood provides independence the same way that producing our own energy, steel, and other critical products does. This renewable resource allows us to create and maintain robust local markets.

As a professional forester, in addition to limiting (not eliminating) the reserves proposed, I would like to see more discussion around active management incorporated into this report, as well as increased attention to the benefits and opportunities associated with wood products and natural resource management.

## Equity & Environmental Justice

Some of the recommendations in this report (particularly those that promote the "protection" of forests from harvesting) appear dismissive of those professionals who actively manage our forests. We must be careful not to alienate individuals or communities who must be part of the solution to climate change. The exclusion of loggers and people from the private forestry sector – some of the people who know Connecticut's woods best and possess a strong land ethic and connection to the land – in the development of this report represents an equity issue, especially considering the direct impact large scale changes to forest policy would have on them and their livelihoods.

The lack of inclusivity in the development of these recommendations falls short of the intention toward equity and environmental justice that the GC3 intended. This could be addressed with a rebalancing of perspectives in the report away from the overwhelming message of reserves and hands-off management to more inclusive and creative solutions that incorporate the knowledge, skills, and technical abilities of the people who work in the woods every day. An environmental justice approach would ensure that communities in low-income, rural parts of the state where residents would be impacted by reducing opportunities for forest management are also included in decision-making processes.

## Conclusion

Creating dichotomies with black and white solutions is easy to do, especially in today's polarized society. Solutions to address climate change that involve our forest ecosystems must acknowledge and embrace their dynamic and complex nature, and the critical roles our forests serve for society. To this end, Connecticut should continue focusing on improving the forest management we currently do in order to help our forests thrive. In return, we all benefit from the habitat features, forest diversity, resiliency, forest products, carbon sequestration and storage, as well as myriad social, economic and ecological benefits that our forests provide.

Instead of taking sides on issues, we should seek to identify shared values and the items we agree upon. I firmly believe that the interests of different groups within the forest community can align. We need to realize that we care primarily about the same things: Keeping forests as forests and ensuring their diversity and productivity now and into the future. Though productivity means different things to different people, we must find ways to work together toward common goals because the consequences of not doing so are too high.

Thank you again for your attention to our forests.

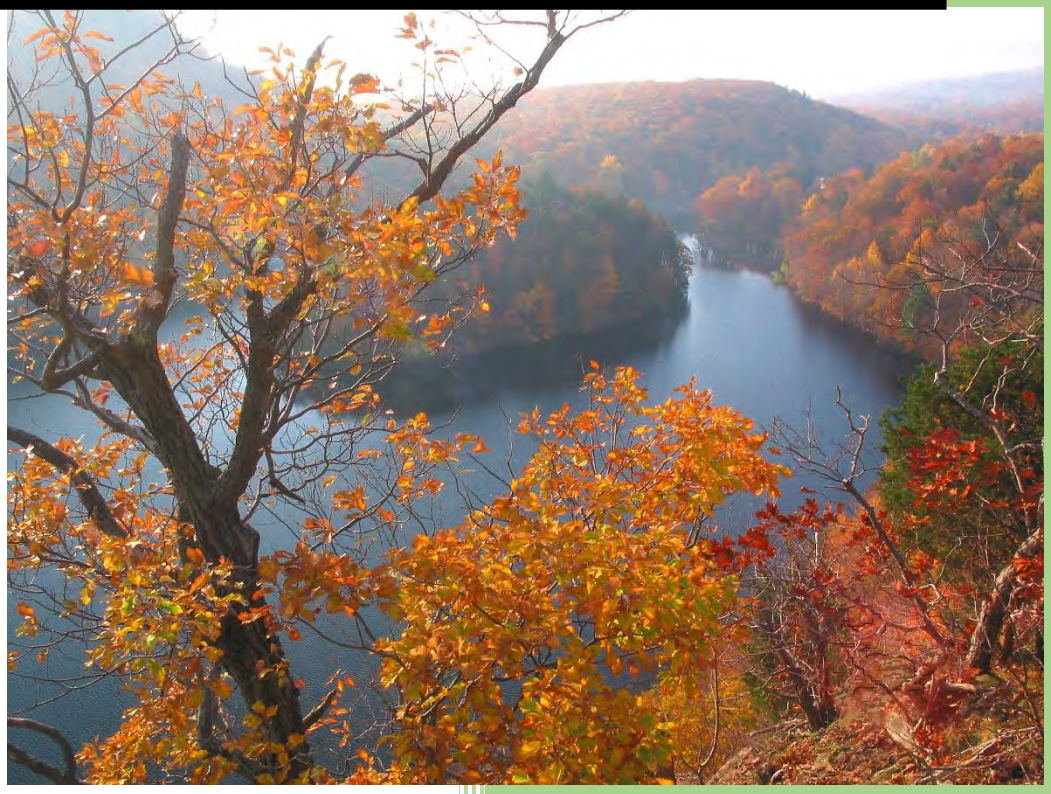
Sincerely,

Eric Hansen, Managing Partner
Ferrucci & Walicki, LLC
6 Way Rd.
Middlefield, CT, 06455
860.349.7007

DRAFT 9.10.2020 for Public Comment

2020

# Forests Sub-Group Draft Report



Forests Sub-Group

Working and Natural Lands Working Group

9/10/2020

# Acknowledgements

Over the course of 5 months, the Forests Sub-Group held 9 public meetings, organized 20 presentations from experts on various issues related to forests and climate change, built a resource catalog of over 40 peer-reviewed journal articles, and kept up an enthusiastic pace thanks to the wisdom, expertise, and commitment of its members.

The following members of the Forests Sub-Group who all contributed to this report are listed below with their organizational affiliations:

- Tim Abbott, Housatonic Valley Association
- Mark Ashton, Yale School of Forestry & Environmental Studies
- Patrick Comins, Connecticut Audubon Society
- Thomas Easley, Yale School of Forestry & Environmental Studies
- Robert Fahey, University of Connecticut, Natural Resources and the Environment
- Edward Faison, Highstead
- David Gumbart, The Nature Conservancy – CT Chapter
- Eric Hammerling, Connecticut Forest & Park Association, Chair
- Lisa Hayden, New England Forestry Foundation
- Charles Leigus, Supreme Forest Products, Inc.
- Amy Paterson, Connecticut Land Conservation Council
- Herb Virgo, Keney Park Sustainability Project

The CT Department of Energy and Environmental Protection also deserves enormous credit for supporting the efforts of this Sub-Group in addition to their "day jobs." In particular, the Sub-Group wants to thank Commissioner Katie Dykes for enabling Rick Jacobson, Chris Martin, Cary Lynch, and Jaimeson Sinclair to be so engaged and helpful throughout this process.

We also want to recognize the other Sub-Groups of the Working and Natural Lands Working Group – Agriculture/Soils, Rivers, Wetlands – as well as the Equity and Environmental Justice Working Group, the Science & Technology Working Group, and the Progress on Mitigation Strategies Working Group for their partnership on forest issues and to make our Sub-group and process as inclusive as it should be.

Lastly, we thank Governor Lamont for re-energizing the Governor's Council on Climate Change through Executive Order #3 which gave our Sub-Group its overall charge to create this report.

In the following report, the Forests Sub-Group endeavors to give you a better understanding of Connecticut's forests and the important role they play in helping Connecticut to adapt, become more resilient, and mitigate the many challenges we face due to climate change.

# Contents

# Executive Summary

## Background

In its 2018 report, Building a Low Carbon Future for Connecticut: Achieving a 45% GHG Reduction by 2030,[1] the Governor's Council on Climate Change (GC3) recognized natural and working lands as important carbon sinks that could help mitigate emissions from the electricity generation, transportation, and building sectors which together produce almost 60% of Connecticut's greenhouse gas (GHG) emissions.[2]

The GC3 recommended that Connecticut continue to work with non-governmental organizations like the U.S. Climate Alliance in efforts to regionally develop carbon sequestration and storage practices.[3] The council also recommended that "DEEP should work with land trusts, forest owners, and working lands managers to help adopt carbon accounting methodologies that further support sustainable land-use practices."

In 2018, Connecticut joined with over 25 states in accepting the U.S. Climate Alliance's Natural and Working Lands Challenge[4] with a commitment to the following actions:

- Improve inventory methods for land-based carbon flux;
- Identify best practices to reduce GHG emissions and increase resilient carbon sequestration;
- Advance programs, policies, and incentives to reduce GHG emissions and enhance resilient carbon sequestration;
- Undertake actions that will support a collective, Alliance-wide goal to maintain natural and working lands as a net sink of carbon and protect and increase carbon storage capacity, while balancing near- and long-term sequestration objectives; and
- Integrate priority actions and pathways into state GHG mitigation plans within two years of joining this challenge.

Although none of these actions are "completed" at this time, Connecticut continues to work toward these goals both individually and in partnership with neighboring states, academia, and nonprofit organizations as well as the private sector. Many of the recommendations in this report are tied to furthering the commitments Connecticut made in 2018.

## Summary of Report

Climate change is an enormous threat to Connecticut's forests and people, and we must respond boldly with urgent action.

This report recommends policy, funding, conservation, research, and stewardship actions which would both make forests more resilient and enhance their potential for sequestering and storing carbon as a significant and growing offset for GHG emissions from other sectors. Following is a summary of the major recommendations and findings in this report:

***We are all forest dwellers.*** Connecticut's dominant land type is "forest" which covers approximately 59% of the state. Go here for more on the Status of Connecticut's forests.

***Resilient forests provide many benefits to people and nature***, such as reducing heat stress and lowering energy bills by providing shade; improving air quality and providing physical and mental health benefits; supporting local wood products, jobs, and economic benefits; sustaining wildlife habitats and more livable communities for people; storing and sequestering carbon; and much more. Go here for the benefits forests provide to Connecticut.

***Forest resiliency is threatened by various factors***. Although forests are an important carbon sink in Connecticut, our forests may become less resilient and effective at adapting to and mitigating climate change due to a mix of factors (invasive plants and forest pests; over-browse by deer impacting forest regeneration; forest conversion to other uses creating more vulnerable forest edges; air pollution; more intense weather events; etc.). Go here for threats to forest resiliency.

***Connecticut's forests are valuable for carbon storage***. Connecticut's forests are the most "carbon dense" (most above-ground carbon stored/acre), oldest (~16% of our forests are 100+ years old), and have the highest annual net growth in forest biomass in the Northeast (net growth exceeds net removals from timber harvests or salvage operations by more than 500%). Go here for forests as mitigation to climate change.

***Keep forests as forests***. Protecting healthy forests and preventing the conversion of forestland to other uses are likely the most important things we can do to allow forests to both adapt to and mitigate climate change. Recommendations in the report include setting a goal for increasing Connecticut's forest cover, protecting and connecting core forests, and dedicating more resources to work with private landowners (who own ~71% of Connecticut's forestland). Go here for recommendations on forest adaptation/resiliency, and go here for recommendations on mitigation.

***Retain large trees in forests and residential areas***. Large trees often provide a significant amount of the carbon and other benefits that trees provide in both urban/residential and rural settings. Retaining large trees and forest cover whenever possible should be actively encouraged. Go here for recommendations on large trees.

***Climate change is impacting vulnerable people the hardest, and there are significant inequities*** both in the locations where trees are, and are not, currently providing benefits to people. These inequities are most apparent in our cities where communities with the highest poverty rates and health inequities tend to also have the lowest tree canopy cover and direct connections to green spaces. Go here for impacts of climate change on vulnerable populations.

***Energize a Youth Conservation Corps*** for another "tree planting army" like the original Civilian Conservation Corps (CCC) to provide outdoor jobs, build trust and cultural understanding of green spaces at the community level, clean-up/plant-up open spaces to benefit both urban and rural environments, and at the same time encourage conservation career opportunities for people of color. Go here for supporting community interest in trees and green spaces.

***Vulnerable forest types require focused protection.*** There are a number of specialized forest types (freshwater forested wetlands, pitch pine-scrub oak, riparian forests alongside cold-water

streams and headwaters, lowland Atlantic white cedar, and other forest types) that should be priorities for protection. Go here for the impacts of climate change on special forest types.

***Establish forest carbon baseline and goals for Connecticut***. Under the Global Warming Solutions Act (GWSA), Connecticut has established significant goals for reducing emissions from the transportation, energy, and building sectors to combat climate change. Connecticut should add similar goals to the GWSA for carbon storage and ongoing "negative emissions" (carbon and other greenhouse gas sinks) that forests, wetlands, soils, and other natural climate solutions can provide. Go here for the need for Connecticut's forest carbon baseline and goals.

***Commitments to funding, programs, and resources are critical.*** Enhancing existing funding programs, funding long-term research initiatives, establishing new sources of revenue, and providing tax incentives for acquisition and stewardship must be priorities. Go here for recommended funding, programs, and resources.

***Adopt a "No Net Loss of Forest" policy for Connecticut*** to support all of the recommendations above by:

(1) Keeping forests as forests to retain the multiple benefits of carbon storage, biodiversity, public health, green infrastructure, etc.

(2) Protecting healthy, intact forests to ensure that impacts upon forests, sensitive habitats, and other natural climate solutions are considered at every level of planning.

(3) Offsetting all planned or permitted forest losses through a combination of compensatory mitigation requirements and other tools.

(4) Providing financial incentives for stewardship, forest retention, and forest resiliency on privately-owned forestlands; and

(5) Protecting urban forests, building more parks, and planting more trees and gardens to maximize the benefits to people of trees and green spaces. Go here for more on a "No Net Loss of Forest" policy for Connecticut.

There are many factors to consider simultaneously with forests which makes any single recommendation on their future insufficient. It will likely require a full suite of conservation strategies working together to manage for a variety of values and uses on a long-term timescale using peer-reviewed science and a holistic understanding of forest systems.

In addition, any comprehensive climate policy solutions for forests should strive to address the challenges of 1) the *longevity* of the approach, 2) *additionality* (that the action would not have taken place anyway), 3) *leakage* (that the mitigation action is not pushing the activity elsewhere where it may cause more damage), and 4) *substitution*, the carbon implications of using one material instead of another compared to keeping carbon stored in the forest.[5,6] This kind of approach can help ensure that southern New England forests continue to capture and store carbon, maintain ecosystem functions and services, and decrease global deforestation.[7]

# Status of Connecticut's Forests

Connecticut's forests and trees add immensely to the quality of life for the people of the state. They filter the air that is breathed, safeguard private and public drinking water sources, produce locally grown forest products, provide essential habitat for wildlife, and moderate summer and winter temperatures near homes and businesses. They also have the potential to absorb and store atmospheric carbon which is currently increasing beyond historic and naturally occurring levels.

## Carbon Storage in Connecticut's Forests

The most recent national Forest Carbon Inventory published by the USDA Forest Service documents 191 million metric tons (MMT) of Carbon in Connecticut's forests in 2019, which has increased by ~9 MMT over the past decade. Of note, these Forest Service figures do not include individual trees or groups of trees that may not fit the standard definition of "forest." The Forest Service's definition of forest land is at least one continuous acre of forest canopy cover.[8]

A different type of carbon pool exists in the urban forest. Connecticut is a heavily urbanized state. According to Forest Service analysis, 36.4% of the land area of the state is urban (1.13 million acres), with 87.7% of the population, nearly 3 million people, living in these urban areas (FIA). Despite the high population concentration in these areas, these same lands have a fairly high degree of tree cover, with tree canopy cover estimated at nearly 50%. These urban trees are storing about 22.5 million tons of carbon and continue to sequester carbon at the rate of about 744 thousand tons per year (FIA). The importance of urban trees is magnified by their proximity to people and co-benefits for health, energy savings, flood retention, and more.[9]

## Forest Quantity is Good but Highest Quality Forests are Getting Fragmented

Approximately 59% of Connecticut is "forested" and this percentage has remained relatively flat since 2010.[10]

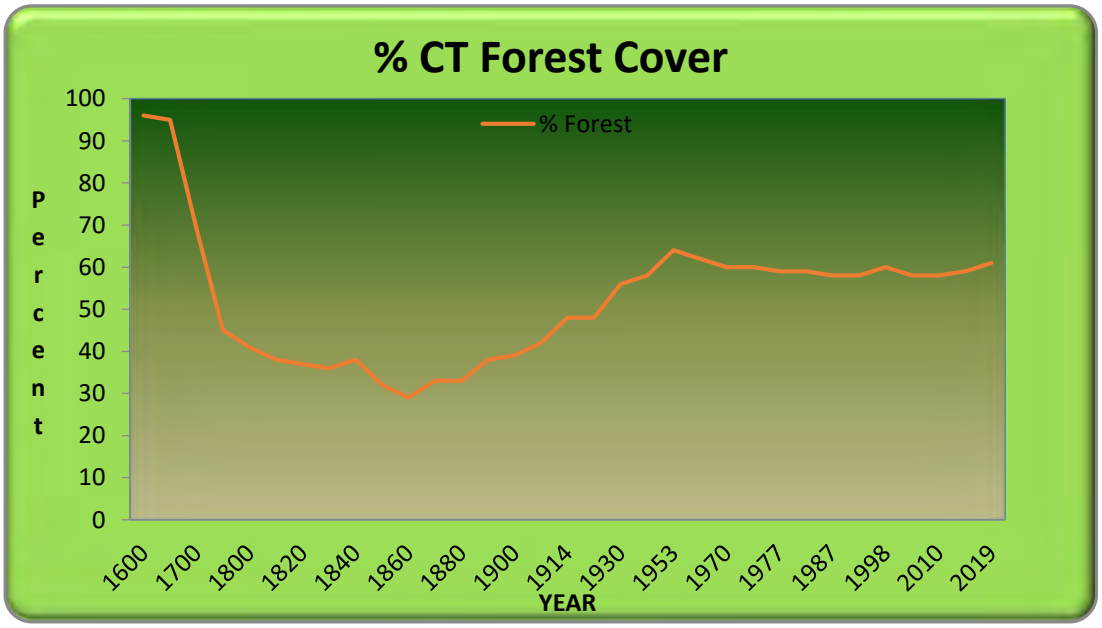



**Figure 1.** Historic Forest Cover in Connecticut.[11]

Connecticut's forests have made a remarkable comeback after being cleared, primarily for agriculture, starting in the 1700's. At the low point in ~1860, only 30% of Connecticut's forests remained (approximately half of the forest cover we enjoy today). As the forests grew back they were repeatedly cut for charcoal fuel that fed the industrial age until about 1920 when coal and petroleum replaced wood-based fuel.

Of the 59% forested area, preliminary findings show ~53% of Connecticut's forest are core forest, larger blocks of forest that are generally more important for wildlife habitat, drinking water supply protection, ecological resilience, and a sustainable supply of lumber, homeowner firewood, and other forest products.

**Larger core forests of 500+ acres have been the fastest declining forest type losing approximately 120,000 acres over 30 years from 1985 to 2015**.[12] In fact, 1985 to 2015, Connecticut lost about 465 km2 of forest cover to development—about 5.8% of the forest that existed in 1985. Loss of core forest during that period was about 719 km2, a relative change of 15.7% from 1985 levels. In fact, core forest was lost at a pace (24 km2 per year) more than 1.5 times the pace of the loss of total forest (15 km2 per year).[13]

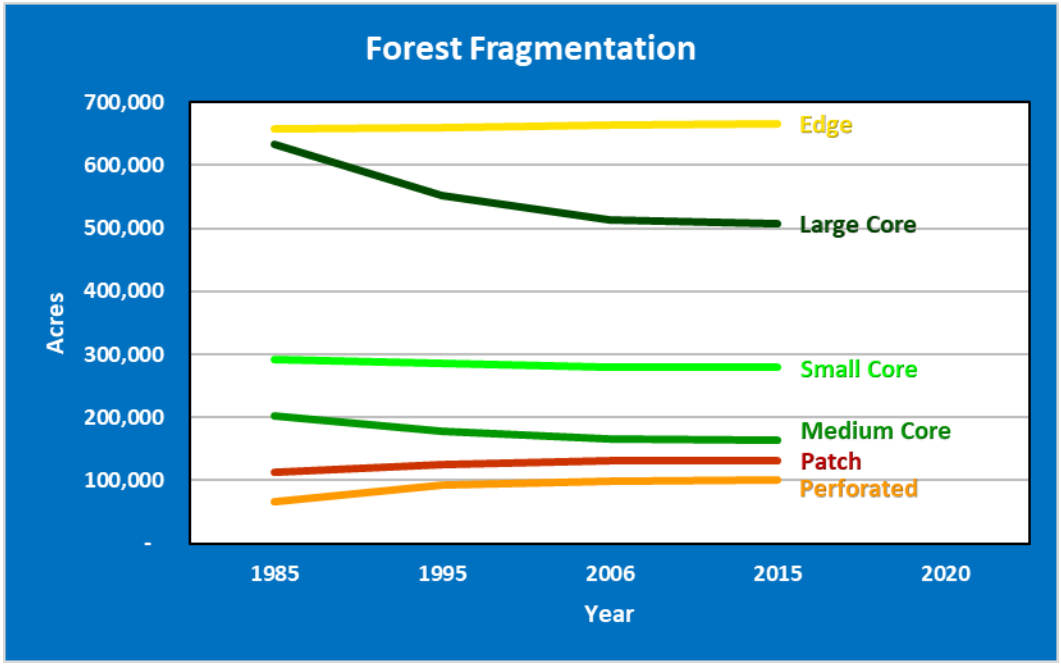



**Figure 2.** Forest fragmentation by forest category. Source: 2015 CT Forest Action Plan. **Note that Connecticut's 2020 Forest Action Plan is due to be published at the end of 2020.

## Dominant Forest Types and Age Structure

Oak/Hickory is the most common forest type with red maple being the most common tree. Regarding tree age and forest demographics, Connecticut's forests are growing older with less age diversity. Despite significant tree mortality between 2013 and 2018 due to Gypsy moth and Emerald ash borer infestations, net annual growth in aboveground forest biomass continued to exceed annual removals by more than five times.[14]

The following figures provide a quick snapshot of Connecticut's forest types and age structure:

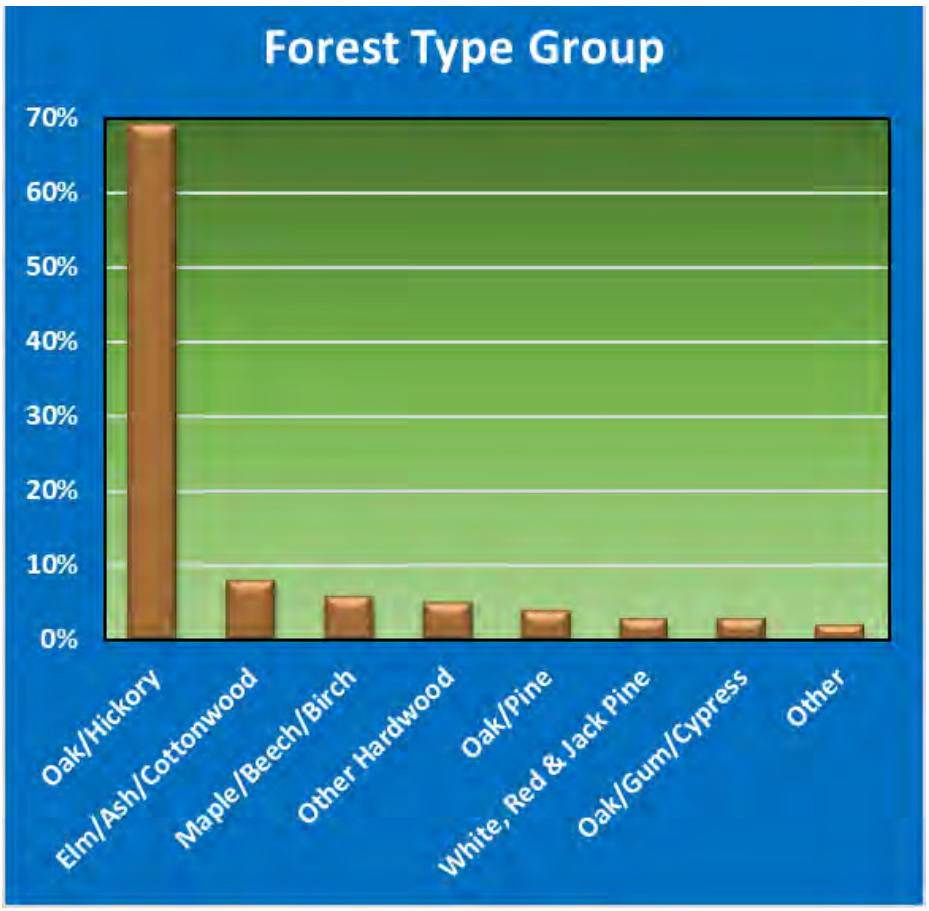



**Figure 3.** Percentage of forest cover in Connecticut by forest type. Source: 2015 CT Forest Action Plan.

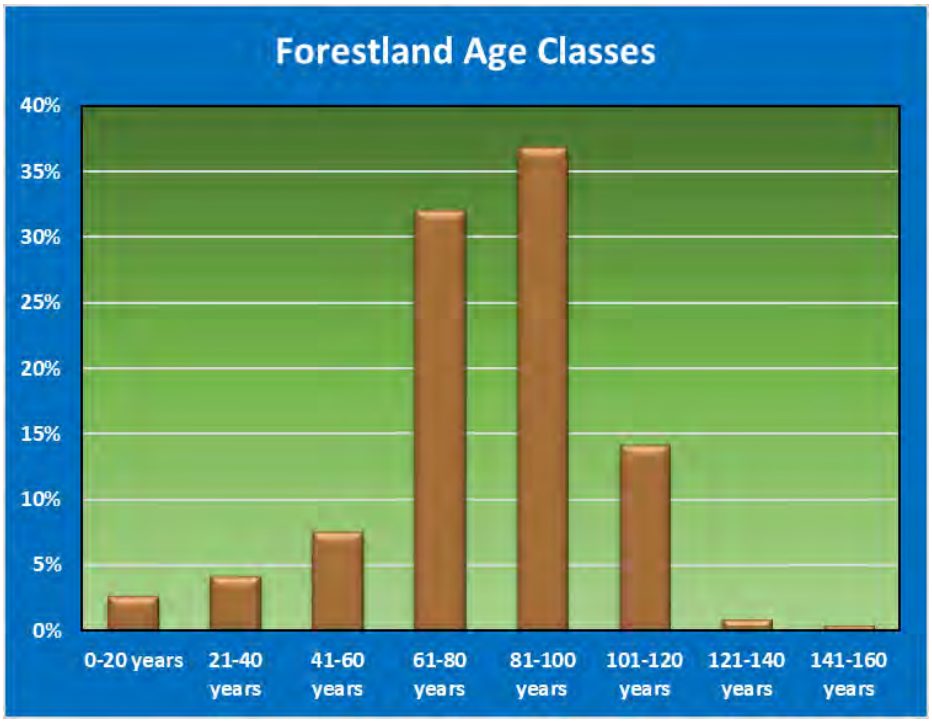



**Figure 4.** Forest cover in Connecticut grouped by age classes. Source: 2015 CT Forest Action Plan.

## Who Owns the Woods?

Of Connecticut's approximate 1.8 million acres of woodlands, 71% is owned by private individuals, corporate landholders (including private water companies), and land trusts. The remaining forestland is owned by the state (17%), municipalities (11%), and minimal federal lands (1%).

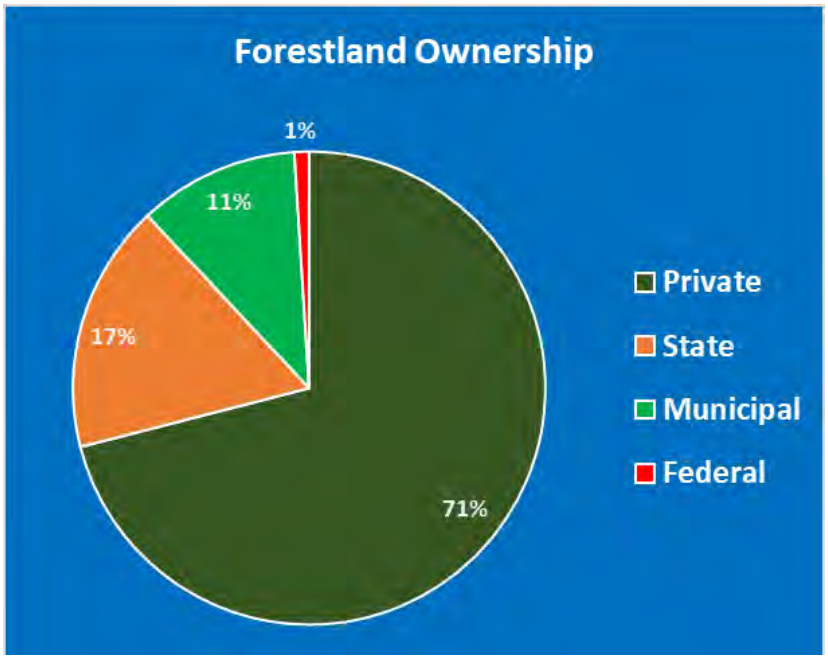



**Figure 5.** Forestland in Connecticut with percentage of ownership. Private includes individuals/families, land trusts, private water companies, and corporate landowners. Source: USDA Forest Service FIA Program (2018).

Likely contributing to an aging forest is the low interest in active forest management by most individual forest landowners. A 2015 Connecticut Woodland Owners (CWO) Survey report documented that the primary ownership objectives tend to be beauty/scenery, privacy, wildlife viewing, and nature protection, with only 21% having cut trees at some time during their ownership. 59% of these landowners have cut trees for their personal home heating purposes. Many woodland owners believe that "hands off, let nature take its course" is the best approach.[15]

The 2015 CWO Survey also showed these owners believe conserving their woodlands is extremely important - they almost unanimously say they would like their land to stay wooded (95%). Hence there exists considerable opportunity to retain Connecticut existing forests as forest. However, most woodland owners would require financial compensation to permanently protect their forest values through a conservation easement.

These same woodland owners are also discouraged and deeply concerned with invasive plants and insects which are disrupting their woodlands. Fortunately, the USDA Natural Resources Conservation Service has invested millions of dollars in Connecticut annually for several years through federal assistance programs such as the Environmental Quality Incentives Program and Regional Conservation Partnerships Programs. These USDA Farm Bill-funded programs encourage property owners to engage and invest in the health, diversity and sustainability of

their woodlands. DEEP's Cooperative Forestry Program also offers technical assistance to these woodland owners supported by the USDA Forest Service. DEEP Service Foresters direct woodland owners to these resources and qualified professional foresters and wildlife biologists to make informed decisions. The more programs and professionals that engage with landowners on stewardship of their woods, the more likely these landowners will continue as long-term, dedicated stewards of their woodlands.

**Because the vast majority of Connecticut's forests are privately owned, engaging family forest landowners, corporate landholders, and land trusts is critical to maintain and increase resilient sequestration and storage of forest carbon in Connecticut.**

## Management of Forests on DEEP Properties

All forested land held by the CT Department of Energy & Environmental Protection (DEEP) can be classified as either "actively managed" or "passively managed." Actively managed lands may support periodic forest, or wildlife habitat management through commercial sales of forest products or other tree and vegetation removal treatments. Passive management lands are generally reserved from commercial forest product harvesting, and left to grow without designed professional intervention.

### Forest Management Plan Status

State Forests are managed based upon Forest Management Plans developed by professional state land foresters at DEEP. These Forest Management Plans, which receive input from interested parties (which varies based upon location) as well as DEEP resource managers in the Wildlife and other divisions, are due to be updated every 10 years. It has been difficult for DEEP to keep its Forest Management Plans up-to-date due to inadequate staff resources to stay on top of this ongoing planning need. All currently active Forest Management Plans are posted online by DEEP.[16]

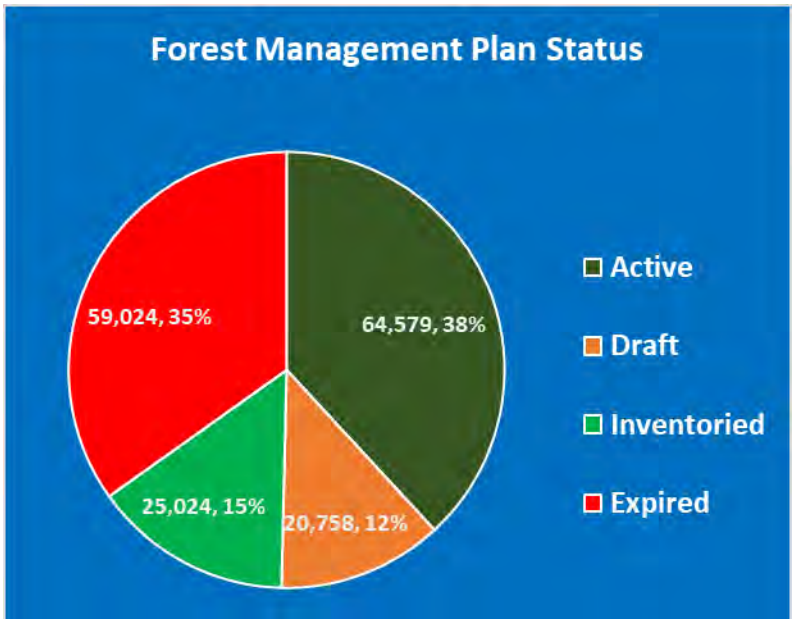



**Figure 6.** Status of Forest Management Plans with acres and percentages as of June, 2020. Source: DEEP Forestry.

## Active and Passive Management on DEEP Properties

State Forests and Wildlife Management Areas (WMAs) are subject to periodic forest and wildlife habitat management with the goals of improving forest health and augmenting conditions for wildlife.

### State Forests

32 State Forests cover approximately 170,000-acres and include a mix of active and passive management.[17] On average, DEEP is conducting active management on an average of 1,000 – 1,500 acres/year (less than 1% of all State Forest lands annually) based upon forest management plan prescriptions.[18] Current program-specific planning guidelines allow for designed passive management, or forest reserve areas within and throughout the State Forest landscape. Old Forest Land Management Sites (OFLMS) are selected to grow and evolve naturally in an attempt to reach advanced stages of vegetative succession and develop as forests subject to the forces of nature with minimal or no human intervention.

There are 36,429 acres -- ~21.4% of all State Forest lands – that today are considered to be under passive management (this figure does not include 104,000+ acres of State Forest lands that do not have active Forest Management Plans). These passive management forest lands fall into the following three categories:

- **Old Forest Management Sites** (planned Forest Reserves): **14,077 acres**
- **Inoperable Sites** (land perpetually passively managed due to site conditions, such as abundant surface stones, excessive soil moisture, steep slopes, etc.): **16,864 acres**
- **Inaccessible Sites** (land which cannot currently be accessed to be managed): **5,488 acres**

### Wildlife Management Areas

Of the 34,000 acres of Wildlife Management Areas, 19,812 acres are considered to be forest land using GIS analysis and CT Land Cover Assessment data.

State WMA's are managed to provide habitat for both common and uncommon wildlife and to provide for wildlife based recreation (hunting, fishing, trapping and wildlife viewing) in support of the Division's overall mission of conserving the state's wildlife resources for the use and appreciation of the public. The vast majority of the funding to manage these lands comes from the U.S. Fish and Wildlife Service Wildlife and Sport Fish Restoration (WSFR) program. WSFR funding is provided to restore, conserve, manage and enhance wildlife habitat and to provide wildlife based recreation. Activities, uses or encumbrances which interfere with the purpose of the WSFR funding are not allowed.

The need for old forest management areas would be determined at the site specific level and would take into consideration existing physical and biological natural resource conditions and the management objectives for the property. Opportunities to designate no management or reserve areas to function as old forest management areas would vary widely, due to the diversity of habitat types found on our WMAs. If it was determined that a particular wildlife species required it and/or it would enhance overall biological diversity, the Wildlife Division would consider passive management (or even active management) to set the stage for well–

developed old forest management areas. Ideally old forest management areas would either provide for or be able to grow into areas characterized with large trees, a diversity of tree species and complex multi-layered structure, canopy gaps, standing dead trees, fallen trees and trees with cavities. At this time, no passive management in WMAs for forests is shown.

## Passive Forest Management Acreage by DEEP Land Classifications

The DEEP Land Classifications on the following chart generally receive no planned forest management. The forested-acreage numbers attributed to each classification are derived based on Land Cover analysis. Any forest activity implemented on these lands would be in response to an immediate public safety issue or large scale forest health concern.[19]

**Table 1.** Passive Forest Management Acreage on DEEP-held lands shown by DEEP Land Classification.

| **Passive Forest Management Acreage by DEEP Land Classification** | **Total Acres Classified (acres)** | **Passive Forest Management Acres** | **Percentage of Total by DEEP Land Class Category** |
|---|---|---|---|
| State Forest | 168,960 | 36,429 | 21% |
| Wildlife Management Area | 34,000 | 0 | 0% |
| State Park | 34,115 | 27,167 | 79% |
| Fish Hatchery | 744 | 393 | 52% |
| Flood Control | 4,434 | 2,627 | 59% |
| Natural Area Preserve | 2,508 | 2,452 | 97% |
| Other | 1,498 | 1,063 | 71% |
| Water Access | 1,588 | 900 | 57% |
| Wildlife Sanctuary | 1,500 | 1,280 | 85% |
| DEEP Water Body | 5,708 | 0 | 0 |
| **Total** | **221,055** | **72,311** | **33%** |

# Benefits of Forests to Ecosystems and Society

Forests are one of nature's most powerful solutions to human-caused climate change.

Whether we live near a forest or not, our human communities are intricately connected with the services they provide. These natural benefits include homes and food for wildlife, pumping oxygen into the air we breathe, filtering runoff that helps clean the water we drink, and delivering nutrients to the soil when leaves and branches decompose.[20]

## Forests benefit wildlife

Healthy forest landscapes often include a variety of tree species of varying age classes. Tall, canopy-layer trees grow above smaller sub-canopy trees, with a shrub layer and diverse plants on the forest floor. This suite of vegetation supports wildlife, from bear and moose to resident and migratory birds. Butterflies and insect pollinators help ensure that same vegetation produces the next generation of life-supporting trees. Many of Connecticut's wildlife species rely on forest habitats. With greater biodiversity comes forest resilience and a greater ability to adapt to changing conditions related to climate change.

## Forests mitigate climate change and clean the air

By doing what they naturally do, the trees in Connecticut's forests – covering an estimated 1.8 million acres, about 59% of the state's land cover[21] – provide innumerable benefits to people, including removing heat-trapping carbon emissions our activities release into the atmosphere. The U.S. Climate Alliance estimates that "within Alliance states [including Connecticut], natural and working lands offset 16% of the GHG emissions from energy, transportation, and other sources in 2016."[22]

The ability of trees to take in or sequester and store carbon dioxide, turning it to wood and other forest components including soil, provides significant potential to mitigate climate change by retaining existing forests and improved forest management. A study in the Proceedings of the National Academy of Sciences finds that "natural climate solutions" could reduce land-based emissions and store additional carbon equivalent to more than a third (37%) of needed emissions reductions to keep global temperatures at or below 2 degrees Celsius through 2030, although benefits decrease beyond that date due to saturation of natural systems among other factors. Among the strategies found to deliver the most benefit, according to the paper, are "reforestation" (conversion of non-forest to forest) and "avoided forest conversion" that along with "natural forest management," represent easily available and effective solutions. [23]

Trees are also effective air filters, removing pollution and particulate matter through their respiration, with studies showing significant reduction of asthma and improved respiratory health in urban areas with more tree cover.[24] Roadside trees could reduce nearby air pollution by more than 50%,[25] but the potential for air pollution reduction varies among species and as a function of tree size and landscape position.[26]

## Forests protect water resources

Forests are also indispensable in production of our drinking water. Approximately 85% of Connecticut residents get their drinking water from public water systems.[27] Forests that

surround public water supply reservoirs and private wells improve water quality and can greatly reduce costs for treatment by filtering surface water and maintaining groundwater reserves, ensuring this vital natural resource is not degraded. Forested wetlands and floodplains along rivers retain and slow the movement of vast quantities of water during storm events, protecting nearby municipalities from flooding and reducing stormwater runoff.

## Forests provide wood products and economic benefits

In Connecticut, the Land of Steady Habits, generations of families have harvested trees from their land to heat their homes, to build the post and beam barns on their farms and perhaps sell some timber to generate income. The vistas of forested hills and fields along country roads, and tree-lined suburban streets are part of our New England cultural identity.

Trees are a renewable resource – and in New England, where conditions usually allow seeds to take root and regenerate, working forests can also supply a local source of wood products. Connecticut consumes an estimated 80.4 million board feet of roundwood or about 22.77 board feet per person each year.[28] For a relative measure, building a typical 2,000 square foot home would require about 16,000 board feet of roundwood.[29]

Depending on the goals and desired outcomes of private or public owners of forests, cutting some trees according to a variety of silvicultural practices or prescriptions, can enhance the health and vigor of remaining trees, generate income from the sale of timber to produce wood products for human needs, and silviculture can be employed to create a wide variety of habitat conditions and specific habitat features to benefit various wildlife species.[30]

Harvesting timber grown sustainably in our own region can help to reduce transport emissions and global deforestation by avoiding a shift of pressure to harvest primary forests in other nations with less stringent environmental policies. In its 2015 report, the North East State Foresters Association estimated Connecticut's forest products and forest recreation industries produce an annual gross output of $3.38 billion and almost 13,000 jobs (figure below).[31]

**Gross State Output (sales), Forest-based Manufacturing & Recreation, Connecticut, 2013**

| | | millions of $ | jobs |
|---|---|---|---|
| Forestry & logging | | 25 | 450 |
| Wood products manufacturing | | 154 | 1,300 |
| Furniture and related product manufacturing | | 418 | 2,802 |
| Paper manufacturing | | 1,573 | 3,550 |
| Wood energy | | 7 | 40 |
| Christmas trees and maple syrup | | 4 | 58 |
| Total Forest Products | | 2,181 | 8,200 |
| | | | |
| Forest Recreation sales | | 1,200 | 4,600 |
| | Total | $ 3,381 | 12,800 |

Long-lived wood products – from your grandmother's antique desk to the cabinets in your renovated kitchen – also lock up and store carbon until the wood decomposes. From paper to plywood and barrels to baseball bats, some wood products are well known; other forest products such as rayon, mulch, medicines, fiber, gums, resins and tannins (such as witch hazel)

are less obvious.[32,33] Lumber can also be reclaimed from old structures and recycled into new uses for furniture or building materials, keeping carbon out of the atmosphere longer.

## Forests support recreation and health

Connecticut's forests provide recreational settings for people to get outside to exercise and enjoy nature through countless activities, such as hiking, mountain biking, horse riding, bird watching, camping, hunting and fishing, and serve as attractions that support tourism and natural resource-related businesses that generate economic benefits to Connecticut.

Forests also offer solace and spiritual renewal to people seeking to unplug from hours of "screen time" spent for work and entertainment. Particularly during the 2020 pandemic, forest trails and open space available for public access has provided physical and mental health benefits. One study on the Japanese practice of forest bathing (shinrin-yoku), found that pulse rate, systolic and diastolic blood pressure were significantly lower among a group of 128 people (ages 45-86) after a two-hour program in the forest which indicated physiological benefits from stress recovery.[34] A recent "Forests Make Us Healthier" campaign by the Northeast Forest Network provides a toolkit with much more information on the important connection between forests and mental and physical health.[35]

## Forests provide shade and make communities more livable

By releasing water vapor through transpiration, street trees can help alleviate the urban "heat island effect" that has caused deaths in some cities during heat waves, which may become more common with higher extreme temperatures.[36] An improved tree canopy can cool residential neighborhoods and reduce energy use, while potentially making communities more attractive, livable and safe.

Connecticut should balance public safety with the health benefits of urban and suburban street trees in reviewing policies for tree planting in residential areas and hazard tree removal implemented by utility companies or municipalities.

By maintaining Connecticut's existing forests, and significantly increasing the acreage of permanently protected forest land, we can help ensure our state's natural and human communities can continue to thrive in the face of climate change.

# Adopt Statewide "No-Net-Loss of Forest" Policy

## Top Priority Action

- **Adopt a statewide "No-Net-Loss of Forest" policy** in the CT General Assembly.

The Forests Sub-Group recommends an overarching "no-net-loss of forest" (NNLF) policy for Connecticut. This policy would support the top priority recommendation in both the Adaptation/Resilience and Mitigation sections of this report which is to KEEP FORESTS AS FORESTS.

To achieve this NNLF policy goal will take concerted actions at the local, regional, and statewide levels. Fortunately, the state of Maryland has been working on implementing its "no-net-loss of forest" policy which was adopted in in 2013 with passage of the MD Forest Preservation Act.[37] This landmark legislation accomplished four goals:[38]

- Establishing no-net-loss of forest as the policy of the State of Maryland.
- Encouraging the retention of family-owned forests by doubling the income tax credit for forest management activities and expanding the range of activities to include the planting of streamside forests, removing invasive species, and improving wildlife habitat.
- Broadening the State Reforestation Law to support tree planting and forest health management on family-owned forests.
- Ensuring that local fees under the Forest Conservation Act of 1991 are used for tree planting and conservation.

The NNLF policy has helped establish several mechanisms at the statewide and county levels to slow the rate of forest losses in Maryland. This policy should be adapted to work for Connecticut, and the climate crisis makes this an urgent priority. The following recommendations are based on those proposed for Maryland to implement its NNLF policy:[39]

(1) **Avoid Forest Conversion** – protect existing public- and privately-owned forestland from conversion to non-forest purposes to retain the benefits of increased carbon storage, biodiversity, public health, green infrastructure, etc. (see benefits in previous chapter);

(2) **Protect Healthy, Intact Forests** – ensure that impacts upon forests, sensitive habitats, and other natural climate solutions and priorities (wetlands, soils, rivers, farmland, etc.) are considered at every level of planning – urban, suburban, and rural – and across all landscapes;

(3) **Offset All Planned or Permitted Forest Losses** – it is not practical to protect all forested areas from conversion and periodic natural disturbances may also result in temporary forest losses. However, it is essential to offset all planned or permitted forest losses through a combination of compensatory mitigation requirements and tools such as compensatory reforestation, replanting programs, and acquiring local or regional forest mitigation banks;

(4) **Provide Incentives for Stewardship, Forest Retention, and Forest Resiliency** – since 71% of the state's woodlands are privately owned by individuals/families, corporate landholders, and land trusts, a no-net-loss policy must include financial and technical assistance measures to

engage private landowners in maintaining and increasing sequestration and storage of forest carbon as well as incentives for critical ecosystem services that their forests provide.

For example, as a participating state in the Regional Greenhouse Gas Initiative or RGGI, Connecticut should study forest carbon offset allowances available through compliance and voluntary markets for reforestation, improved forest management, avoided conversion, and reforestation as well as programs that aggregate, evaluate and monitor forest offsets, in order to implement a system of paying landowners for enhanced carbon sequestration and storage with verifiable climate benefits and strict certification standards in place; and

(5) **Protect Urban Forests, Build More Parks, and Plant More Trees** – planting, re-planting, and caring for trees and establishing neighborhood parks in Connecticut's cities not only provides improved health, reduced energy costs, and other co-benefits, but also often provides more equitable access to parks and the outdoors for people of color and other vulnerable communities disproportionately impacted by climate change. If this is implemented with appropriate community engagement rather than as a top-down program, this can result in more healthy, equitable, and resilient communities.

## Adaptation and Resilience Considerations for Connecticut's Forests

Resilience is the fundamental ecological ability of a forest to change and adapt to stressors and provide the functions and values that society demands.[41,42]

Following are the primary components of resilience and their relevance for Connecticut's forests:

1. Forests and their native species (especially trees) have an inherent ability to endure and self-organize after disturbances with which they have co-evolved.

In Connecticut, the predominant oak-hardwood forest type has co-evolved with disturbances that are mostly episodic (e.g. hurricanes, microbursts, tornadoes, droughts) – rather than frequent and chronic (e.g. small canopy wind events).[43,44] The historic frequency and intensity of storms may be different in the future as climate changes occu

2. Greater tree species diversity confers greater stability, in the form of resistance to change in forest stands (and landscapes) related to disturbance and stress.[45,46]

The primary environmental drivers of our forest diversity follow (in general order of importance for forests in Connecticut):

a) The ability of plant species to specialize in relation to each other on different soils and topographies (a.k.a. niche partitioning);[47]

b) The ability of different plant species (trees) to have different growth habits and forms such as herbs, shrubs, small trees and canopy trees which is closely tied to precipitation and soil moisture (a.k.a. crown stratification);[48,49,50,51]

c) The ability of different tree species to grow and live for different lengths of time as a forest grows back after an episodic disturbance such as tornadoes, microbursts and hurricanes (a.k.a. successional development);[52,53]and

d) Ability for various species to "hide" amongst unrelated neighbors to avoid insects and diseases specific to that species. This process in and of itself promotes diversity (a.k.a. negative density dependence).[54,55]

Connecticut's forest diversity is relatively young, since these drivers have been dynamically interacting over the past 20,000 years (since the peak of the last glaciation) with human-related land uses, climate, and other stressors (mostly human-related) and disturbances. Its current diversity is largely controlled by three diversity drivers: a) niche partitioning - because of Connecticut's inherent soil and topographic variability; b) crown stratification - promoted by moist soils from the relatively high rainfall Connecticut receives; and c) succession - disturbances that are punctuated by periods of recovery long-enough to promote sun-loving long-lived canopy trees (ash, oak, hickory and pine) to grow as canopy dominants with longer-lived shade tolerant species (beech, hemlock, maple) more characteristic of northern New England Forests.

3. Redundancy is a form of resilience where multiple species have the same roles or functions in a developing forest.[56]

Generally speaking, Connecticut's forest redundancy is high meaning that there are multiple species and multiple unrelated genera. For example, oak, hickory, and maple trees all have multiple species found across the state that can inhabit the same space and function in a forest. Hence, the elimination of one species through insects, disease, or other stressors would not limit the ability of a forest to recover and retain its basic structure and composition. Of course, the removal of multiple species will reduce or eliminate redundancy and will have a dramatic impact in a forest's resilience. Evidence suggests this is beginning to happen, for example with the functional elimination of chestnut, elm and ash and the decline in beech, hemlock, and oak.

There are other drivers of Connecticut's forest resiliency that are not covered in this report, such as "driver" and "passenger" species relationships[57,58,59] and biogeographic effects.[60]

## The Resilience of Connecticut's Forests is currently Threatened and Declining

There are multiple factors and stressors that have combined to threaten the resilience of our forests:

1. Forest Age Classes and Structure are Not Diverse – Legacies of Connecticut's agriculture, chronic selective logging, and development history has left a relatively age- and structure-simplified second growth forest across most of our state.[61,62]

2. Most Forests Are Mature and Getting Older – The pattern of a large proportion of forests in the landscape simultaneously reaching maturity has the potential to reduce resilience as maturing forests are more susceptible to multiple stressors (e.g. insects, disease, pollutants, and drought).[63] Old growth forests have enormous ecological and social value, are rare in the modern landscape, and can have substantial resilience to disturbance. Also disturbances in mature forests can promote the age and structural diversity missing from the forest landscape, but novel stressors described below may affect these values and outcomes.[64,65]

3. Most stressors are human caused but beyond our immediate control – Abiotic stressors to trees such as ozone and NOx[66] can be significant, as can biotic stressors such as invasive insects, plants, and diseases. Both have been impacting the development of the Connecticut forest for over a century and will continue to impact future forest composition and structure.[67,68]

4. Fragmented forests with permanent "edge" are more prone to degradation -- Permanent edge exists because of persistent and continuous disturbance from: i) farming and agricultural activities; ii) development and suburban expansion through roads, lawns, and lots; and iii) through continuous activities in the forest such as recreation (e.g. trails), frequent rather than episodic timber harvesting, and the chronic imbalance of predator-prey in wildlife populations (e.g. deer).[69]

5. Climate Change is Increasing Disturbances – Climate change is exacerbating chronic issues for forests such as incremental mean increases in temperature resulting in increased respiration stresses and decomposition processes. Climate change also heightens episodic stresses such as periods of drought during the growing season, extra-normal rainfall and snowfall events, and increased abnormal and high severity disturbance events such as ice storms, tornadoes, hurricanes, and microbursts.[70,71]

6. Climate Change Can Reduce Forest Carbon Sink Potential -- Climate change is producing, facilitating, and reinforcing negative impacts from stressors already present in low-resilience forests. This can cause a degradation spiral which further simplifies forest composition and structure, increases dominance of non-native species, may reduce standing biomass, increases decomposition processes, and lowers soil carbon.[72,73,74]

**The bottom line is that forests will not be impactful to mitigate climate and carbon if they are not resilient.**

# Actions to Increase Adaptation and Resilience of Connecticut's Forests

## Top Priority Actions

- **KEEP FORESTS AS FORESTS** with mechanisms to encourage private landowners to protect forestland through easements, tax incentives, ecosystem payment mechanisms, and strong markets for local forest products.
- **Create forest monitoring network** to evaluate forest ecosystem conditions in naturally regenerating forests across the rural to urban gradient, various land ownerships, and including trees in more developed areas.
- **Sponsor research on active and passive ways to create greater resiliency in forests** through alteration or natural development of structure, function, and diversity. Encourage financial incentives to apply the results of this research on public and private lands by stakeholders to promote more resilient forests.
- **Ensure statewide, regional, and local actions align to maintain un-fragmented forests** (both reserves and actively managed) within and across political boundaries with emphasis on connections to waterways and wetlands, core forests, and wildlife habitat linkages.

## Short Term (1-5 year) Recommendations

### Monitoring, Evaluation, and Planning

- Create a monitoring network to evaluate forest ecosystem conditions in naturally regenerating forests (i.e., not mowed or maintained ground cover) across the rural to urban gradient throughout Connecticut at a more refined scale than the National FIA and that complements other existing programs such as the Breeding Bird Survey. Incorporate or establish additional network for "maintained trees" across the state.
    - Include a wide diversity of measurements beyond forest growth and change in composition: such as breeding bird census, invasive plant monitoring, insects and diseases, disturbance characterization from a variety of sources (timber harvest, wind, insects, pathogens, and fire) and periodic measures of soil carbon.
    - Ensure that data are accessible and usable by stakeholders through an open access data portal and that the importance and utility of the data are communicated to potential users.

  - Create a citizen science program where trained and mentored individuals (from across life stages – including students and adults) conduct some of the monitoring – e.g., bird census on a specific series of days at the sampling points, camera trap monitoring for mammals, or amphibian surveys. If well planned, this could be systematic part of the design for the monitoring program carried out by or alongside professionals. This could be developed as a component of a college or high school curricula.
- Identify areas that are especially important to landscape-level resilience through partnerships with TNC's Staying Connected Initiative,[75] HVA's Follow the Forest Initiative,[76] and other climate corridor proponents to identify and prioritize the protection and enhancement of climate and habitat corridors in Connecticut. TNC's Resilient Lands Mapping Tool[77] can also be used for site assessments in Connecticut to measure the capacity of different lands to withstand climate change.
  - Identify areas where wildlife movement between core forests becomes constrained by roads, culverts and bridges, and design mitigation efforts to improve wildlife passage.

## Experimentation

- Sponsor experimental studies to investigate both active and passive ways of creating greater resiliency in forests through management-promoted or natural development of structure, function, and diversity. Use these studies as baselines for adaptive management of forests in different contexts. Initiate studies across the rural-urban gradient, ownership and land use types, and in both maintained and naturally regenerating forest systems.
  - Promote and expand on existing examples such as Adaptive Silviculture for Climate Change program at UConn[78] and many efforts of USFS Northern Institute of Applied Climate Science.[79] Create a state-wide list/portal of existing and newly created projects where their outcomes can be communicated.
  - Explore funding streams through USFS and other agencies for expanded efforts.

## Forest Management Approaches

- Increase the reserve (passive management) acreage in the state to promote local and landscape/regional resilience (e.g., as buffers against extinction/extirpation[2]) and to provide controls to assess the outcomes of experimental manipulations.
  - Reserves should be representative of the entire landscape in order to provide suitable controls (i.e., similar environments) for actively managed areas.
- Implement active forest management approaches that can increase structural, age class, and species diversity in low-diversity second-growth forests.[80][81]
  - Promote silviculturally-informed, resilience-focused management approaches across ownership categories and especially on private lands.
- Respond to ongoing elevated tree mortality (related to gypsy moth, drought, emerald ash borer, etc.) across the urban to rural gradient with hazard tree removals, limited

salvage harvesting where appropriate (e.g., not in reserves and to a very limited extent on public lands where public safety including wildfire risk is not increased), and tree additions (seedling/sapling planting) where needed based on regeneration monitoring.
    - Coordinate and share information on tree mortality patterns and safety concerns.
    - Set up specialized monitoring program to assess tree regeneration patterns across affected and unaffected stands.
    - Re-vitalize the State Tree Nursery to promote seedling availability.
    - Retain snags and deadwood to promote wildlife habitat and carbon storage wherever feasible based on hazards and economic considerations.
- Respond to ongoing invasive pests and pathogens and prepare for future introductions.
    - Adopt and promote biocontrol methods where possible and work with partners from the federal level to test and apply these methods.
    - Continue and expand monitoring programs and early warning systems.
    - Continue and fund firewood and horticulture regulations to limit new introduction.
- Promote regeneration of native and future-adapted tree species (especially oaks and hickories) across forest types, stand conditions, and ownership types.
    - Develop and promote herbivore population control measures where appropriate and based on monitoring of regeneration and herbivore populations.
    - Include regeneration as a primary focus of monitoring and experimentation plans outlined above.
    - Implement forest management approaches and planting initiatives to promote regeneration of mid-tolerant and intolerant species such as oaks and hickories where needed and appropriate (based on monitoring or protected status).

## Education and Outreach

- Continue and expand education and outreach/training efforts focused on promoting the importance of resilient forests, and forest management approaches (both passive and active) that promote resilience, as linchpins of state climate adaptation and mitigation strategies.
    - Create and fund a Connecticut Youth Conservation Corps, on the model of the Civilian Conservation Corps, to provide jobs and paid job training to young people that prioritize tree planting and reforestation activities with an emphasis on explicitly creating employment opportunities for young people from Environmental Justice communities (as defined under section 22a-20a of the CT General Statutes) to carry out planting and reforestation activities in EJ communities

## Longer Term (5-10 year) Recommendations

### Forest Protection Strategies

- KEEP FORESTS AS FORESTS with "no-net-loss of forest" policies and financial incentives to encourage private landowners to protect forestland through easements, tax incentives, ecosystem sustaining payments, and strong markets for forest products.
- Develop active outreach programs to connect and engage private woodland owners with conservation-based estate planning resources, such as tax benefits of conservation, family facilitation in succession planning, and guidance about options to sell carbon credits as market opportunities emerge.
- Ensure statewide, regional, and local actions align to maintain un-fragmented forests (both reserves and actively managed) within and across political boundaries with emphasis on connections to waterways and wetlands, core forests, and wildlife habitat linkages.
    - Reduce fragmentation, protect sensitive soils and waterways, and create a forest structure and composition that is a buffer to edge, diverse in composition and structure - making it resilient to both acute (hurricanes) and chronic (pollutants) disturbances.
- Keep wetlands as wetlands, woo[illegible] wetlands and riparian forests (floodplains), and enact amplified land protection strategies to avoid wetland and riparian forest conversion.
    - Promote restoration of forested wetlands to more diverse species composition, including coniferous component where appropriate.
- Protect the most significant forest cores and wildlife habitat linkages and actively restore connections where wildlife movement (terrestrial and aquatic) is constrained by roads, culverts, dams, and bridges.

### Forest Restoration and Acquisition Strategies

- Acquire riparian lands for rehabilitation and restoration back into forest
- Look for appropriate opportunities to reforest currently non-forested lands that would have historically supported forest vegetation and are not currently or likely in the near term to be utilized for agriculture, to provide additional habitat for early successional species
- Sponsor and develop a network of forest resilience nurseries developed and managed by landowners to propagate plant species of ecological concern for out-planting in forests and regions of Connecticut with extirpated populations (with appropriate oversight).

### Implementing Forest Resiliency

- Encourage financial incentives to implement what we learn from adaptive experimentation and monitoring (above) on public and private lands by stakeholders to promote more resilient forests in structure, function and diversity.

- Create a funded program for municipalities (especially in underserved/EJ areas) to increase urban tree canopy cover and resilience in plantings and post-establishment treatments/monitoring as well as in appropriate circumstances to maintain mature and large trees which provide especially high levels of ecosystem services such as cooling, pollution reduction, and habitat.
- Fund strategic state programs to control important emerging invasive insects, plants, and diseases.
- Develop and promote programs to increase resiliency of trees and forests in proximity to human (gray) infrastructure and reduce tree-infrastructure conflicts

## Education and Outreach

- Create a funded educational program for forest landowners and interested citizens around what a resilient forest is and how promoting a resilient forest benefits society.
- Enhance outreach and education efforts focused on promoting the importance of tree and forest cover to human health and well-being to constituents.
- Develop programs and outreach/education materials that educate citizens, stakeholder institutions (e.g., highway departments and utilities), and policy-makers about the exceptional ecosystem services of maintaining large trees in gray infrastructure areas, but also balance with the "right tree, right place" message to avoid disbenefits[83] and work with communities to determine local priorities rather than a cookie-cutter, top-down approach.

## Changing Laws and Regulations

- Enact and enforce tougher firewood and horticultural State laws around invasives, fuelwood, and packaging across state lines – including a well-funded enforcement program.
- Very carefully regulate hunting of top predators to encourage development of intact top-down trophic food webs and to remediate the current imbalance regarding herbivory.

## Creating Strong Markets for Products and Services with Multiple Benefits

- Strengthen local markets for long-lived forest products to promote a local rural economy so that treatments to create more resilient forests are not paid for by the taxpayer but come “free.”
    - Include “Build with Wood” programs and market local timber products (e.g., Connecticut Grown Wood) with certifications and requirements for implementation of resilience-focused forest management approaches to incentivize construction in wood and mass timber technologies and discourage more carbon-intensive building materials.
    - Incentivize local production and marketing of Connecticut Grown non-timber forest products (e.g., forest gardening of non-timber forest foods – maple syrup,

ramps, mushrooms, herbs, and berries as well as understory spices and medicinals).

- Create a fund to strengthen local markets and provide payments or services to promote social and economic resilience for landowners - particularly for rural economically-disadvantaged and small-acreage landholders who are currently incentivized to sell or develop.
    - Watershed services payments for private landowners.
    - Recreational trail payments to landowners for public access on private land.
    - Payments for enhanced sequestration and/or storage of carbon through reforestation, improved forest management, or avoided conversion, with strict standards in place through programs that aggregate verified carbon credits from private lands in order to sell carbon offsets in voluntary or compliance markets.

# Mitigation Considerations for Connecticut's Forests

Climate mitigation involves both reducing the emissions of carbon dioxide ($CO_2$) and other greenhouse gases, and increasing the removal of $CO_2$ and other GHG's - e.g. methane, nitrous oxides, and ozone - from the atmosphere to reduce potential adverse effects of climate change.

Natural ecosystems (grasslands, wetlands, forests) are, on balance, the best and most effective climate solutions available both for the uptake ("sequestration") and long-term storage of carbon, whereas human-made carbon capture technologies are still in their infancy.[84] Of these natural systems, forests sequester and store the most carbon and likely have the largest potential to remove additional $CO_2$ from the atmosphere.[85]

## Available climate mitigation solutions in forests

- A*voided conversion of forest* to non-forest sustains the mitigation value of forests and is a prerequisite for both *proforestation* and *improved forest management.*[86]
- *Proforestation* (natural forest growth in areas protected from timber harvesting) is likely the most effective solution to preserve and foster further growth of accumulated carbon storage in woodlands.[87,88,89]
- *Mitigation-focused forest management* – (e.g., extending rotation periods and retaining more and larger trees) has important potential to retain carbon storage on managed lands, while providing long-lived wood products.
- *Reforestation* (conversion from non-forest to forest) generally has the highest potential rate of carbon dioxide sequestration among these four solutions.

## Connecticut's Forest Carbon Storage

Connecticut's forests are, on average, the most carbon dense – in aboveground carbon stored per acre – of the nine Northeastern US states[90] and therefore have extraordinary mitigation value for this region in terms of their accumulated carbon stocks. A combination of *avoided conversion*, *proforestation, and mitigation-focused forest management* is critical to maintain these carbon stocks.[91]

## Connecticut's Forest Carbon Sequestration and Future Role in Climate Mitigation

Approximately 16% of Connecticut's forests are estimated to be >100 years of age, the highest percentage in the Northeast.[92] Annual net growth of Connecticut's forests is also estimated to be the highest in the region,[93] indicating that forest age is not currently constraining forest growth. In fact, Connecticut's forests have increased their rate of growth and standing biomass significantly over the past 10 years.[94] These increases have occurred despite, and perhaps in part because of, an increase in tree mortality resulting from insect outbreaks and windstorms over this time period.[95] Connecticut's forest resilience in the face of increased tree mortality can likely be attributed to the following:

- Natural disturbance events have resulted in relatively small fluctuations in carbon across the state as a whole.[96]
- Temperate deciduous forests typically develop structural complexity naturally as they age and are exposed to moderate severity disturbances; this complexity can lead to greater carbon sequestration that helps maintain carbon storage in mature forests well beyond the 100-year mark.[97] [98]

- Recent surveys of private forestland owners suggest a relatively low interest in timber harvests on their land with their top reasons for owning their woodlands being to enjoy the beauty and scenery, followed by privacy, home, and protecting wildlife habitat, nature, and biological diversity. That said, landowner attitudes can certainly change over time and it is difficult to generalize across this group.[99]

Though growth rates and carbon uptake rate will eventually slow as Connecticut's forests enter late successional and old growth stages, most of these forests will continue to accumulate carbon in live tree biomass, down and dead trees, and soils well past 200 years of age.[100,101,102] In fact, Connecticut's forests have the potential to almost double their carbon storage.[103] Natural disturbances, predicted with climate change to increase in both frequency and intensity, will generally sustain carbon sequestration levels up to a relatively high disturbance severity threshold, beyond which sequestration tends to decline.[104]

## Forest Conversion threats

Connecticut's forests cover ~59% of the state's land area,[105] and 53% of these forested areas is considered to be "core forest" as defined by UConn CLEAR in its landmark forest fragmentation study.[106] Over the past 10 years, Connecticut's forest area has changed little, ranging from a net loss of 400 acres per year to a net gain of 1,400 acres per year, depending on the calculation.[107] However, large core forest has declined sharply (see Figure 2 on page 4). The biggest ongoing and future threats from forest conversion and fragmentation occur in the Connecticut River valley and northern Fairfield, New London and Windham counties.[108]

## Reforestation Potential in Connecticut

Four hundred years ago, Connecticut was almost entirely forested.[109] Moderate mitigation potential exists for reforestation on lands that were once forested and are not currently being used for agriculture (i.e., lawns, vacant lots, barren lands and other non-agricultural fields in rural, suburban, and urban areas).[110] In Connecticut, the reforestation potential is highest in the rural areas of Litchfield county and in the settled areas of the Connecticut River valley and Fairfield County.[111]

## The Settled Treescape

Because of increased light, trees and forests that grow near edges, along roads and in settled areas are generally larger and store more carbon than trees in forest interiors.[112] Settled treescapes also cool buildings in summer and insulate them in winter, reducing $CO_2$ emissions from heating and air conditioning.[113] Large trees provide the largest cooling/insulation benefits and airborne pollution reduction compared to small trees.[114] Because of these significant benefits, removals and aggressive pruning of large trees by utility companies and highway departments can result in disproportionately large effects on climate mitigation and should be limited to trees in poor condition that are imminent threats to people or electric infrastructure.

## Timber harvesting in Connecticut

Connecticut's forests are currently harvested at a relatively low intensity – 17% of the state's annual forest growth in volume is being cut each year.[115] However, there is some concern that

Connecticut forests are being high-graded (i.e., the largest and most valuable trees are being harvested.[116] *Mitigation-focused forest management* combined with incentives for landowners could help retain more of the state's larger trees and their carbon on managed forestlands.

# Actions to Increase Mitigation of GHG from Connecticut's Forests

## Top Priority Actions

- KEEP FORESTS AS FORESTS and set statewide goal to permanently protect at least 50% of medium (>250 ac.) and large (>500 ac.) core forests by 2040.
- Develop Action Plan to Increase statewide forest cover from 59% to over 60% by 2040.
- Establish Criteria and Designate Core Forest Natural Area Preserves on state conservation lands.
- Retain large trees and forest cover in urban and residential areas to reduce carbon emissions from buildings and retain health and other co-benefits.
- Improve forestry practices in Connecticut's working forests by extending harvest rotations and retaining more large trees.

Forests offer the single most effective land-based solution for removing carbon dioxide from the atmosphere and storing it long-term to limit some of the worst impacts of climate change.[117] From the deep "core forest"[118] to the individual, mature trees that shade our streets, all of our treescapes are essential to meeting the state's carbon emission reduction goals.

As a co-benefit, forests sustain the health and well-being of the state's residents and the broad diversity of plant and animal life that comprise Connecticut's natural heritage. The protection, expansion and extension of forests are central to an effective and equitable approach to climate mitigation that Connecticut requires and deserves. The following recommendations are bold and necessary to address the enormous threats associated with climate change.

## Permanently Protect at least 50% of Core Forests >250 acres Statewide by 2040

*Avoided conversion* of forest to non-forest is a critical climate mitigation strategy. Connecticut's Forest Action Plan already recognizes core forest protection as a conservation priority**.** Public Act 17-218 further requires that the Commissioner of DEEP consider the environmental impacts to core forests from proposed solar projects and certify to the Connecticut Siting Council that such projects will not materially impact the status of core forests. Because of the many co-ecological benefits core forests provide in addition to climate mitigation, Connecticut should ensure that loss of core forest cover does not occur, or is offset by core expansion. Permanently protecting 50% or more of the state's medium and large[119] core forests by 2040 should be a conservation goal with the same statutory authority as the State's current 21% overall land conservation goal.[120]

### Short Term (1-5 year) Actions

- Adopt statewide core forest permanent protection goal (cores >250 acres) of 50% by 2040, an increase of about 137,000 acres from 33.5%.[121] This goal would have the same statutory authority as the existing 21% overall conservation goal.

- Realign state land protection program and funding sources in the Green Plan to reward and incentivize land protection that protects core forest land >250 acres in size.
- Actively discourage loss of core forest by incompatible land-uses through required mitigation, financial disincentives, and strong policies to avoid land-use conversion.
- Increase land protection funding from all available sources, including funds to increase capacity of DEEP land protection and stewardship staff necessary to sustain a fivefold increase in acres saved and tripling the number of conservation transactions accomplished each year. This should include annual bond authorizations of at least $25 million for DEEP's Recreation and Natural Heritage Trust Fund and $25 million for the Open Space and Watershed Land Acquisition (OSWA) program.

### Longer Term (5-10 year) Actions

- Ensure Forest Management Plans for state conservation lands include prioritization of protecting intact large core forest areas.
- Incorporate training on recognizing core forest areas into resources available for all state licensed forest practitioners.
- Ensure water utilities are made aware of medium and large core forest areas on their properties, and are incentivized to discourage activities that would fragment these valuable lands.
- Require an individual permit for any petition before the Connecticut Siting Council that would affect core forest.
- Consider increasing financial incentives such as PILOT payments to municipalities that exceed the statewide average of protected core forest.

## Develop Action Plan to Increase Forest cover from 59% to over 60% by 2040

Approximately 59% of Connecticut is forested.[122] Although of varied size and uneven distribution, these forests already have significant aboveground carbon storage (averaging from 31.5 to 39 metric tons/acre),[123] especially compared to other states in the northeastern U.S.

Using a no-net-loss policy in Connecticut to avoid deforestation and building upon it to increase forest cover to safely above 60% of the state's land area with *reforestation* (defined here as conversion of land from non-forest to forest) will expand carbon storage capacity, and increase the rate of carbon uptake ("sequestration"). In fact, reforestation is the single most effective forest-based solution to increase the sequestration rate on a per-acre basis in Connecticut.[124]

This increase in forest land cover could be achieved through natural forest succession on currently unforested land in residential, rural, and urban areas (i.e., grass and turf, reclaimed and remediated lands, marginal and abandoned fields). It could also be achieved by deliberate re-plantings (as needed), expanding forested riparian buffers, and curtailing unnecessary tree pruning and removals along transportation, residential utility transmission, and telecommunications lines and infrastructure.

This increase in forest land cover would not require the reforestation of active agricultural fields, except in areas where the priority may be to expand riparian buffers. Reforestation potential is particularly high in Litchfield, Tolland, and Windham Counties and in the urban areas of the Connecticut Valley and northern Fairfield County.[125] Co-benefits of reforestation

include improved water quality, vegetated buffers to forest cores and old growth forest, and enhanced wildlife connectivity between larger areas of forest habitat.

### Short Term (1-5 year) Actions

- Adopt a statewide forest cover goal of "over 60% by 2040" and launch rapid action planning process to determine areas and incentives to target for reforestation efforts.
- Create and fund a Connecticut Youth Conservation Corps, on the model of the Civilian Conservation Corps, to provide jobs and job training to young people that prioritize tree planting and reforestation activities with an emphasis on employment and work in environmental justice communities as defined under section 22a-20a of the CT General Statutes.
- Consider options for amending Public Act 490 to more actively discourage forest conversion in and beyond the current 10-year term.
- Actively discourage conversion of forest, particularly core forest, for industrial solar projects, while increasing incentives for renewable energy projects on the built environment, such as on brownfields or along highway infrastructure.
- Develop educational programs for policy makers and local governments on the climate mitigation benefits of reforesting urban and settled areas, and update existing public information to highlight Connecticut's land-based carbon.
- Greatly reduce clear-cutting of mature forests as a habitat management practice benefiting young forest species.

### Longer Term (5-10 year) Actions

- Establish financial incentives for landowners who allow their lawns or abandoned fields to reforest.
- Invest in scientific monitoring, remote sensing and GIS capacity, by DEEP or its partners in the public and non-profit sectors, to track progress toward increasing overall forest cover using remote sensing and the most current land cover and protected lands data.

## Establish Criteria and Designate Core Forest Natural Area Preserves on State Lands

*Proforestation* (defined as continuous forest growth in natural areas protected from timber harvesting) is the most effective solution to preserve accumulated carbon storage and enable it to continue to increase.[126] Given the accumulated carbon density in the state (ranked first on a per acre basis in the Northeast and the second highest average carbon density/acre of forest of any state in the eastern United States), establishing long-term protection of this carbon storage is an important step the state can take in meeting its climate mitigation goals.

Designating natural areas is consistent with long-standing federal and state policy and existing models. Since 1927, the USDA Forest Service has established over 430 Research Natural Areas (RNAs) across the nation where commercial harvests and salvage logging are excluded and where natural processes predominate.[127] Connecticut has been establishing Natural Area Preserves since 1969 with the statutory purpose of keeping land "in as natural and wild a state as is consistent with the preservation and enhancement of protected resources and educational, scientific, biological, geological, paleontological and scenic purposes."

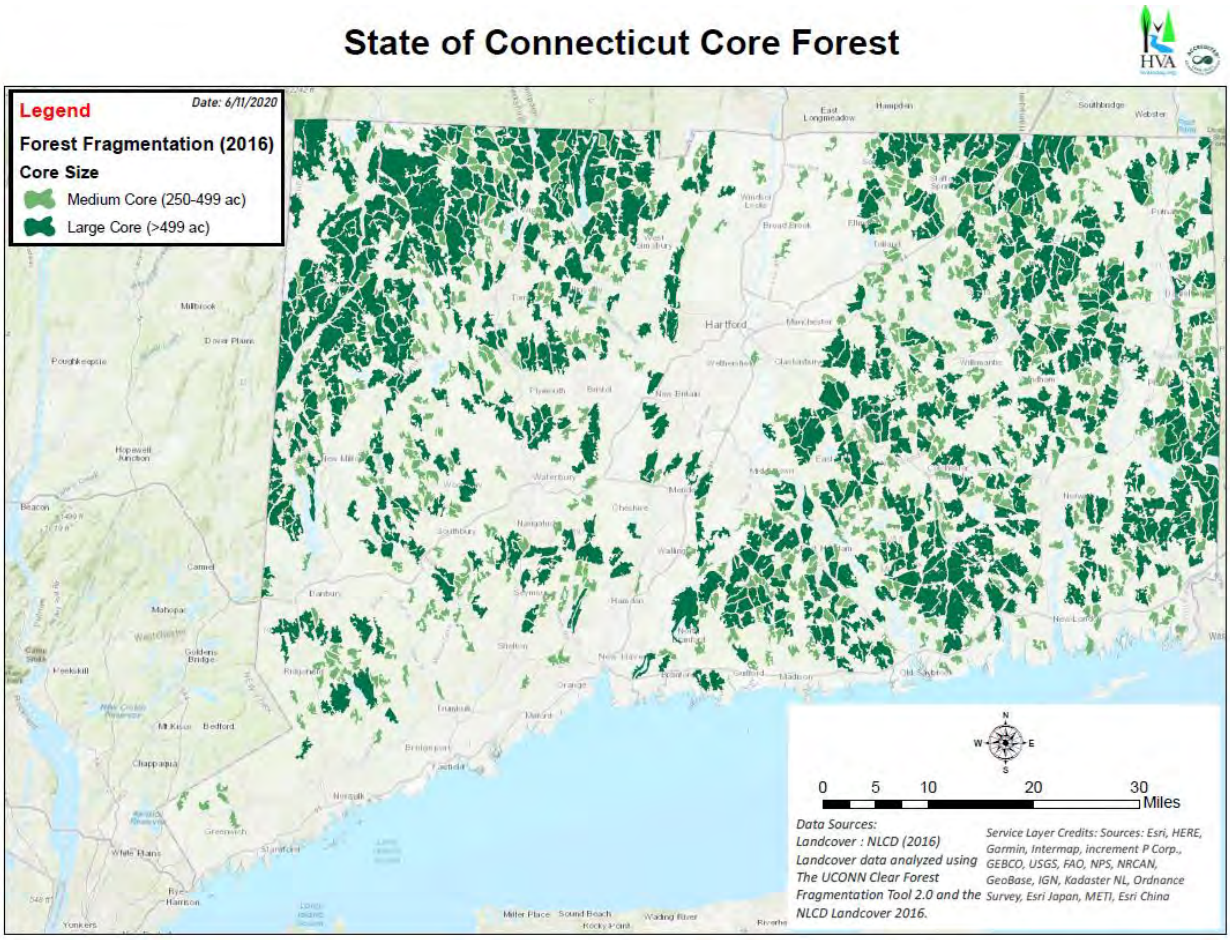



**Figure 7.** Map of Medium and Large Core Forest Areas in Connecticut produced by Housatonic Valley Association using NLCD Landcover 2016 data with UConn CLEAR Forest Fragmentation Tool 2.0.

Though the Natural Area Preserves program has not been a budget or funding priority for DEEP in recent years, updating the Natural Area Preserves statute could be the basis for rejuvenating this program and establishing Core Forest Natural Area Preserves (CFNAPs) as a new category of Natural Area Preserves with formalized criteria. These CFNAPs would be focused on protecting large core forest areas of greater than 250 contiguous acres that occur (entirely or in part) on State properties.

We suggest there are three urgent reasons to establish criteria and designate CFNAPs on state conservation lands as a critical mitigation strategy:

1. Although profores[illegible]on is a new term, it is based upon considerable scientific evidence that continuous forest growth in protected reserves is the most effective immediate solutions to preserve accumulated carbon storage and enable it to continue to increase. On lands already owned by the state, this is a very low cost climate solution, as there is no need to purchase the land in order to take it out of production, but only a need to change management objectives;
2. State lands managed for profo[illegible]tation would provide a "control" to compare to the outcomes of management prescriptions that are designed to increase the resilience of

Connecticut's forest or to mitigation-focused forest management. In experimental research, the "control" provides the "no change" option that other variables are tested against.[128] Without areas that exclude commercial harvests and salvage logging, there would be no controls to compare with forests subject to various management techniques; and

3. There is uncertainty about how climate change will impact forests because there are so many variables. That necessitates employing various strategies at the same time– avoided conversion, reforestation, mitigation-focused forest management, and Proforestation -- while continuing to follow the emerging science[129] about the role of forests in climate mitigation.

### Short Term (1-5 year) Actions

- DEEP should work with partners to identify core forest areas (>250 acres) occurring on or intersecting with land owned or conserved by the State of Connecticut, and designate areas to be managed as Core Forest Natural Area Preserves with priority on the most carbon-dense forests in Tolland, Litchfield, Fairfield, and New Haven Counties. Recommended is that a multi-disciplinary research group (including academics, non-profits, forest practitioners, and DEEP personnel) should be formed to study and report on the implications of a potential statewide goal of 104,000 acres (which would protect 70% of large core forest areas on state lands) and produce a feasible and consensus implementation strategy for this or any revised goal stemming from the analysis.
- Include the state's existing old forest management sites that occur in core forest on State lands as part of the 70% goal above.
- Update Connecticut's Natural Area Preserves statute[130] to incorporate the management model of the USDA Research Natural Areas[131] and establish Core Forest Natural Area Preserves to enable this program to be implemented quickly based on important groundwork that has been laid over many decades.

### Longer Term (5-10 year) Actions

- Ensure core forest protection is a top priority considered in current and future additions to state parks, forest and wildlife management areas through the state's Recreation and Natural Heritage Trust Fund.
- Establish financial incentives for private and municipal landowners to maximize carbon storage on their protected forestlands with mechanisms like wild carbon easements[132] and working forest conservation easements.

## Retain Large Trees and Forest Cover in Settled Landscapes (urban and residential)

Because of higher light levels and reduced competition from other trees, edge forests and residential and urban treescapes typically contain larger trees, on average, and therefore store more carbon per tree or area of forest than do interior forests and trees.[133] Hence their climate mitigation value is disproportionately large and should be reflected in the level of protection that they are afforded.

Residential and urban trees and forests also shade and cool buildings in summer and insulate them in winter, which significantly reduces energy levels of air conditioning and heating fuel and associated carbon emissions.[134] Moreover, large trees reduce airborne pollutants (i.e.,

carbon monoxide, sulfur dioxide, nitrogen dioxide, ozone, and particulate matter) to a much greater extent than do small trees. For example, a large tree ≥30 inches in diameter at breast height (dbh) removes an estimated 60-70 times the pollutants as a small tree <3 inches in dbh.[135]

### Short Term (1-5 year) Actions

- Do not permit aggressive pruning and removals of healthy street trees, and focus (or target) pruning and removals to trees in hazardous poor condition that are imminent threats to people or electric infrastructure. If trees are removed, PURA should require a plan and support funding for utilities to replant trees, especially in EJ communities with higher percentages of impervious surfaces and related heat island impacts.
- Create and promote model municipal ordinances to encourage replacement of and mitigation offsets for non-emergency removals of street trees within the municipal road right-of-way.
- Establish new Connecticut standards for state roads and highways that minimize losses of healthy trees.

## Improve the Management of Connecticut's Working Forests

Improving the forest management that takes place outside of Core Forest Natural Area Preserves, while retaining core forest land and large tree cover in settled landscapes – most notably extending the time between harvests and retaining larger trees – is an important forest solution to reducing emissions and mitigating climate change. Large trees store by far the largest amount of carbon in the forest and therefore contribute disproportionately to climate mitigation.[136]

### Short Term (1-5 year) Actions

- Implement New England Forestry Foundation's 'Exemplary Forestry™' in managed forests to retain more large trees and carbon in the forest.[137] This approach incorporates climate mitigation and adaptation, management for umbrella wildlife species and best management practices for soil and water, in conjunction with improved forestry or silvicultural practices to increase forest growth rates.
- Reduce salvage harvests and establish policies to help retain dead trees in managed forests hit by insects except in areas where they are a public safety hazard (i.e. along roadways and trails). Dead trees provide a significant source of aboveground carbon [138] and exceptional habitat for cavity nesting birds.[139]
- Include assessment in forest management plans and timber harvests of the forested landscape in which the property is situated, together with its contributions to maintaining core forest cover and embedded habitats.[140]
- Increase resources for service foresters to help private landowners practice exemplary forestry. That includes hiring at least three more DEEP service foresters and partnering with organizations like NEFF to help advance the principles of 'Exemplary Forestry.'

### Longer Term (5-10 year) Actions

- Support thoughtful reuse of wood products to help reduce waste and demand for new wood products.[141]
- Review indigenous forest and wildlife management practices for ideas on different techniques to achieve more resilient mature forests.[142]

# Climate Change Threats to Vulnerable Population

## Top Priority Actions

- **Improve the social determinants of health and reduce health inequities** at the individual and community levels to reduce vulnerability and increase resilience to climate change.
- **Support community interest in tree planting, parks, and/or community gardens** in densely populated areas to support climate solutions that could meet multiple needs such as increasing health outcomes, employment, and entrepreneurial opportunities. Youth Conservation Corps could help community-based groups with implementation.
- **Build a market for creative re-use of urban wood waste** to store carbon while simultaneously creating education, employment, and stewardship opportunities.
- **Engage, train, and educate on adaptation planning, resiliency, and risks** from climate change with emphasis on local officials, planners, community organizations, and emergency responders.

In the United States, some communities of color, low-income groups, people with limited English proficiency (LEP), and certain immigrant groups (especially those who are undocumented) live with many of the factors that contribute to their vulnerability to the health impacts of climate change.[143]

These populations are at increased risk of exposure given their higher likelihood of living in risk-prone areas (such as urban heat islands, isolated rural areas, or coastal and other flood-prone areas), areas with older or poorly maintained infrastructure, or areas with an increased burden of air pollution. These groups of people also experience relatively greater incidences of chronic medical conditions, such as cardiovascular and kidney disease, diabetes, asthma, and COPD which can be exacerbated by climate-related health impacts.

Socioeconomic and educational factors, limited transportation, limited access to health education, and social isolation related to English language deficiencies collectively impede their ability to prepare for, respond to, and cope with climate-related health risks. These populations also may have limited access to medical care and may not be able to afford medications or other treatments. For LEP and undocumented persons, high poverty rates, language and cultural barriers, and citizenship status limit access to and use of health care and other social services and make these groups more hesitant to seek out help that might compromise their immigration status in the United States.

The number of people of color in the United States who may be affected by heightened vulnerability to climate-related health risks is growing. Currently, Hispanics or Latinos, Blacks or African Americans, American Indians and Alaska Natives, Asian Americans, and Native Hawaiians and Pacific Islanders represent 37% of the total U.S. population and 24.8% of the population in Connecticut. 22.1% of the population in Connecticut speaks some language other than English at home, and 10.4% of the population was born outside the U.S. As a proportion of Connecticut's population, people of color as a group grew by 2.6% from 2010 to 2014.[144,145]

As noted earlier in the Status of CT Forests section of this report, 36.4% of the land area of Connecticut is considered by the U.S. Census to be "urban" (1.13 million acres), with 87.7% of the population, nearly 3 million people, living in these urban areas. Despite the high population concentration in these areas, these same lands have a fairly high degree of tree cover, with tree canopy cover estimated at nearly 50%. Despite this encouraging canopy cover statistic statewide, there continues to be a strong correlation between lower-income neighborhoods, communities of color, and a distinct lack of tree cover.


**Figure 8.** Urban areas like Hartford are hotter than more rural areas during summer. Tree cover can help reduce health and other problems associated with urban heat islands.[146]

## Vulnerability to Climate-Related Health Stressors

Disproportionate climate impacts for some communities of color and low-income, LEP, and immigrant populations include heat waves, other extreme weather events, poor air quality, food safety, infectious diseases, and psychological stressors.[147]

Race and class are important factors in the vulnerability to climate-related stress, but it can be difficult to isolate the role of race from other related socioeconomic and geographic factors. Some racial minorities are also members of low-income groups, immigrants, and people with limited English proficiency, and it is their socioeconomic status (SES) that contributes most directly to their vulnerability to climate change-related stressors. SES is a measure of a person's economic and social status, often defined by income, education, and occupation. Additional factors such as age, gender, pre-existing medical conditions, psychosocial factors, and physical and mental stress are also associated with vulnerability to climate change. Because many of these variables are highly related to one another, statistical models must account for these factors in order to accurately measure the relative importance of various risk factors. For instance, minority race and low SES are jointly linked to increased prevalence of underlying

health conditions that may affect sensitivity to climate change. When adjusted for age, gender, and level of education, the number of potential life-years lost from all causes of death was found to be 35% greater for Blacks than for Whites in the United States, indicating an independent effect of race.

***Extreme heat events.*** Some communities of color and some low-income, homeless, and immigrant populations are more exposed to heat waves as these groups often reside in urban areas affected by heat island effects.

***Other weather extremes.*** As observed during and after Hurricane Katrina and Hurricane/Post-Tropical Cyclone Sandy, some communities of color and low-income people experienced increased illness or injury, death, or displacement due to poor-quality housing, lack of access to emergency communications, lack of access to transportation, inadequate access to health care services and medications, limited post-disaster employment, and limited or no health and property insurance.

***Degraded air quality.*** Climate change impacts on outdoor air quality will increase exposure in urban areas where large proportions of minority, low-income, homeless, and immigrant populations reside. Fine particulate matter and ozone levels already exceed National Ambient Air Quality Standards in many urban areas.

***Waterborne and vector-borne diseases.*** Climate change is expected to increase exposure to waterborne pathogens that cause a variety of illnesses—most commonly gastrointestinal illness and diarrhea. Health risks increase in crowded shelter conditions following floods or hurricanes, which suggests that some low-income groups living in crowded housing may face increased exposure risk.

***Food safety and security.*** Climate change affects food safety and is projected to reduce the nutrient and protein content of some crops, like wheat and rice. Some communities of color and low-income populations are more likely to be affected because they spend a relatively larger portion of their household income on food compared to more affluent households.

***Psychological stress.*** Some communities of color, low-income populations, immigrants, and LEP groups are more likely to experience stress-related mental health impacts, particularly during and after extreme events. Other contributing factors include barriers in accessing and affording mental health care, such as counseling in native languages, and the availability and affordability of appropriate medications.

## Improve Community Health and Reduce Health Inequities

The impacts of climate change on health and health inequities are moderated by individual and community vulnerability and resilience. Interventions that improve the social determinants of health and population health and reduce health inequities can significantly reduce vulnerability and increase resilience to climate change, at the individual and community-levels. Increasing resilience to climate change will require investing significantly in the public sphere, including in social determinants of health and in public health infrastructure.

Many climate actions bring significant health co-benefits, but some may have significant adverse health consequence and/or increase health inequities. Some health interventions also

have climate co-benefits. Thoughtful implementation of actions to reduce greenhouse gas emissions and adapt to climate impacts will help maximize co-benefits and minimize co-harms.

Urban trees and other natural systems provide a range of physical health benefits. Trees can improve air and water quality, mitigate the heat island effect, and help alleviate noise.[148] Trees can shield people from ultraviolet (UV) radiation, the cause or contributing factor for three types of skin cancer.[149] Urban ecosystems are increasingly recommended by national and State environmental protection agencies to mitigate the harmful impacts of air and water pollutants, harmful emissions, and the negative effects of urban heat and noise.[150] Trees also help reduce flooding by slowing rainwater runoff.

The demands of modern life can often be mentally exhausting. Focusing attention on flows of information and tasks, screening out distractions, and responding to the constant stimuli of commuting, work, school, and family leaves many people feeling drained, with memory loss and reduced capacity for sustained attention.[151] Rachel and Stephen Kaplan's Attention Restoration Theory (ART) suggests that we can use nature to restore depleted cognitive functions and maintain performance.[152]

Access to green spaces also provides other health benefits. Researchers at the University of Exeter surveyed 10,000 urban residents in the United Kingdom, asking how satisfied they were with their lives and whether they had signs of depression, anxiety, or other psychological disorders. After controlling for other factors known to significantly influence well-being such as income, employment, marital status, health, and housing, researchers found a strong correlation between a boost in a feeling of well-being overall and increases in green space within a 2.5-mile radius of residents' homes.[153]

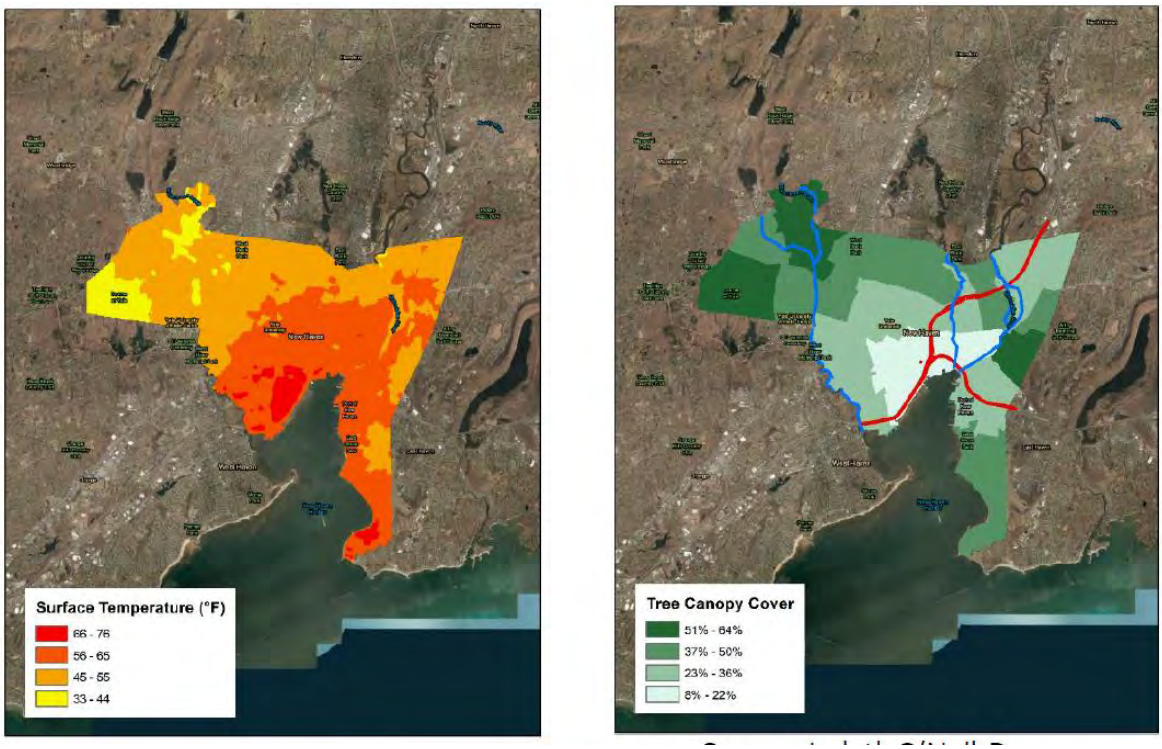



**Figure 9.** Maps showing tree canopy cover and surface temperatures in New Haven help to show the urban heat island effect that trees help to mitigate.[154]

## Support Community Interest in Tree-Planting, Green Spaces, and/or Gardens

Tree planting in urban areas provides many potential benefits to human health, but it's important to note that the top green priority for a neighborhood may not be tree-planting, and policy-makers should be careful to not approach community green spaces with a "top-down" approach.[155] It is critical to engage the community locally to understand local needs and discuss trees as one potential solution rather than approaching the community with the assumption that tree-planting is the answer. Ongoing stewardship of local investments in green spaces is critical and may be more important than tree-planting depending upon various factors. Ultimately, community support is the foundation for long-term stewardship. As an additional benefit, work done to increase access to community green spaces may also inspire young people of color to consider outdoor employment opportunities, and perhaps this kind of locally-driven effort might provide the first step to a conservation career.

Underrepresented communities are adversely impacted by climate conditions, but historically, these communities have been marginalized, set aside, and not engaged in these discussions. While this report addresses Climate Change Threats to Vulnerable Populations, assessing community needs without their input would further exacerbate the vulnerabilities these communities face. Decisions about others without their input would further perpetuate the effects of climate when leaders are not communicating with the communities they represent. So, it is critical that we connect with leaders within the communities we're identifying as vulnerable populations and learn with them while assisting them.

That said, the existence of trees in areas with limited canopy cover can sometimes literally be the difference between life and death. Neighborhoods with little to no trees can, on average, be 5 to 7 degrees hotter during the day and up to 22 degrees hotter at night than neighborhoods with good tree cover. Treeless neighborhoods also have worse air pollution because trees trap air pollutants and the hotter temperatures in these treeless neighborhoods help cook air pollutants into dangerous smog. That's one of the reasons why health experts project a ten-fold increase in heat-related deaths across America's cities.[156]

Another reason for considering tree planting amongst community options is that some trees in urban areas are in poor condition and need to be removed and/or replaced. For example, Connecticut is currently losing many ash trees due to the emerald ash borer. A recent study suggests suggest that the loss of trees to emerald ash borer is increasing human mortality related to cardiovascular and lower-respiratory-tract illnesses. [157] This finding adds to the growing evidence that the natural environment provides major public health benefits.

The need to maintain and increase urban tree cover (UTC) in Connecticut is not a new issue and is well-documented. Studies of UTC were conducted in New Haven (2009),[158] Hartford (2010),[159] Bridgeport (2012),[160] and the Greater Bridgeport region (2014)[161] to map UTC, show areas where heat islands are a current problem, and suggest areas where UTC could be increased through a combination of plantings or replantings and stewardship of existing trees. There have been follow-up studies and recommendations such as Hartford's Urban Tree Canopy Assessment and Planting Plan (2014).[162]

The City of Hartford, working with the city's Tree Advisory Commission, developed a Hartford Tree Canopy Action Plan (June, 2020)[163] with the following laudable long-term goals:

- Maintain the health of the urban forest.
- Ensure public safety.
- Increase our tree canopy to at least 35% (current tree canopy is ~25%).
- Reduce the urban heat island effect through targeted planting in the urban heat islands.
- Increase tree plantings aimed at energy savings.
- Reduce storm water run-off through target plantings.
- Improve air quality through forest management and careful selection of new trees.
- Design and implement an environmental stewardship program for Hartford schools, City of Hartford employees, and Hartford citizens.
- Become an urban forestry model for cities in the northeast and beyond.

The Hartford Tree Canopy Action Plan calls for the a 5-year goal of planting 3,000+ trees each year to increase its canopy from 25% to 35% over the next 50 years. According to the Tree Plan, planting ~1,500 trees each year is required just to maintain the current tree canopy. Of course, to maintain and increase tree cover in a healthy urban forest requires more than tree planting alone. Hartford and other cities must also make investments to remove dead trees, care for diseased, damaged or aging trees, and have a plan for replacing trees that are lost through storms or other common stressors for trees in cities.

Tree planting programs are more impactful when complemented by local environmental education and green jobs programs at the municipal level. KNOX for example, provides hands-on environmental education for Hartford students through their Gaia's Guides program which offers a combination of after-school educational opportunities and in-school programming on the benefits of trees to communities. In addition, KNOX offers Green Jobs Apprenticeships that provide job counseling and hand-on experience for out-of-work Hartford residents in the fields of landscaping (which includes tree planting), and horticulture. These kinds of job opportunities build experience for potential careers in landscaping, landscape design, land management, plant and soils science, agriculture, arboriculture/tree care, forestry, and many more fields.

Actively nurturing a broad appreciation of trees at the community level through outreach and education is important because there are ongoing costs associated with maintaining tree health that individual land-owners and community residents should consider. Well-maintained trees can be seen as a community asset and point of pride, but poorly maintained, unhealthy, or dead trees can be viewed as symbols of community neglect.

The plans and goals for Hartford's urban tree canopy are very good. However, due to budget shortfalls and other challenges, Hartford has been losing ground and has only been able to plant a few hundred trees in recent years. In the Tree Plan, it is suggested that Hartford's urban tree cover may have actually decreased by approximately 2% between 2014 and 2018 due to inadequate plantings despite best intentions, strong plans, and an appreciation for trees.

Without additional state or federal funding, human resources, and support with technical elements such as GIS mapping of heat islands and potential planting zones, to assist cities like

Hartford and local partners like KNOX, Connecticut's urban areas will continue to struggle just to maintain the status quo for their urban tree canopies. A program like a Youth Conservation Corps could help provide some human resources to complement and extend the capacity of existing community-based organizations such as KNOX (Hartford), Urban Resources Initiative (New Haven), and Groundwork Bridgeport.

A Youth Conservation Corps, funded through a model like the national AmeriCorps program or perhaps a model like the "Greening the Gateway Cities" program being implemented in 13 towns in Massachusetts,[164] could employ high school or recently graduated students to build trust and cultural understanding at the community level around environmental restoration. Work that could be led by this youth corps could include controlling invasive plants or protecting native plants, working on trails connecting green spaces, and cleaning-up/planting-up open spaces in urban and rural environments. This could be a great program for expanding outdoor youth employment and career enrichment opportunities for students of color in fields such as landscaping, horticulture, and land management/conservation, and can bring multiple benefits when students from the local community are employed.

## Support Market for Local Wood Re-use

A program to encourage the local re-use of wood from the urban forest can accomplish multiple goals. Trees in urban areas provide many benefits while trees are growing and healthy, especially if they are well-maintained. However, some trees are not in good condition and need to be removed. In this situation, urban trees can move from being seen as a benefit to becoming a cost for the municipality. If the wood from that tree were re-used, it could reduce costs associated with tree removal and disposal, create job opportunities, partially offset the use of wood products from international forests that can be poorly regulated and leave a larger carbon footprint, and store carbon in long-lived wood products.[165,166]

It's worth noting that some tools and equipment that would support local wood re-use can represent barriers to entry. Some tools and equipment – e.g., a portable sawmill or lathe or chipper or kiln for drying wet wood – may be more apt to be readily accessed if it were available for rent from an equipment rental business or loanable through a local/regional co-op. There are significant resources on urban wood re-use to provide models that work.[167]

Construction in densely developed neighborhoods with locally-grown, long-lived wood products substituted for more carbon-dense materials (e.g. steel, aluminum, or concrete) can also have carbon offset benefits.[168,169] Wood products have many important benefits when used as a construction material. New techniques, such as cross-laminated timber and wood fiber insulation, are allowing use of wood in new ways that expand potential beneficial impacts. In a climate context, long-lived wood products have two benefits. First, they can store carbon previously captured by trees; as living forests may potentially experience increasing mortality and associated carbon release due to climate change, this could become an increasingly important benefit.[170,171,172] Greater focus and incentives toward reduced-impact techniques of forest harvest, improved forest management to enhance growth rates, and directing more of the harvest to long-lived products has potential to improve the efficiency of this carbon benefit over past performance.

# Climate Threats to Vulnerable Forest Types

## Top Priority Actions

- **Reevaluate Connecticut's Green Plan and open space grant programs** to prioritize acquisition of land and conservation easements for habitats most at risk from climate change.
- **Increase efforts to model and map vulnerable natural communities** and their buffers to increase efficiency of protection efforts to create better and integrated mapping of all natural resources and better inform decisions (e.g., Natural Resource Atlas and Monitoring Project).
- **Increase pace of forest and open space protection** with a focus on vulnerable natural communities and important buffers.
- **Advocate for passage of federal funding programs** such as the Great American Outdoors Act, Recovering America's Wildlife Act, and others that support habitat stewardship and protection.
- **Invest in research and actions supporting adaptive management** for vulnerable natural communities.

Because of the uncertainty of climate change, all types of Connecticut Forest could be considered vulnerable. Unpredictable changes in temperature regimes, precipitation and importantly invasive species, pests and pathogens may mean that forest types thought to have low vulnerability, such as northern hardwood and central hardwood pine, may in fact be more vulnerable than we expect. For the purposes of this section we will focus on forest communities that are most likely to be negatively affected by climate change:[173,174]

- Black spruce bogs
- Lowland mixed conifer
- Beech, birch maple forest
- Freshwater forested wetlands (forested swamps)
- Pitch pine-scrub oak (not called out in the literature, but added because of threat from southern pine beetle)
- Cold water streams and headwaters and the associated shading forests
- Lowland Atlantic white cedar forests
- Floodplain forests, and
- Coastal Forests

The climate-related threats to forests in Connecticut and the northeastern U.S. are well-described by Swanston et al. (2018):[175]

“Forests of the Midwest and Northeast significantly define the character, culture, and economy of this large region but face an uncertain future as the climate continues to change. Forests vary widely across the region, and vulnerabilities are strongly influenced by regional differences in climate impacts and adaptive capacity. Not all forests are vulnerable; longer growing seasons

and warmer temperatures will increase suitable habitat and biomass for many temperate species. Upland systems dominated by oak species generally have low vulnerability due to greater tolerance of hot and dry conditions, and some oak, hickory, and pine species are expected to become more competitive under hotter and physiologically drier conditions. However, changes in precipitation patterns, disturbance regimes, soil moisture, pest and disease outbreaks, and nonnative invasive species are expected to contribute forest vulnerability across the region. Northern, boreal, and montane forests have the greatest assessed vulnerability as many of their dominant tree species are projected to decline under warmer conditions. Coastal forests have high vulnerability, as sea level rise along the Atlantic coast increases damage from inundation, greater coastal erosion, flooding, and saltwater intrusion. Considering these potential forest vulnerabilities and opportunities is a critical step in making climate-informed decisions in long-term conservation planning."

### Black Spruce Bogs

This is a rare habitat type in Connecticut and we represent the southern terminus of its range and a habitat expected to be adversely affected by climate change in general.[176] As such changes in temperature regimes may decrease suitability for this habitat type in Connecticut.

### Lowland mixed conifer

This forest type is generally uncommon in Connecticut and is considered to be of moderate to high vulnerability in the Northeast (though upland mixed conifer at above 1,000-foot elevation is doing better in Connecticut).[177] Good examples may be found in Norfolk and Eastford. Changes in temperature regimes and increased threat of non-native pests (hemlock woolly adelgid, *Adelges tsugae*) may stress this habitat type in Connecticut, particularly hemlock which is included in this grouping.

### Beech, birch, maple forest

This forest type is considered highly vulnerable in Southern New England because of temperature changes, precipitation changes, change in timing of seasons, Invasive plants and animals, pests and diseases, and is already stressed by development and habitat loss as well as terrestrial connectivity loss (roads and development).[178]

### Freshwater forested wetlands

This forest type is considered highly vulnerable in Connecticut because of temperature changes, precipitation changes, changes in hydrology, changes in winter, Sea level rise, storms and floods, change in timing of seasons, invasive plants and animals, pests and diseases, development as well as habitat loss and terrestrial connectivity loss (roads and development).[179]

### Pitch pine-scrub oak

Generally thought to have low vulnerability,[180] this is already a rare habitat type in Connecticut, threatened by development, invasive plants and insect pests. Climate change is making our habitats more suitable for the southern pine beetle, but restoration projects on old sand plains may offer hope.

## Cold water streams and headwaters and the associated shading forests

It is the cold water streams and headwaters that are the vulnerable community, but associated riparian forests are important for reducing water temperature and creating suitable habitat for Brook Trout and other associated wildlife.[181] It's important to note that in urbanized watersheds, existing riparian forests can be relatively intact, less stressed than roadside forests, and important to protect for carbon storage, habitat, floodwater retention, aesthetic, shade and other community benefits.

## Lowland Atlantic white cedar forests

An already rare habitat type in Connecticut. These forested wetlands are threatened by increased severity and length of droughts in Connecticut.[182] Coastal examples could be threatened with increased saltwater intrusion into groundwater.

## Coastal Forests

Rising sea levels, the associated landward migration of tidal marshes, and increased salinity of ground water, as well as our attempts to protect developed infrastructure threatens the viability and resilience of our coastal forests.[183]

# Funding, Programs, and Resources Needed for Implementation

## Top Priority Actions

**Enhance Existing Funding Programs**

- Bonding
- Community Investment Act
- State Revolving Funds (Water Quality and Drinking Water)
- Regional Greenhouse Gas Initiative

**Establish New Sources of Revenue**

- Include comprehensive forest protection component in a Carbon Tax
- Enable Municipal Funding Option
- Establish Compensatory Mitigation Fund as part of "No Net Loss of Forest" policy

**Provide Tax Incentives for Acquisition and Stewardship**

- Expand existing corporate tax credit to individuals for land donations

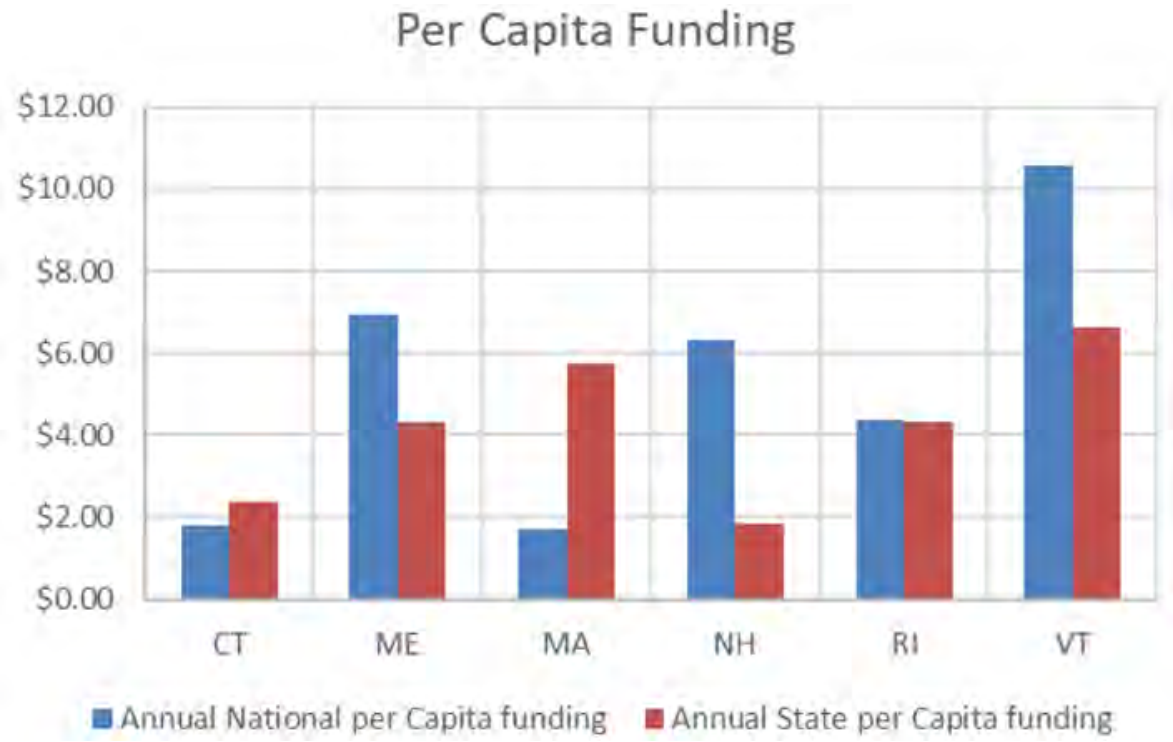



**Figure 10.** Connecticut's spending on land conservation -- $2.12 per year per person -- places the state last in combined state and federal per capita public funding among other New England states.[184]

Connecticut must ramp up investments in natural lands protection which is a necessary component of the state's plans to meet its ambitious goals of achieving a 100% net zero-carbon target by 2040.[185] Investments in natural climate solutions are relatively inexpensive compared to the costs of doing nothing or simply responding to magnified impacts of climate change.

## 1. Enhance Existing Land Conservation Programs

**Increase state investments for existing land conservation programs and incorporate more specific climate-related criteria into selection of projects/level of funding (Open Space and Watershed Land Acquisition Grant Program [OSWA]; Recreation and Natural Heritage Trust Program; Recreational Trails Program)**

- Source of funds: State Bonding
- Action required: Legislative
- Note: Typical bond authorizations for these programs have ranged from $3 to $7.5 Million per year, but allocation of those funds has neither been consistent nor adequate to meet project demands. Based upon specific Sub-Group recommendations related to forest protection, annual bond authorizations for OSWA and RNHT should be $25 Million, respectively, and $10 Million for the Recreational Trails Program. In states offering statewide bond referendums, voters have approved the dedication of significantly higher levels of funding for open space conservation.[186] With more specific carbon accounting criteria, the OSWA scoring may be further refined to award projects that provide higher carbon mitigation benefits.

**Increase funding for Community Investment Act (CIA)**

- Source of funds: Increase surcharge on local recording fee (currently $40)
- Action required: Legislative
- Note: The CIA provides dedicated funds to support community-level investments across four sectors: Open Space Conservation, Farmland Preservation, Affordable Housing, and Historic Preservation. The CIA is currently funded through a $40 surcharge on municipal recording fees, which is distributed as follows: $1 remains with the Town Clerk; $3 go to the municipality to pay for local capital improvement projects; $10 supplements the income to dairy farmers; and the remaining $26 is distributed to state agencies to fund matching grants to the four sectors enumerated above. The Forests Sub-Group recommends an increase in the surcharge on recording fees, ranging from $10 to $20, with the additional revenue to the CIA account distributed evenly to the four sectors. A $10 - 20 increase to the recording fee would add an estimated $1.5 - 3.0 million per year for the open space sector of the CIA account. This additional funding could be dedicated to urban forest improvement projects such as tree planting or re-planting and stewardship in underserved areas, as well as support for CT DEEP to administer the program.

**Expand Urban Green and Community Garden Program to include Urban Forest Improvement Projects**

- Source of funds: Community Investment Act
- Action required: Legislative
- Note: CT DEEP's Urban Green and Community Garden Program provides assistance to communities designated as targeted and/or distressed to develop or enhance urban open spaces for public enjoyment and/or environmental education, including the

development of a community garden or reclaiming and enhancing existing open space for the public's use. The Forests Sub-Group recommends expanding this program to specifically include funding for urban forest improvement projects. See also, Urban Forest Carbon Credit Program.

**Utilize Portion of State Revolving Funds for Land Conservation/Green Infrastructure Projects**

- Source of funds: Existing state revolving funds (SRF) for clean water and drinking water
- Action Required: None. Currently up to 10% of SRF may be used to finance green infrastructure projects, which may include street trees, bio-swales, land conservation, etc. However, legislative action would be required to mandate spending on green infrastructure projects. In 2019, S.B. No. 927, **An Act Creating the Environmental Infrastructure Fund Within the Connecticut Green Bank**, proposed expanding the types of projects the Green Bank can promote investment in to include environmental infrastructure, which, under the bill, is structures, facilities, systems, services, and improvement projects related to water, waste and recycling, zero-emission vehicle refueling, climate adaptation and resiliency, agriculture, land conservation, parks and recreations, and other environmental markets.
- Note: This is an opportunity for cross-sector dialogue about tapping into the Green Bank for creative financing for infrastructure projects to leverage co-benefits of land conservation including air pollution reduction, carbon removal, flood protection, food production, avoided costs for healthcare system, etc. See also, Urban Forest Carbon Credit Program.

**Expand Use of Regional Greenhouse Gas Initiative (RGGI) funds to Forest Land Conservation**

- Source of funds: Proceeds from sale of RGGI State Emission Allowances
- Action Required: Legislative
- Note: While RGGI participating states may use afforestation projects to award offset allowances (project-based GHG emission reduction outside of the capped electric power generation sector),[187] this recommendation proposes the state reinvest the proceeds from the CO2 allowance auctions to fund CT DEEP land protection projects, land acquisition staff capacity, due diligence, scientific studies related to forest science (including an assessment of current forest management practices and policies and impacts on climate mitigation goals), development of a state mapping system to identify forests of highest current or future conservation value, and public education and outreach programs promoting the importance of resilient forests, forest stewardship, etc. New Jersey is an example of a RGGI state that has a legislative mandate to spend a portion of RGGI proceeds on land sector activities.[188] At the same time, Connecticut should study forest carbon offset allowances available through compliance and voluntary markets for reforestation, improved forest management, avoided conversion, and proforestation as well as programs that aggregate, evaluate and monitor forest offsets, in order to implement a system of paying landowners for enhanced carbon sequestration and storage with verifiable climate benefits and strict certification standards in place.

## 2. Tax and Other Incentives

**Expand Corporate Tax Credit for Donations/Bargain Sale of Open Space to Individuals for Land that meets certain Climate Mitigation Criteria and/or for Forest Carbon Services**

- Source of Funds: Individual Tax Credit
- Action required: Legislative
- Note: The Forest Sub-Group should include recommendations for climate mitigation criteria to include in the next iteration of the State's Green Plan, which may then be tied into legislation providing for an individual income tax incentive for forestland protection. We may also want to consider transferable tax credits for conservation easement donations as offered in multiple states, allowing landowners with little taxable income to transfer tax credits to another taxpayer and/or carry the credit forward over a number of years. The New York tax credit is unique, offered not at the time of donation, but every year in an amount equivalent to 25% of the property taxes paid on land under easement.[189] Tax credits may also be allocated to landowners engaging in afforestation, reforestation, proforestation, and other forest stewardship and restoration efforts with defined carbon mitigation benefits.[190] Extra incentives may be built in to the program to encourage landowners to pursue other co-benefits.

**Enable Compensatory Mitigation for State and Local Projects**

- Source of Funds: Developers make payments to a mitigation fund if unavoidable conversion of forest and other natural lands occurs.
- Action required: Legislative
- Note: Requiring mitigation for forest loss through the adoption of "no-net-loss of forest" laws would provide an opportunity to generate significant new funding for conservation from developers mitigating their forest impacts.[191] This program should also apply to disturbances on public land, i.e. any project conducted on public land that leads to a loss of forest cover must be compensated for by the state or municipality with an equivalent amount of replanting in another location (e.g., models in New Jersey and Maryland). Any program needs to carefully consider what is deemed "unavoidable conversion," which must be strictly construed (see below).

**Incentivize the Siting of Renewable Energy Infrastructure to Avoid Loss of Forests, Farmland and Other Sensitive Lands**

- Source of Funds: N/A
- Action Required: Legislative/Regulatory
- Note: Incentivize the development of renewable energy infrastructure on areas other than forests and other open lands by loosening regulatory requirements to do so (e.g. requiring only a general permit) and/or disincentivizing development on open lands by developing more stringent siting approval requirements. Require developers to make payments to a mitigation fund if unavoidable conversion occurs.

## 3. Municipal Funding Programs (See also Urban Forest Carbon Credit)

**Enable Municipal Option to Fund Local Land Conservation, Stewardship and Climate Mitigation Strategies**

- Source of Funds: Local Buyer's Conveyance Fee
- Action required: Legislative
- Note: The legislation is enabling, giving municipalities the option, if they so choose, to establish a buyer's conveyance fee program to generate a local source of revenue to implement nature-based climate solutions and other local environmental projects. 2020 draft legislation included specific authorization to use funds for local climate mitigation strategies and to offset loss of tax revenue from land that has been permanently protected. See www.ctconservation.org for case studies and other information.

## 4. Tax Revenue Options

**Sales Tax Increase or a Percentage of Current Sales Tax Devoted to Fund Land Conservation and Related Programs**

- Source of funds: Increase CT General Sales Tax by .125% (from 6.35% – 6.475%)
- Action required: Legislative
- Note: Using the State of Minnesota Clean Water, Land and Legacy Amendment model (funds natural and cultural heritage programs), a sales tax increase of .125% would generate an estimated $78.4 million to fund a variety of climate-related programs, including land conservation. Based upon on overall New England average, this tax increase would cost approximately $47 per family per year.[192] The revenue would not be a substitute for other state conservation funding; rather it would provide an additional source of dedicated funds which may be available to CT DEEP, as well as non-profits and municipalities through a competitive grant process. An alternative to a tax increase is to allocate a percentage of the existing general sales tax paid on outdoor recreation and related goods and services to fund land conservation and stewardship programs.

**Carbon Tax**

- Source of funds: Tax on power plants, developments, and other uses (including renewable energy infrastructure projects on forest or agricultural lands) responsible for greenhouse gas (GHG) emissions and/or loss of CO2 storage, with revenues to help pay for climate initiatives including forest carbon mitigation programs.
- Action required: Legislative
- Note: Carbon legislation in Washington State is a notable example.[193] If other subgroups are suggesting a carbon tax, then a portion of the revenue should go to investments in natural climate solutions.

## 5. Public – Private Partnership Pilot Programs to Advance Land Conservation

**Connecticut Land Conservation Partnership Program**

- Source of funds: State Bonding
- Action required: Legislative
- Note: This, and other suggested programs funded through bonding, could be packaged as part of a larger green bond program. Using the well-established New York State Conservation Partnership Program as a model, the state would partner with a private non-profit organization to offer competitive matching grants to qualified Connecticut land trusts for organizational capacity building, collaborations, stewardship/resource management, and conservation transaction support. Studies commissioned by the Land Trust Alliance found that stronger, more professional land trusts save more land.[194] Other public-private partnership programs may include DEEP personal services agreements with NGOs to provide direct services to municipalities and other NGOs for grant writing, grant administration, and project administration.

**Urban Forest Carbon Credit Project**

- Source of funds: Urban Forest Carbon Credit[195]
- Action required: None unless the state wants to incentivize partnerships, including (i) enacting enabling legislation for municipalities that want to set up special carbon districts; and/or (ii) using SRF; and/or (iii) expanding Urban Green and Community Garden Program, or other incentives.
- Note: This program would value carbon credit (metric tons of CO2 captured in urban forests), including quantifiable ecosystem and other co-benefits associated with urban trees (stormwater reduction, air quality, energy savings, health and equity benefits, as well as employment); value the carbon revenue; establish a value per year; and sell the carbon credits to garner funding for local preservation, planting, restoration and other projects. Whether or not there is an urban forest carbon credit program established in Connecticut, the state should fund a program for municipalities (especially in underserved/EJ areas) to increase urban tree canopy cover and resilience in plantings and post-establishment treatments/monitoring as well as, in appropriate circumstances, to maintain mature and large trees which provide especially high levels of community benefits services such as cooling, mental health, pollution reduction, and habitat.

## Top Priority Actions

- Develop a usable model to reliably monitor carbon sinks related to working and natural lands, or to utilize models developed by state, academic, and nonprofit partners involved with the U.S. Climate Alliance.
- Report on Connecticut's "forest carbon inventory" over time alongside reported emissions for the building, energy, and transportation sectors.
- Include goals for increasing Connecticut's forest carbon sink (a.k.a. "negative emissions") with the next update to the Global Warming Solutions Act.

Connecticut relies heavily on the U.S. Environmental Protection Agency's State Inventory Tool (SIT) modules[196] for estimating annual GHG emissions. SIT is an interactive spreadsheet model that calculates sector-by-sector GHG emissions based on numerous state-level data sets.

Currently, the Connecticut annual GHG inventory does not use the "land use, land use change, and forestry" (LULCF) SIT module. The SIT LULCF module applies national emission factors to state forest inventories. Data used in this model comes primarily from USDA Forest Service reports,[197] which can have significant sampling errors and inconsistent inventory methodologies over time. For Connecticut, this tool produces results that are not well understood.[198] For example, there are two large unexplained swings in total forest carbon flux (Figure 9). In 1998, a large increase in soil organic carbon and dead wood results in the total carbon flux in LULC changing from a sink to a source. Then in 2006, this trend sharply reverts, and soil organic carbon and litter becomes a large sink for $CO_2$ emissions. There are no changes in forest policy or disturbances that can account for these fluctuations.

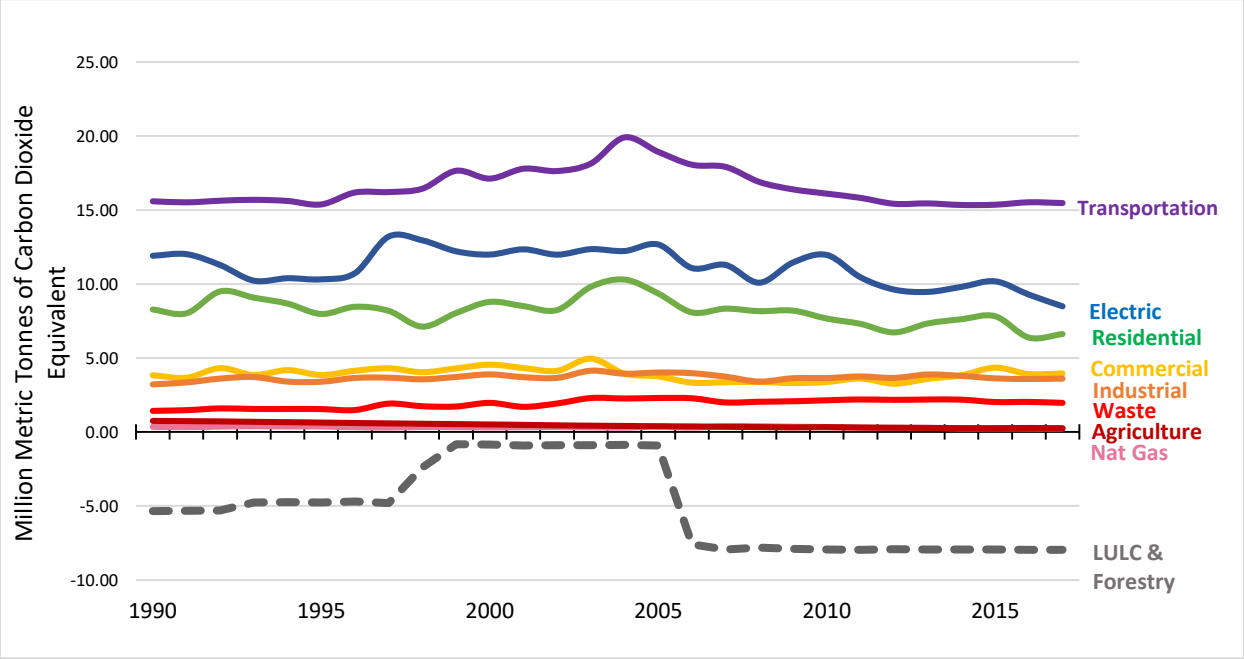



**Figure 11.** Annual Connecticut GHG emissions by sector 1990-2017. Sectoral estimates are from EPA SIT modules and state-level data. LULCF module data included in figure but not counted in annual GHG total.

In effect, Connecticut does not account for carbon sinks. Connecticut statutes PA-08-98 and PA-18-82 established several future reduction goals below baseline estimates. Baseline estimates are based on 1990 and 2001 annual emission totals, years in which carbon sinks have not been estimated for Connecticut forests. Methods to quantify and assess sources and sinks of carbon in the forestry and land use sectors will help inform Connecticut's policy efforts to meet its statutory emission targets.

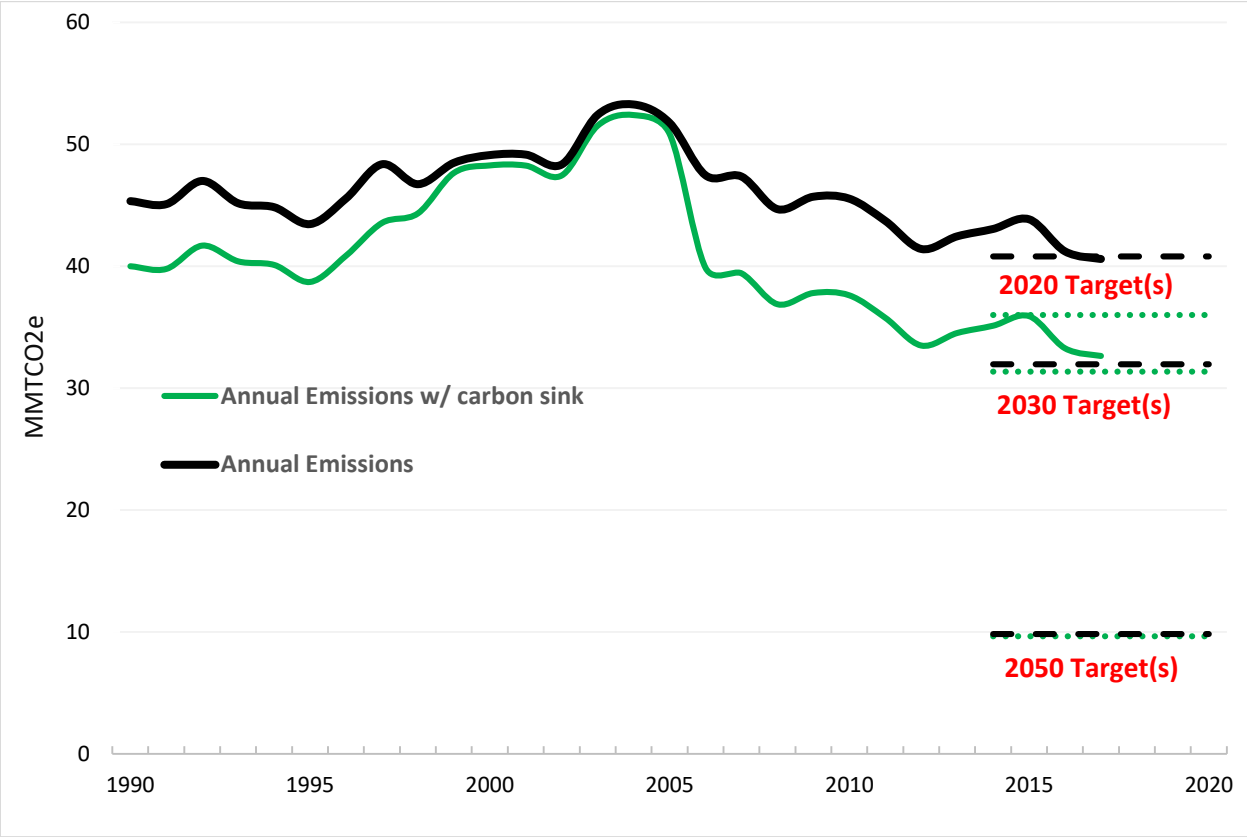



**Figure 12.** Annual Connecticut, sector-wide GHG emissions and future emission targets, 1990-2017. Black lines (solid and dashed) are annual emission totals without LULCF carbon sink accounting. Green lines (solid and dashed) are annual emission totals with LULCF carbon sink accounting.

Although the SIT LULCF estimates leave much to be desired in terms of accuracy, it does suggest that the carbon sequestered and stored in forests and related soils accounted for the equivalent of 20% of total emissions in 2017 (Figure 2). If estimates were reliable, the carbon sink from forests and related soils could represent about a decade's worth of emission reductions.

Another way to look at this challenge may be similar to what is currently done in Maryland (see Figure 3 below) where the state estimates that it can reduce emissions by 80% by 2040 using all available tools. However, the remaining 20% of emissions are proposed to be offset by "negative emissions" or carbon sinks from natural climate solutions such as management and protection of additional forest lands with increased carbon capture in mind.

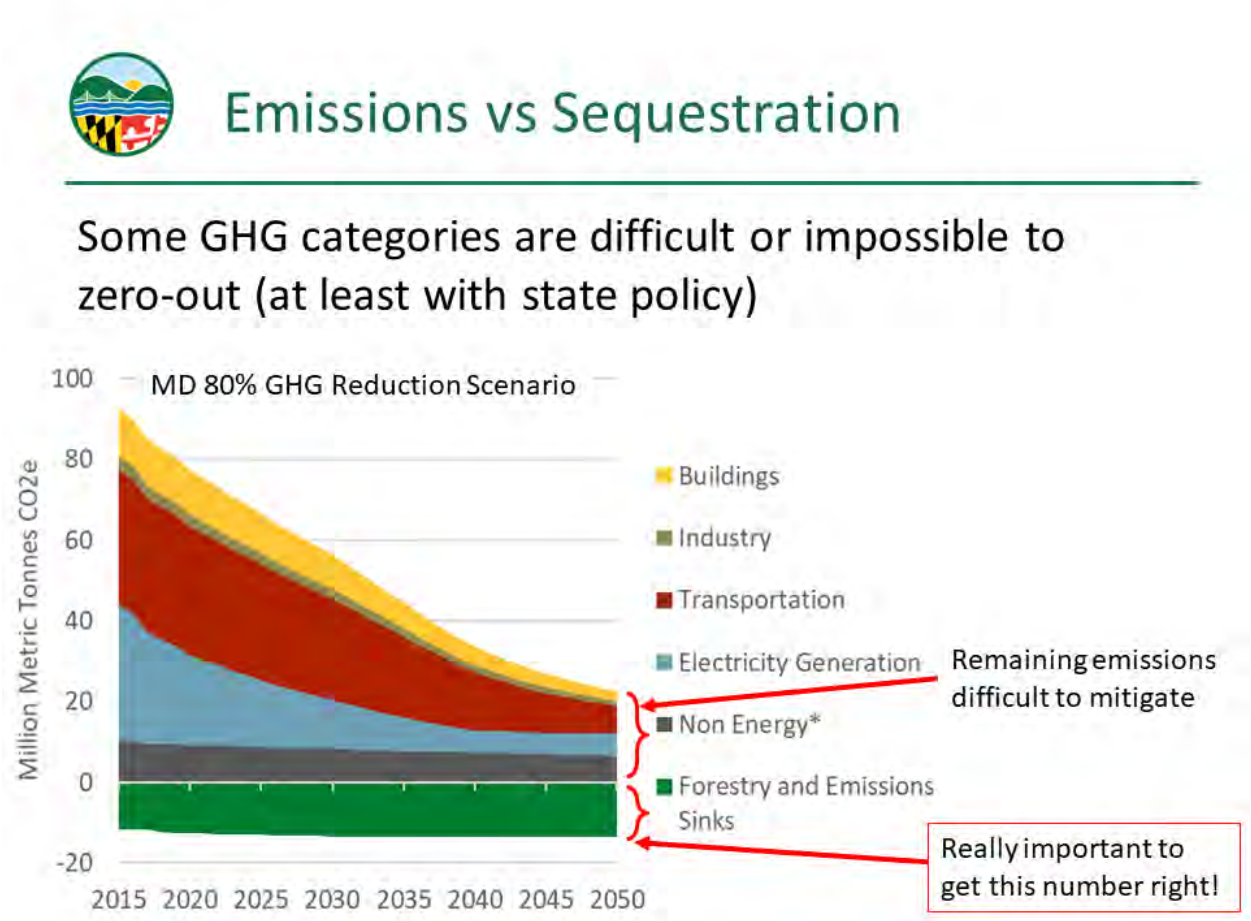



**Figure 13.** From presentation by Chris Hoaglund, Climate Change Program Manager with MD Department of the Environment showing the State efforts to both reduce emissions and account for sequestration from natural climate solutions, e.g. forests.

Accounting for carbon sink estimation through forestry is an important potential aspect of Connecticut's GHG emission inventory. Forests can be significant sinks for atmospheric carbon, potentially offsetting GHG emissions. For the New England region, projections show that despite land-use, land cover (LULC) change projected trends, carbon storage will increase.[199,200] Regardless of projected increases in soil respiration due to increased temperatures, the longer growing season and increased $CO_2$ fertilization account for this growth in carbon stock.

In a 2014 study,[201] a method was created to use land cover data for estimating land use, land change, and forestry (LUCF) impacts on GHG inventories. The authors used Stanford's Integrated Valuation of Ecosystem Services and Tradeoffs (InVEST) Carbon Storage and Sequestration model,[202] applied to the University of Connecticut's land cover change data (discussed below) for which carbon pool valuations had been assigned. The study was thus able to account for "foregone carbon sequestration" lost due to decreases in forested land cover over the 25-year period of the land cover dataset. Continuation of this work can inform state and local policy by accounting for $CO_2$ emissions from LUCF impacts while highlighting the potential for carbon sequestration to meet state statutory GHG emission goals.

The data that provided the basis for the Tomasso and Leighton (2014) study is from the University of Connecticut's Center for Land Use Education and Research (CLEAR). CLEAR has a long-running project, Connecticut's Changing Landscape (CCL), that uses remote sensing technology to chart changes in the state's major land cover categories over time. CLEAR developed the CCL project specifically to enable the public to compare multi-temporal land cover data sets, based on 30-meter pixel Landsat imagery.

The data in the CCL viewer dates back to 1985, the first year for which imagery of this resolution was available. CLEAR used cross-correlation analysis, which employs statistical analysis to identify pixels indicating a potential change between images, to produce a consistent land cover dataset for land cover change over time (Hurd et al., 2003[203]). Potentially changed pixels were identified and then merged with the 1985 classification to create the 1990 classification. This process was done for the 1995, 2002, 2006, 2010, and 2015 classifications, resulting in a 30-year record of land cover change for the state with 12 land cover categories. Land cover change data is compiled for the entire state, by town, by watershed, and shown in geographically-specific maps.

Previous work to construct a baseline in forest carbon storage has not yet resulted in a reproducible methodology for annual reporting. It should be a top priority to develop a usable model for reliably charting carbon sinks related to working and natural lands, and/or to utilize models developed by state, academic, and nonprofit partners involved with the U.S. Climate Alliance.

# Review & Rank of 2011 Climate Preparedness Report Recommendations

One of the important charges to the Forests Sub-Group was to review the recommendations made in the 2011 Connecticut Climate Change Preparedness Plan: Adaptation Strategies for Agriculture, Infrastructure, Natural Resources and Public Health Climate Change Vulnerabilities.

This important report included recommendations on 15 Best Management Practices, 30 Research, Monitoring, and Education priorities, and 22 Policy, Legislation, Regulation, and Funding priorities. The members of the Forests Sub-Group utilized a survey and voted to determine the highest priority actions for Forests. The top priorities in each category follow:

## Top Priority Actions: Best Management Practices

- Identify and conserve ecosystem services vulnerable to climate change.
- Encourage land management behaviors that support ecosystem services.
- Encourage adaptation strategies, including natural habitat conservation, Low Impact Development (LID) Best Management Practices (BMPs), agriculture water BMPs and drinking water treatment standards that will ameliorate the effects of water inundation.
- Apply adaptive management procedures.
- Increase active management of upland forests and reduce non-climatic stressors.
- Consider the public health needs of vulnerable populations in climate change adaptation planning.

## Top Priority Actions: Research, Monitoring, and Education

- Engage and educate private landowners to manage their lands to minimize risk from climate change.
- Build public consensus for adaptation strategies through education and outreach.
- Develop educational campaigns for climate change adaptation awareness in Connecticut targeted at multiple sectors.
- Advance regional research and modeling to guide conservation efforts.
- Assess future flooding risks to natural and built infrastructure, including agricultural operations and public health and safety.
- Develop Connecticut- specific climate change projections for temperature, precipitation and sea level rise and support monitoring efforts for these climate drivers.
- Include students (future stakeholders) in climate change programs.
- Partner with educational institutions or organizations that conduct research.

## Policy, Legislation, Regulation, and Funding: Top-Ranked Priorities

- Acquire land and conservation easements in riparian areas adjacent to coldwater streams.
- Target headwaters for protection throughout the state.
- Reevaluate Connecticut's Green Plan and open space grant programs to prioritize acquisition of land and conservation easements for habitats most at risk from climate change.
- Collaborate among state agencies, municipalities and non-profits within Connecticut to implement regulations and policies that promote and facilitate the conservation of habitats and species most at risk from climate change.
- Continue to support regional cooperation on climate change adaptation through involvement in regional planning activities.
- Proceeds from RGGI auctions should support climate change adaptation work identified in this report and in accordance with Section 22a-200c(c).
- Implement new or modified policies that would encourage appropriate land use and reduce repetitive losses.
- Acquire land and conservation easements to provide upslope advancement zones adjacent to tidal marshes.

# Synergies with CT Forest Action Plan and Other GC3 Working Groups

The Forests Sub-Group did not develop this report in a vacuum, and tried to stay connected to the efforts of other Working Groups, Sub-Groups, and Subcommittees of the Governor's Council on Climate Change. In addition, we were mindful of the development of the 2020 Forest Action Plan for Connecticut by the Department of Energy and Environmental Protection, and hosted a presentation on this topic. Following are some of the notable synergies with these other efforts.

## 2020 Connecticut Forest Action Plan

Every 10 years, each State and US Territory is required to develop and submit to the USDA Forest Service a statewide comprehensive Forest Action Plan that covers all lands within its jurisdiction; Federal, State, private, municipal, and non-profit. The Plan requires considerable stakeholder input and public outreach ensuring identified strategies are the "State's" priorities but based upon three overarching national priorities 1) Conserving and managing working forest landscapes for multiple values and uses, 2) Protecting forests from threats, 3) Enhancing public benefits from trees and forests. State-based strategies are built upon an in-depth assessment of current forest and tree conditions.

As required in the 2008 Farm Bill, Connecticut developed and submitted its first Forest Action Plan in 2010. This plan was slightly revised in 2015 and by December 31, 2020 a new Forest Action Plan will be submitted to USDA Forest Service. Having a Forest Action Plan allows Connecticut to receive substantial annual federal financial assistance to address the threats and issues we as a State have identified.

## Other GC3 Working Groups and Sub-Groups

As the Forests Sub-Group was holding public meetings and preparing this report, other GC3 Working Groups and Sub-Groups were developing recommendations that at times touched on forests. The following groups deserve special recognition for their partnership and coordination:

- Agriculture/Soils, Rivers, and Wetlands Sub-Groups;
- Equity and Environmental Justice Working Group;
- Science & Technology Working Group; and
- Progress on Mitigation Strategies Working Group.

This report is being shared with those Working Groups and others to solicit additional input and suggestions before presenting an updated report to the full GC3 Council.

# Glossary of Terms & Endnotes

Early in the informational gather phase for the Forests Sub-Group it became apparent the need to define common terms to help working group members understand context of dialog and presentations. On February 27, 2020 GC3 Natural and Working Lands Work Group Forests Subgroup agreed upon the following definitions for the terms provided. While there are many ways to define these terms for the purpose of the Forests Subgroup effort the following definitions were agreed upon to achieve common understandings of ecological terms that relate to climate adaption and mitigation of forests. We are grateful to Mark Ashton, Robert Fahey, and Edward Faison and the following source materials UMASS/UVM (Forest-Carbon-Booklet UMass UVM 2020.pdf.), Society of American Foresters, USDA FS R & D.

**Adaptation:** How forests react over time to all impacts including climate, fragmentation, insect disease, and pollution.

**Carbon sequestration:** The process of removing carbon from the atmosphere for use in photosynthesis, resulting in the maintenance and growth of plants and trees. The rate (or amount and speed) at which a forest sequesters carbon changes over time. In the northeastern United States, carbon sequestration [rates] typically peak when forests are young to intermediate in age (around 30–70 years old), but they continue to sequester carbon through their entire life span.

**Carbon storage:** The amount of carbon that is retained in a carbon pool within the forest. Storage levels increase with forest age and typically peak in the northeastern United States when forests are old (>200 years old). Forest-Carbon-Booklet UMass UVM 2020.pdf.

**Competitive hierarchy:** Longer lived species are site restrictive and will dominate specific sites reducing structural diversity and complexity.

**Diversity Theory (a.k.a. "negative density dependence hypothesis"):** Forests have evolved complexity over time including the adaptation and resistance to native insects and disease.

**Forest Health:** A tricky term because it is often used in the "eye of the beholder" and can refer to several different aspects of a forest. Most common use refers to an absence of invasive insects, disease, and related problems for tree survival.

**Intermediate disturbance hypothesis:** Relates to forest succession. How forests adapt and interact to site disturbance and climate. Guided by length in between disturbances and severity of disturbance. Forest diversity simplifies over time to late successional species.

**Mitigation (of forest carbon):** Action taken to alleviate potential adverse effects of climate change by increasing carbon sequestration in forest ecosystems.

**Redundancy:** A form of resilience. Multiple species comprising the same functional role.

**Resilience:** Rate of recovery from a disturbance. The ability of forest to absorb impacts over time. The capacity of an ecosystem to return to its previous pre-disturbance condition.

**Resistance:** Affiliated with resilience. The capacity to absorb disturbance and remain unchanged.

[1] https://portal.ct.gov/-/media/DEEP/climatechange/publications/BuildingaLowCarbonFutureforCTGC3Recommendationspdf.pdf
[2] https://portal.ct.gov/DEEP/Climate-Change/CT-Greenhouse-Gas-Inventory-Reports
[3] The U.S. Climate Alliance Commits to Maintain Lands as a Net Carbon Sink and Develop Pathways to Act by 2020. United States Climate Alliance. August 23, 2018.
[4] U.S. Climate Alliance Natural & Working Lands Challenge: http://www.usclimatealliance.org/nwlchallenge
[5] Valatin, Gregory. 2012. Additionality and climate change mitigation by the UK forest sector. Forestry: An International Journal of Forest Research. Volume 85, Issue 4, 445-462. https://doi.org/10.1093/forestry/cps056
[6] Virgilio, N. and S. Marshall. 2009. Forest Carbon Strategies in Climate Change Mitigation: Confronting Challenges Through On the-Ground Experience, The Nature Conservancy. Arlington, Virginia.
[7] Foster, D et al. 2017 as described in Southern New England Forest Management in an Era of Climate Change: A Position of the Yankee Division of the Society of American Foresters (2020), found at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-2020-agendas-and-minutes/GC3_Forests_Yankee_SAF_Position_061820.pdf
[8] As defined by the USDA Forest Service's Forest Inventory and Analysis National Program (FIA) available at https://www.fia.fs.fed.us/
[9] Hochholzer, H. (2015, Revised). Connecticut's Forest Action Plan 2010. 46. Retrieved from https://portal.ct.gov/-/media/DEEP/forestry/assessment_and_strategy/FAP2015pdf.pdf
[10] Arnold, C; Wilson, E; Hurd, J; and Civco, D. (2020) 30 Years of Land Cover Change in Connecticut, USA: A Case Study of Long-Term Research, Dissemination of Results, and Their Use in Land Use Planning and Natural Resource Conservation. Land, P. 12. https://www.mdpi.com/2073-445X/9/8/255?type=check_update&version=2
[11] Chart by 2006 D. Smith (former Connecticut State Forester). Updated to current with data from Forest Inventory and Analysis National Program
[12] Connecticut's Changing Landscape study on forest fragmentation since 1985 by UConn Center for Land Use Education and Research from http://clear.uconn.edu/projects/landscape/v2/index.htm
[13] Ibid. Arnold, C; Wilson, E; Hurd, J; and Civco, D. (2020). P. 16.
[14] USDA Forest Service. 2019. Forests of Connecticut, 2018. Resource Update FS-209. Madison, WI: U.S. Department of Agriculture, Forest Service. 2p. https://doi.org/10.2737/FS-RU-209
[15] Tyrrell, M. report by Yale University's Global Institute of Sustainable Forestry. 2015. Understanding Connecticut Woodland Owners: A Report on the Attitudes, Values and Challenges of Connecticut's Family Woodland Owners.
[16] https://portal.ct.gov/DEEP/Forestry/Management-on-State-Lands/Forest-Management-on-State-Lands
[17] Based on analysis of a 168,960-acre forest stands database by DEEP.
[18] Estimate of average annual active forest management provided by DEEP's State Forester, Christopher Martin.
[19] An assessment of the DEEP property layer was conducted in June 2020 by DEEP Forestry staff, and the Summary of Passive DEEP Land by Category has been produced summarizing the results. In presenting the assessment they noted this analysis is somewhat incomplete since not all DEEP land records have been added to the GIS property layer to date, but efforts are underway by DEEP Land Acquisition and Management staff to capture all holdings.
[20] Jenkins, M. & Schaap, B. (April 2018). Forest Ecosystem Services: Background study prepared for the thirteenth session of the United Nations Forum on Forests. Retrieved June 11, 2020 from https://www.un.org/esa/forests/wp-content/uploads/2018/05/UNFF13_BkgdStudy_ForestsEcoServices.pdf
[21] Hochholzer, H. (2015, Revised). Connecticut's Forest Action Plan 2010. 8. Retrieved from https://portal.ct.gov/-/media/DEEP/forestry/assessment_and_strategy/FAP2015pdf.pdf
[22] U.S. Climate Alliance. NWL Challenge. Retrieved from http://www.usclimatealliance.org/nwlchallenge-faqs
[23] Griscom, B., et al. (2017) Natural Climate Solutions. *Proceedings of the National Academy of Sciences of the United States of America.* https://doi.org/10.1073/pnas.1710465114
[24] McDonald, R., Kroeger, T., Boucher, T., Longzhu, W. & Salem, R. (2016). Planting Healthy Air: A global analysis of the role of urban trees in addressing particulate matter pollution and extreme heat. The Nature Conservancy. Retrieved June 10, 2020 from file:///C:/Users/lhayden/Downloads/20160825_PHA_Report_Final.pdf

[25] Maher, B., Ahmed, I., Davison, B., Karloukovski, V. & Clarke, R. (2013). Impact of Roadside Tree Lines on Indoor Concentrations of Traffic-Derived Particulate Matter. *Environmental Science & Technology. 47* (23), 13737-13744. https://pubs.acs.org/doi/10.1021/es404363m

[26] Yang, J., Y. Chang, and P. Yan. (2015). Ranking the suitability of common urban tree species for controlling PM2.5 pollution. *Atmospheric Pollution Research. 6*(2): 267-277.

[27] Connecticut Department of Public Health. What is a Public Water System? Retrieved June 10, 2020 from https://portal.ct.gov/DPH/Drinking-Water/DWS/Public-Drinking-Water-FAQs

[28] Hochholzer, H. (2015, Revised). Connecticut's Forest Action Plan 2010. 8. Retrieved from https://portal.ct.gov/-/media/DEEP/forestry/assessment_and_strategy/FAP2015pdf.pdf

[29] National Association of Home Builders. Estimate of lumber from http://imi.us.tripod.com/imi/lumber_cost.html

[30] Hunter, M. L., Jr. 1990. Wildlife, forests, and forestry: principles of managing forests for biological diversity. Prentice Hall, Englewood Cliffs, New Jersey, USA.

[31] North East State Foresters Association. (2015) The Economic Importance of Connecticut's Forest Based Economy: https://www.nefainfo.org/uploads/2/7/4/5/27453461/connecticuts_forest_based_economy_4.2.15.pdf

[32] New England Forestry Foundation. New England Forests: The Path to Sustainability. Retrieved June 8, 2020 from https://newenglandforestry.org/wp-content/uploads/2016/04/12._Grow_As_Much_As_We_Use_0613141.pdf

[33] USDA Forest Service. Ethnobotany. Retrieved June 8, 2020: https://www.fs.fed.us/wildflowers/ethnobotany/

[34] Yu, C. P., Lin, C. M., Tsai, M. J., Tsai, Y. C., & Chen, C. Y. (2017). Effects of Short Forest Bathing Program on Autonomic Nervous System Activity and Mood States in Middle-Aged and Elderly Individuals. *International journal of environmental research and public health*, *14*(8), 897. https://doi.org/10.3390/ijerph14080897

[35] Forests Make Us Healthier Toolkit: https://standupforforests.org/amplify-forests-make-us-healthier/

[36] McDonald, R., Kroeger, T., Boucher, T., Longzhu, W. & Salem, R. (2016). Planting Healthy Air: A global analysis of the role of urban trees in addressing particulate matter pollution and extreme heat. The Nature Conservancy. Retrieved June 10, 2020 from file:///C:/Users/lhayden/Downloads/20160825_PHA_Report_Final.pdf

[37] Link to text of MD Forest Preservation Act: http://mgaleg.maryland.gov/2013RS/bills/hb/hb0706T.pdf

[38] Description of the MD Forest Preservation Act of 2013 on the website of the National Association of State Foresters: https://www.stateforesters.org/2013/04/08/maryland-passes-landmark-forestry-legislation/

[39] The text for this session is modeled after recommendations set forth in the "Report on Policies to Achieve No Net Loss of Forests in Maryland" (2011) https://dnr.maryland.gov/forests/Documents/nonetlossfinalreport.pdf

[40] Visit https://www.tpl.org/parkscore to get the data, explore maps of Connecticut communities, and learn how well Connecticut cities are meeting the need for parks.

41 Cain, M.L., Bowman, W.D. and Hacker, S.D., 2014. Ecology, Sinaur Associates, Incorporated, Sunderland, MA. ISBN-13: 978-0878939084.

42 Peterson, G., Allen, C.R. and Holling, C.S., 1998. Ecological resilience, biodiversity, and scale. Ecosystems, 1(1), pp.6-18.

43 Foster, D.R., 1988. Species and stand response to catastrophic wind in central New England, USA. The Journal of Ecology, pp.135-151.

44 Boose, Emery R., Kristen E. Chamberlin, and David R. Foster. "Landscape and Regional Impacts of Hurricanes in New England." Ecological Monographs 71, no. 1 (2001): 27-48.

45 Jactel, H., Brockerhoff, E. and Duelli, P., 2005. A test of the biodiversity-stability theory: meta-analysis of tree species diversity effects on insect pest infestations, and re-examination of responsible factors. In Forest diversity and function (pp. 235-262). Springer, Berlin, Heidelberg.

46 Wright, J.S., 2002. Plant diversity in tropical forests: a review of mechanisms of species coexistence. Oecologia, 130(1), pp.1-14.

47 Canham, C.D., Papaik, M.J., Uriarte, M., McWilliams, W.H., Jenkins, J.C. and Twery, M.J., 2006. Neighborhood analyses of canopy tree competition along environmental gradients in New England forests. Ecological applications, 16(2), pp.540-554.

48 Liptzin, D. and Ashton, P.M.S., 1999. Early-successional dynamics of single-aged mixed hardwood stands in a southern New England forest, USA. Forest ecology and management, 116(1-3), pp.141-150.

49 Kelty, M.J., 1986. Development patterns in two hemlock–hardwood stands in southern New England. Canadian Journal of Forest Research, 16(5), pp.885-891.

50 Ellum, D.S., Ashton, M.S. and Siccama, T.G., 2010. Spatial pattern in herb diversity and abundance of second growth mixed deciduous-evergreen forest of southern New England, USA. Forest Ecology and Management, 259(8), pp.1416-1426.
51 Panchen, Z.A., Primack, R.B., Nordt, B., Ellwood, E.R., Stevens, A.D., Renner, S.S., Willis, C.G., Fahey, R., Whittemore, A., Du, Y. and Davis, C.C., 2014. Leaf out times of temperate woody plants are related to phylogeny, deciduousness, growth habit and wood anatomy. New Phytologist, 203(4), pp.1208-1219.
52 Lorimer, C.G. and White, A.S., 2003. Scale and frequency of natural disturbances in the northeastern US: implications for early successional forest habitats and regional age distributions. Forest Ecology and Management, 185(1-2), pp.41-64.
53 Burns, R.M., 1990. Silvics of North America: Conifers/Hardwoods (No. 654). US Department of Agriculture, Forest Service. Vols. 1-2.
54 Johnson, D.J., Beaulieu, W.T., Bever, J.D. and Clay, K., 2012. Conspecific negative density dependence and forest diversity. Science, 336(6083), pp.904-907.
55 LaManna, J.A., Mangan, S.A., Alonso, A., Bourg, N.A., Brockelman, W.Y., Bunyavejchewin, S., Chang, L.W., Chiang, J.M., Chuyong, G.B., Clay, K. and Condit, R., 2017. Plant diversity increases with the strength of negative density dependence at the global scale. Science, 356(6345), pp.1389-1392.
56 Cain, M.L., Bowman, W.D. and Hacker, S.D., 2014. Ecology, Sinaur Associates, Incorporated, Sunderland, MA. ISBN-13: 978-0878939084.
57 Ellison, A.M., Bank, M.S., Clinton, B.D., Colburn, E.A., Elliott, K., Ford, C.R., Foster, D.R., Kloeppel, B.D., Knoepp, J.D., Lovett, G.M. and Mohan, J., 2005. Loss of foundation species: consequences for the structure and dynamics of forested ecosystems. Frontiers in Ecology and the Environment, 3(9), pp.479-486.
58 Orwig, D.A., Plotkin, A.A.B., Davidson, E.A., Lux, H., Savage, K.E. and Ellison, A.M., 2013. Foundation species loss affects vegetation structure more than ecosystem function in a northeastern USA forest. PeerJ, 1, p.e41.
59 Case, B.S., Buckley, H.L., Barker-Plotkin, A.A., Orwig, D.A. and Ellison, A.M., 2017. When a foundation crumbles: forecasting forest dynamics following the decline of the foundation species Tsuga canadensis. Ecosphere, 8(7), p.e01893.
60 Bell, M., 1985. The Face of Connecticut: People. Geology and the Land.
61 Foster, D.R., Motzkin, G. and Slater, B., 1998. Land-use history as long-term broad-scale disturbance: regional forest dynamics in central New England. Ecosystems, 1(1), pp.96-119.
62 Hochholzer, H. (2015, Revised). Connecticut's Forest Action Plan 2010. 8. Retrieved from https://portal.ct.gov/-/media/DEEP/forestry/assessment_and_strategy/FAP2015pdf.pdf
63 Messier, C., Puettmann, K.J. and Coates, K.D. eds., 2013. Managing forests as complex adaptive systems: building resilience to the challenge of global change. Routledge.
64 Stuart-Haëntjens, E.J., Curtis, P.S., Fahey, R.T., Vogel, C.S. and Gough, C.M., 2015. Net primary production of a temperate deciduous forest exhibits a threshold response to increasing disturbance severity. Ecology, 96(9), pp.2478-2487.
65 Fahey, R.T., Fotis, A.T. and Woods, K.D., 2015. Quantifying canopy complexity and effects on productivity and resilience in late-successional hemlock-hardwood forests. Ecological applications: 25(3), p.834.
66 Ollinger, S.V., Aber, J.D. and Reich, P.B., 1997. Simulating ozone effects on forest productivity: Interactions among leaf-, canopy-, and stand-level processes. Ecological Applications, 7(4), pp.1237-1251
67 Gandhi, K.J. and Herms, D.A., 2010. Direct and indirect effects of alien insect herbivores on ecological processes and interactions in forests of eastern North America. Biological Invasions, 12(2), pp.389-405.
68 Harper, K.A., Macdonald, S.E., Burton, P.J., Chen, J., Brosofske, K.D., Saunders, S.C., Euskirchen, E.S., Roberts, D.A.R., Jaiteh, M.S. and Esseen, P.A., 2005. Edge influence on forest structure and composition in fragmented landscapes. Conservation biology, 19(3), pp.768-782.
69 Didham, R.K., Ghazoul, J., Stork, N.E. and Davis, A.J., 1996. Insects in fragmented forests: a functional approach. Trends in ecology & evolution, 11(6), pp.255-260
70 Seidl, R., SCHELHAAS, M.J. and Lexer, M.J., 2011. Unraveling the drivers of intensifying forest disturbance regimes in Europe. Global Change Biology, 17(9), pp.2842-2852.

71 Seidl, R., Thom, D., Kautz, M., Martin-Benito, D., Peltoniemi, M., Vacchiano, G., Wild, J., Ascoli, D., Petr, M., Honkaniemi, J. and Lexer, M.J., 2017. Forest disturbances under climate change. Nature climate change, 7(6), pp.395-402.

72 Seidl, R. and Rammer, W., 2017. Climate change amplifies the interactions between wind and bark beetle disturbances in forest landscapes. Landscape Ecology, 32(7), pp.1485-1498.

73 Ma, Z., Peng, C., Zhu, Q., Chen, H., Yu, G., Li, W., Zhou, X., Wang, W. and Zhang, W., 2012. Regional drought-induced reduction in the biomass carbon sink of Canada's boreal forests. Proceedings of the National Academy of Sciences, 109(7), pp.2423-2427.

74 Hubau, W., Lewis, S.L., Phillips, O.L., Affum-Baffoe, K., Beeckman, H., Cuní-Sanchez, A., Daniels, A.K., Ewango, C.E., Fauset, S., Mukinzi, J.M. and Sheil, D., 2020. Asynchronous carbon sink saturation in African and Amazonian tropical forests. Nature, 579(7797), pp.80-87.

[75] The Nature Conservancy: Staying Connected Initiative (SCI): http://stayingconnectedinitiative.org/

[76] Housatonic Valley Association: Follow the Forest: http://followtheforest.org

[77]http://maps.tnc.org/resilientland/

[78] https://www.adaptivesilviculture.org/

[79] https://forestadaptation.org/

[80] Messier, C., Puettmann, K. J., & Coates, K. D. (Eds.). (2013). Managing forests as complex adaptive systems: building resilience to the challenge of global change. Routledge.

[81] Keeton, W. S. (2006). Managing for late-successional/old-growth characteristics in northern hardwood-conifer forests. Forest Ecology and Management, 235(1-3), 129-142.

[82] Mylecraine, K. A., & Zimmerman, G. L. (2000). Atlantic white-cedar: Ecology and best management practices manual. Department of Environmental Protection, Division of Parks and Forestry, New Jersey Forest Service.

[83] Conway, T. M., & Yip, V. (2016). Assessing residents' reactions to urban forest disservices: A case study of a major storm event. Landscape and Urban Planning, 153, 1-10.

[84] Fargione, J. E., Bassett, S., Boucher, T., Bridgham, S. D., Conant, R. T., Cook-Patton, S. C., ... & Gu, H. (2018). Natural climate solutions for the United States. *Science advances*, *4*(11), eaat1869.

[85] Fargione, J. E., Bassett, S., Boucher, T., Bridgham, S. D., Conant, R. T., Cook-Patton, S. C., ... & Gu, H. (2018). Natural climate solutions for the United States. *Science advances*, *4*(11), eaat1869.

[86]Fargione, J. E., Bassett, S., Boucher, T., Bridgham, S. D., Conant, R. T., Cook-Patton, S. C., ... & Gu, H. (2018). Natural climate solutions for the United States. *Science advances*, *4*(11), eaat1869

[87] Moomaw, W. R., Masino, S. A., & Faison, E. K. (2019). Intact Forests in the United States: Proforestation Mitigates Climate Change and Serves the Greatest Good. *Frontiers in Forests and Global Change*, *2*, 27.

[88] Nunery, J. S., & Keeton, W. S. (2010). Forest carbon storage in the northeastern United States: net effects of harvesting frequency, post-harvest retention, and wood products. Forest Ecology and management, 259(8), 1363-1375.

[89] Catanzaro, P., & D'Amato, A. (2019). Forest carbon: An essential natural solution for climate change. University of Massachusetts.

[90] The 9 Northeastern states include the six New England states, New York, New Jersey, and Pennsylvania. USDA Forest Service, Forest Inventory and Analysis Program, Fri Jun 12 00:38:20 GMT 2020. Forest Inventory EVALIDator web-application Version 1.8.0.01. St. Paul, MN: U.S. Department of Agriculture, Forest Service, Northern Research Station. [Available only on internet: http://apps.fs.usda.gov/Evalidator/evalidator.jsp]

[91] Mackey, B., Prentice, I. C., Steffen, W., House, J. I., Lindenmayer, D., Keith, H., & Berry, S. (2013). Untangling the confusion around land carbon science and climate change mitigation policy. *Nature Climate Change*, *3*(6), 552-557.

[92] https://apps.fs.usda.gov/Evalidator/evalidator.jsp

[93] https://apps.fs.usda.gov/Evalidator/evalidator.jsp

[94] Oswalt, Sonja N.; Smith, W. Brad; Miles, Patrick D.; Pugh, Scott A., coords. 2019. Forest Resources of the United States, 2017: a technical document supporting the Forest Service 2020 RPA Assessment. Gen. Tech. Rep. WO-97. Washington, DC: U.S. Department of Agriculture, Forest Service, Washington Office. 223 p. https://doi.org/10.2737/WO-GTR-97.

[95] Curtis, P. S., & Gough, C. M. (2018). Forest aging, disturbance and the carbon cycle. New Phytologist, 219(4), 1188-1193.

[96] Harris, N. L., Hagen, S. C., Saatchi, S. S., Pearson, T. R. H., Woodall, C. W., Domke, G. M., ... & Fore, A. (2016). Attribution of net carbon change by disturbance type across forest lands of the conterminous United States. *Carbon balance and management*, *11*(1), 24.

[97] Gough, C. M., Atkins, J. W., Fahey, R. T., & Hardiman, B. S. (2019). High rates of primary production in structurally complex forests. *Ecology*, *100*(10), e02864. Curtis, P. S., & Gough, C. M. (2018). Forest aging, disturbance and the carbon cycle. *New Phytologist*, *219*(4), 1188-1193.

[98] Domke, G., Williams, C. A., Birdsey, R., Coulston, J., Finzi, A., Gough, C., ... & Kurz, W. A. (2018). Forests. *In Second State of the Carbon Cycle Report (SOCCR2): A Sustained Assessment Report.[Cavallaro, N.; Shrestha, G.; Birdsey, R.; Mayes, MA; Najjar, RG; Reed, SC; Romero-Lankao, P.; Zhu, Z., eds. Washington, DC, USA: US Global Change Research Program.*, 365-398.

[99] Tyrrell, Mary. Understanding Connecticut Woodland Owners: A Report on the Attitudes, Values and Challenges of Connecticut6s Family Woodland Owners. 2015.

[100] Catanzaro, P., & D'Amato, A. (2019). Forest carbon: An essential natural solution for climate change. *University of Massachusetts*.

[101] McGarvey, J. C., Thompson, J. R., Epstein, H. E., & Shugart Jr, H. H. (2015). Carbon storage in old-growth forests of the Mid-Atlantic: toward better understanding the eastern forest carbon sink. Ecology, 96(2), 311-317.

[102] Keeton, W. S., Whitman, A. A., McGee, G. C., & Goodale, C. L. (2011). Late-successional biomass development in northern hardwood-conifer forests of the northeastern United States. Forest Science, 57(6), 489-505.

[103] Adams, J. M., Faure, H. F. D. L., Faure-Denard, L., McGlade, J. M., & Woodward, F. I. (1990). Increases in terrestrial carbon storage from the Last Glacial Maximum to the present. *Nature*, *348*(6303), 711-714. McGarvey, J. C., Thompson, J. R., Epstein, H. E., & Shugart Jr, H. H. (2015). Carbon storage in old-growth forests of the Mid-Atlantic: toward better understanding the eastern forest carbon sink. *Ecology*, *96*(2), 311-317.

[104] Stuart-Haëntjens, E. J., Curtis, P. S., Fahey, R. T., Vogel, C. S., & Gough, C. M. (2015). Net primary production of a temperate deciduous forest exhibits a threshold response to increasing disturbance severity. Ecology, 96(9), 2478-2487.

[105] Oswalt, Sonja N.; Smith, W. Brad; Miles, Patrick D.; Pugh, Scott A., coords. 2019. Forest Resources of the United States, 2017: a technical document supporting the Forest Service 2020 RPA Assessment. Gen. Tech. Rep. WO-97. Washington, DC: U.S. Department of Agriculture, Forest Service, Washington Office. 223 p.
National Land Cover Database (NLCD) 2016.

[106] Defined using the University of Connecticut's Center Forest Land Use & Education (CLEAR) Forest Fragmentation Model 1 as an area of forest land cover at least 300 feet from a non-forest edge.
http://clear.uconn.edu/projects/landscape/CT/stats/change7dates.htm#top

[107] Oswalt, Sonja N.; Smith, W. Brad; Miles, Patrick D.; Pugh, Scott A., coords. 2019. Forest Resources of the United States, 2017: a technical document supporting the Forest Service 2020 RPA Assessment. Gen. Tech. Rep. WO-97. Washington, DC: U.S. Department of Agriculture, Forest Service, Washington Office. 223 p.
https://doi.org/10.2737/WO-GTR-97

[108]UConn/CLEAR Forest Fragmentation Analysis Project. Found at
http://clear.uconn.edu/projects/landscape/v2/forestfrag/index.htm

[109]Oswalt, Sonja N.; Smith, W. Brad; Miles, Patrick D.; Pugh, Scott A., coords. 2019. Forest Resources of the United States, 2017: a technical document supporting the Forest Service 2020 RPA Assessment. Gen. Tech. Rep. WO-97. Washington, DC: U.S. Department of Agriculture, Forest Service, Washington Office. 223 p.
https://doi.org/10.2737/WO-GTR-97.

[110] UConn/CLEAR Forest Fragmentation Analysis Project. Found at
http://clear.uconn.edu/projects/landscape/v2/forestfrag/index.htm

[111]Ibid.

[112] Reinmann, A. B., & Hutyra, L. R. (2017). Edge effects enhance carbon uptake and its vulnerability to climate change in temperate broadleaf forests. *Proceedings of the National Academy of Sciences*, *114*(1), 107-112.
Nowak, D.J., Crane, D.E., 2002. Carbon storage and sequestration by urban trees in the USA. Environmental Pollution 116 (3), 381e389

[113] https://www.itreetools.org/

[114]Nowak, D.J., 1994. Air pollution removal by Chicago's urban forest. In: McPherson, E.G., Nowak, D.J., Rowntree, R.A. (Eds.), Chicago's Urban Forest Ecosystem: Results of the Chicago Urban Forest Climate Project. USDA Forest Service General Technical Report NE- 186, Radnor, PA, pp. 63-81

[115]https://apps.fs.usda.gov/Evalidator/evalidator.jsp

[116] Canham, C. D. (2020). *Forests Adrift-Currents Shaping the Future of Northeastern Trees*. Yale University Press.

[117]Fargione, J. E., Bassett, S., Boucher, T., Bridgham, S. D., Conant, R. T., Cook-Patton, S. C., ... & Gu, H. (2018). Natural climate solutions for the United States. *Science advances*, *4*(11), eaat1869.

[118] Defined using the University of Connecticut's Center Forest Land Use & Education (CLEAR) Forest Fragmentation Model 1 as an area of forest land cover at least 300 feet from a non-forest edge.

[119] Medium core forests comprise 250-500 acres and Large core forests comprise >500 acres.

[120] Section 23-8 of the General Statutes

[121] Connecticut has 830,679 acres of core forest >250 acres [190,471 acres classified as medium size core forest of 250-499 acres, and 640,208 acres of large cores >500 acres]. Protected lands used in this analysis were calculated using POSM and Litchfield Hills Greenprint datasets. According to these data, 33.53% of these medium and large cores is permanently protected [42,324 acres or 22.22% of medium cores and 236,230 acres or 36.89% of large cores].

[122] Based on the National Land Cover Database (NLCD) 2016.

[123] USDA Forest Service, Forest Inventory and Analysis Program, Fri Jun 12 00:38:20 GMT 2020. Forest Inventory EVALIDator web-application Version 1.8.0.01. St. Paul, MN: U.S. Department of Agriculture, Forest Service, Northern Research Station. [Available only on internet: http://apps.fs.usda.gov/Evalidator/evalidator.jsp]

[124] Fargione, J. E., Bassett, S., Boucher, T., Bridgham, S. D., Conant, R. T., Cook-Patton, S. C., ... & Gu, H. (2018). Natural climate solutions for the United States. *Science advances*, *4*(11), eaat1869.

[125] Connecticut's Changing Landscape study on forest fragmentation since 1985 by UConn Center for Land Use Education and Research from http://clear.uconn.edu/projects/landscape/v2/index.htm

[126] Moomaw, W. R., Masino, S. A., & Faison, E. K. (2019). Intact Forests in the United States: Proforestation Mitigates Climate Change and Serves the Greatest Good. *Frontiers in Forests and Global Change*, *2*, 27.

[127] https://www.nrs.fs.fed.us/rna/

[128] https://en.wikipedia.org/wiki/Scientific_control

[129] Sohngen, B. (2020). Climate Change and Forests. Annual Review of Resource Economics. 12(17), 1–17. https://doi.org/10.1146/annurev-resource-110419-010208

[130] Natural Area Preserve statute Section 23-5a - i: https://www.cga.ct.gov/current/pub/chap_447.htm#sec_23-5a

[131] Example of Research Natural Area Management Plan from the Routt National Forest in Colorado: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5166048.pdf

[132] The Northeast Wilderness Trust offers a Wild Carbon option for landowners found at https://newildernesstrust.org/wilderness-conservation/climate-change/

[133] Reinmann, A. B., & Hutyra, L. R. (2017). Edge effects enhance carbon uptake and its vulnerability to climate change in temperate broadleaf forests. *Proceedings of the National Academy of Sciences*, *114*(1), 107-112. Nowak, D.J., Crane, D.E., 2002. Carbon storage and sequestration by urban trees in the USA. Environmental Pollution 116 (3), 381e389

[134] https://www.itreetools.org/

[135] Nowak, D.J., 1994. Air pollution removal by Chicago's urban forest. In: McPherson, E.G., Nowak, D.J., Rowntree, R.A. (Eds.), Chicago's Urban Forest Ecosystem: Results of the Chicago Urban Forest Climate Project. USDA Forest Service General Technical Report NE- 186, Radnor, PA, pp. 63-81

[136] Lutz, J. A., Furniss, T. J., Johnson, D. J., Davies, S. J., Allen, D., Alonso, A., ... & Blomdahl, E. M. (2018). Global importance of large-diameter trees. *Global Ecology and Biogeography*, *27*(7), 849-864.

[137] https://newenglandforestry.org/2019/02/11/what-is-exemplary-forestry/

[138] Krebs, J., Pontius, J., & Schaberg, P. G. (2017). Modeling the impacts of hemlock woolly adelgid infestation and presalvage harvesting on carbon stocks in northern hemlock forests. *Canadian Journal of Forest Research*, *47*(6), 727-734.

[139] Gutzat, F., & Dormann, C. F. (2018). Decaying trees improve nesting opportunities for cavity-nesting birds in temperate and boreal forests: A meta-analysis and implications for retention forestry. *Ecology and evolution*, *8*(16), 8616-8626.
[140] North East Association of State Foresters: Landscape stewardship guide (NA–IN–06–11). 2011. Found at https://www.fs.usda.gov/naspf/sites/default/files/publications/landscape_stewardship_guide_11_screen_1.pdf
[141] Donnelly, C. and Doria, G. The Use of Wood from Urban and Municipal Trees. CT DEEP Division of Forestry publication. June 2014. Found at https://portal.ct.gov/-/media/DEEP/forestry/urban_forestry/Biomassfinal62914pdf.pdf
[142] Waller, D. M., and N. J. Reo. 2018. First stewards: ecological outcomes of forest and wildlife stewardship by indigenous peoples of Wisconsin, USA. Ecology and Society 23(1):45. https://doi.org/10.5751/ES-09865-230145
[143] U.S. Global Change Research Program, Section 9.2
[144] U.S. Census Bureau Profile of Connecticut: https://data.census.gov/cedsci/profile?q=Connecticut&g=0400000US09
[145] Governing: A State-by-State Look at Growing Minority Populations. 2015. https://www.governing.com/topics/urban/gov-majority-minority-populations-in-states.html
[146] Graphic of urban heat island effect in Hartford on Climate Central website: https://www.climatecentral.org/news/urban-heat-islands-threaten-us-health-17919
[147] https://health2016.globalchange.gov/populations-concern
[148] Nowak, David & Dwyer, John. (2010). Understanding the Benefits and Costs of Urban Forest Ecosystems. 10.1007/978-1-4020-4289-8_2.
149 Nowak, D. and Heisler, G. Air Quality Effects of Urban Trees and Parks. National Recreation and Parks Association Research Series. 2010.
150 Wolf, K. L., & Robbins, A. S. (2015). Metro nature, environmental health, and economic value. Environmental health perspectives, 123(5), 390–398. https://doi.org/10.1289/ehp.1408216
[151] Berto R., Baroni M.R., Zainaghi A., Bettella S. An exploratory study of the effect of high and low fascination environments on attentional fatigue. J. Environ. Psychol. 2010;30:494–500. doi: 10.1016/j.jenvp.2009.12.002.
[152] Kaplan, S. The restorative benefits of nature: Toward an integrative framework. Journal of Environmental Psychology. Volume 15, Issue 3, September 1995, Pages 169-182.
[153] White, MP; Alcock, I; Wheeler, BW; et al. Coastal proximity, health and well-being: results from a longitudinal panel survey. Health Place Journal. 2015.
[154] Landsat-8 satellite imagery provided by Jarlath O'Neil-Dunne at the University of Vermont Spatial Analysis Laboratory as part of 2014 study on urban tree cover in New Haven.
[155] Mock, B. CityLab Article. "Why Detroit residents pushed back against tree planting." https://getpocket.com/explore/item/why-detroit-residents-pushed-back-against-tree-planting
[156] American Forests Magazine. Tree Equity Issue. Winter/Spring 2020. Found at https://www.ctwoodlands.org/sites/default/files//American-Forests%20Magazine%20Tree%20Equity%20Issue%202.11.20.pdf
[157] American Journal of Preventative Medicine (2013); 44(2):139 –145.
[158] Study of urban tree cover in New Haven (2009): https://portal.ct.gov/-/media/DEEP/forestry/urban_forestry/UTCReportNewHavenpdf.pdf
[159] Study of urban tree cover in Hartford (2010): https://portal.ct.gov/-/media/DEEP/forestry/urban_forestry/TreeCanopyReportHartfordpdf.pdf
[160] Study of urban tree cover in Bridgeport (2012): https://portal.ct.gov/-/media/DEEP/forestry/urban_forestry/TreeCanopyReportBridgeportpdfpdf.pdf
[161] Study of urban tree cover in Greater Bridgeport region (2014): https://portal.ct.gov/-/media/DEEP/forestry/urban_forestry/GreaterBridgeportTreeCanopyReportpdf.pdf
[162] City of Hartford Urban Tree Canopy Assessment and Planting Plan (2014): https://www.americanforests.org/wp-content/uploads/2015/04/AF-Community-ReLeaf-%e2%80%94-Hartford-UTC-Assessment.pdf

[163] City of Hartford Tree Canopy Action Plan (June 2020): https://hartfordgov-my.sharepoint.com/:b:/g/personal/yig001_hartford_gov/EWf4RrmpvSxHrB8f4LP8QU8BN8o8gHUfvI89QN4EJzi82g?e=kUV41m

[164] https://www.mass.gov/service-details/greening-the-gateway-cities-program

[165] Donnelly, C. and Doria, G. The Use of Wood from Urban and Municipal Trees. CT DEEP Division of Forestry publication. June 2014. Found at https://portal.ct.gov/-/media/DEEP/forestry/urban_forestry/Biomassfinal62914pdf.pdf

[166] Sherrill, S. and Bratkovich, S. (2018) Estimates of Carbon Dioxide withheld from the Atmosphere by Urban Hardwood Products. https://www.researchgate.net/publication/324687399_ESTIMATES_OF_CARBON_DIOXIDE_WITHHELD_FROM_THE_ATMOSPHERE_BY_URBAN_HARDWOOD_PRODUCTS

[167] USDA Forest Service. Wood Education Resource Center/Urban Wood Utilization resources: https://www.fs.usda.gov/naspf/programs/wood-education-and-resource-center/urban-wood-utilization

[168] Oliver, C., Nassar, N., Lippke, B., & McCarter J. (2014). Carbon, Fossil Fuel, and Biodiversity Mitigation with Wood and Forests. *Journal of Sustainable Forestry. 33*(3), 248-275.

[169] Forest Management & Greenhouse Gas Mitigation Opportunities. Information Sheet #7. Peter Woodbury & Jenifer Wightman (2017).

[170] McDowell, N.G., Allen, C.D., Anderson-Teixeira, K., Aukema, B.H., Bond-Lamberty, B., Chini, L., Clark, J.S., … Xu, C. (2020.) Pervasive shifts in forest dynamics in a changing world. Science. 368 (6494). DOI: 10.1126/science.aaz9463

[171] Brodribb, T.J., Powers, J., Cochard, H. and Choat, B. (2020) Hanging by a thread? Forests and drought. Science. 68, 261–266.

[172] Anderegg, W.R.L., Trugman, A.T., Badgley, G., Anderson, C.M., Bartuska, A., Ciais, P., Cullenward, D., … Randerson,J.T. (2020) Climate-driven risks to the climate mitigation potential of forests. Science 368, 1327.

[173] Janowiak, Maria K. et al. 2018. *New England and northern New York forest ecosystem vulnerability assessment and synthesis*: a report from the New England Climate Change Response Framework project. Gen. Tech. Rep. NRS-173. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 234 p. https://doi.org/10.2737/NRS-GTR-173

[174] Swanston, C., Brandt, L.A., Janowiak, M.K. *et al.* Vulnerability of forests of the Midwest and Northeast United States to climate change. *Climatic Change* **146,** 103–116 (2018). https://doi.org/10.1007/s10584-017-2065-2

[175] Ibid.

[176] Joyce, Dennis G., and Gerald E. Rehfeldt, Management strategies for black spruce (*Picea mariana* (Mill.) B.S.P.) in the face of climate change: climatic niche, clines, climatypes, and seed transfer, *Forestry: An International Journal of Forest Research*, Volume 90, Issue 4, October 2017, Pages 594–610, https://doi.org/10.1093/forestry/cpx018

[177] Janowiak, Maria K. et al. 2018. *New England and northern New York forest ecosystem vulnerability assessment and synthesis*: a report from the New England Climate Change Response Framework project. Gen. Tech. Rep. NRS-173. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 234 p. https://doi.org/10.2737/NRS-GTR-173

[178] Manomet Center for Conservation Science (Manomet) and Massachusetts Division of Fisheries and Wildlife (MA DFW). 2010. Climate change and Massachusetts fish and wildlife: Volume 2 habitat and species vulnerability. Massachusetts Division of Fisheries and Wildlife, Westborough, MA. https://climateactiontool.org/

[179] Ibid.

[180] Ibid, Janowiak, Maria K. et al. 2018.

[181] Adaptation Subcommittee to the Governor's Steering Committee on Climate Change (ASGSCCC). 2010. The impacts of climate change on Connecticut agriculture, infrastructure, natural resources and public health. Available at: http://www.ct.gov/deep/lib/deep/climatechange/impactsofclimatechange.pdf

[182] Climate Change Atlas https://www.fs.fed.us/nrs/atlas/tree/43 U.S. Department of Agriculture, Forest Service.

[183] Moore Myers, Jennifer, Coastal Forests Face Rising Sea Levels, Increased Salinity, SRS Science Communications, November 7, 2019: U.S. Department of Agriculture, Forest Service. https://www.srs.fs.usda.gov/compass/2019/11/07/coastal-forests-face-rising-sea-levels-increased-salinity/

[184] Wildlands and Woodlands, "Public Conservation Funding in New England: Recent Trends in Government Spending on Land Conservation."
https://www.wildlandsandwoodlands.org/sites/default/files/Public%20Funding%20LR.pdf
[185] From powerpoint presentation by Chris Hoagland, Climate Change Program Manager, Maryland Department of the Environment on May 18, 2020.
[186] U.S. Climate Alliance Natural and Working Lands Learning Lab, July 9-11, 2018
[187] https://www.rggi.org/allowance-tracking/offsets/offset-categories/forestry-afforestation
[188] U.S. Climate Alliance Natural and Working Lands Learning Lab, July 9-11, 2018
[189] https://www.landtrustalliance.org/topics/taxes/income-tax-incentives-land-conservation
[190] U.S. Climate Alliance Natural and Working Lands Learning Lab, July 9-11, 2018
[191] Highstead, "New England Conservation Pathways Report", pp 73-80
https://www.wildlandsandwoodlands.org/sites/default/files/Highstead_Pathways_Report.pdf
[192] Id., pp. 52-58
[193] U.S. Climate Alliance Natural and Working Lands Learning Lab, July 9-11, 2018
[194] Land Trust Alliance, Studies by Peter Szabo, Bloomington Management Advisors
[195] https://www.cityforestcredits.org/
[196] https://www.epa.gov/statelocalenergy/state-inventory-and-projection-tool
[197] Butler, B. (2018). Forests of Connecticut, 2017. Resource Update FS-159. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 3 p. https://doi.org/10.2737/FS-RU-159.
[198] Tomasso, L., and M. Leighton (2014). The impact of land use change for greenhouse gas inventories and state-level climate mediation policy: A GIS methodology applied to Connecticut. Journal of Environmental Protection, 5: 1572-1587. http://dx.doi.org/10.4236/jep.2014.517149
[199] Brown, M., Canham, C., Murphy, L., and T. Donovan (2018). Timber harvest as the predominant disturbance regime in northeastern U.S. forests: effects of harvest intensification. Ecosphere 9, e02062.
[200] Duveneck, M., and J. Thompson (2019). Social and biophysical determinants of future forest conditions in New England: Effects of a modern land-use regime. Global Environmental Change, 55: 115-129. https://doi.org/10.1016/j.gloenvcha.2019.01.009
[201] Tomasso, L., and M. Leighton (2014). The impact of land use change for greenhouse gas inventories and state-level climate mediation policy: A GIS methodology applied to Connecticut. Journal of Environmental Protection, 5: 1572-1587. http://dx.doi.org/10.4236/jep.2014.517149
[202] Sharp, R., H. Tallis, T. Ricketts, A. Guerry, S. Wood, R. Chaplin-Krame, E. Nelson, D. Ennaanay, S. Wolny, N. Olwero, K. Vigerstol, D. Pennington, G. Mendoza, J. Aukema, J. Foster, J.Forrest, D. Cameron, K. Arkema, E. Lonsdorf, C. Kennedy, G. Verutes, C. Kim, G. Guannel, M. Papenfus, J. Toft, M. Marsik, J. Bernhardt, R. Griffin, K. Glowinski, N. Chaumont, A. Perelman, M. Lacayo, L. Mandle, P. Hamel, A. Vogl, L. Rogers, W. Bierbower, D. Denu, and J. Douglass (2018). InVEST 3.6.0 User's Guide. The Natural Capital Project, Stanford University, University of Minnesota, The Nature Conservancy, and World Wildlife Fund.
[203] Hurd, J., E. Wilson, D. Civco, S. Prisloe, and C. Arnold (2003). Temporal Characterization of Connecticut's Landscape: Methods, Results and Applications. In Proc 2003 ASPRS Annual Convention, Anchorage, AK 12 p.

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Public Comment re: Protecting a Strategic Network of Nature

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:43 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Crowley, Erica M. <erica.crowley@trincoll.edu>
**Sent:** Wednesday, October 21, 2020 10:08 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Public Comment re: Protecting a Strategic Network of Nature



Good evening,

This is Erica Crowley from Hartford, CT. I am a Master's level social worker by training, community organizer, and community-engaged staff member at Trinity College. I'm writing today in my personal capacity to ask you to protect nature preserves for the public which are critical to the well-being of our communities across the state, especially for our mental health. Right now only 1% of the land in CT has strong protection (i.e. a National Park) - which is essentially none of our public land.

There are so many reasons why this is critical and we know that the pace of our environmental destruction is far too fast. I hope that Connecticut can be a leader in finding strategic ways to protect the natural areas we have for the well-being of our earth and communities. As a social worker I know the detriment to our communities' mental health without opportunities to engage in nature. Our outdoor spaces are a lifeline for so many people, especially during Covid, and this is especially true for those of us living and working in urban areas.

In my work I hope to continue to engage community-based organizations including those focused on climate change issues. I hope the Governor's Council can help us by stepping forward to protect our public land.

Thank you for your time and consideration.

--

Erica Crowley, MSW

Director of Community Learning

Center for Hartford Engagement and Research

Trinity College

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Pronouns: she/her/hers

"When you lose your laugh, you lose your footing." -Ken Kesey

Connecticut Department of
ENERGY &
ENVIRONMENTAL
PROTECTION

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October 21, 2020

Rebecca French
Director, Office of Climate Planning
Connecticut Department of Energy and
Environmental Protection
79 Elm Street, Hartford, CT 06106-5127

***Re: Comments for the Draft GC3 Work Groups.***

Dear Ms. French:

We appreciate the opportunity to comment on the seven draft GC3 working group reports. Each of these reports cover a vast amount of material, an enormous task for each of the workgroups. We, the Watersheds Section, are a small group within the Bureau of Water Protection and Land Reuse at the Department of Energy and Environmental Protection. Much of the work that we focus our efforts on overlaps with several of the recommended actions and is significantly impacted by climate change. We commend the GC3 Work Groups for this effort and provide the following comments in support of this monumental task before us all:

- **GC3 Process and Next Steps.** We support the intent to consolidate and correlate the recommended actions of the various reports. Many of the overlapping themes between the reports are essential for abating the impacts of climate change and improving quality of life for the citizens of Connecticut. These commonalities should be coordinated across the workgroups, thereby reducing the possibility for contradictory recommendations.

- **Recommended Implementation Action, Infrastructure and Land Use – Land Use and Buildings (LUB-1).** We recognize and support the intent of the recommendation for a state-wide storm water utility, as recommended in the Infrastructure and Land Use Adaptation Report. However, we recommend careful consideration of local acceptance for a state centralized utility. Many stormwater utilities or authorities that exist elsewhere are framed and developed to respond to locally prioritized stormwater management needs. An emerging alternative with promising support is the non-formal stormwater collaboratives in several regions of New England. Locally, the Eastern Connecticut Stormwater Collaborative has developed regular and productive participation through peer-to-peer networking of municipal public works and engineering staff, consultants, regional Council of Governments, and agency representatives with a part time coordinator. More information is available at

www.conservect.org/eastern.

- **Recommended Implementation Action – Infrastructure and Land Use – Utility Infrastructure (UI-6) Identify and incentivize construction of high-priority water supply interconnections to improve resiliency –** While it may be necessary under some circumstances to identify high-priority water supply interconnections to improve regional water supply resiliency, we urge cautious and careful consideration of unanticipated impacts that proposed interconnections may have on the existing water resources from which this water would be diverted. Out-of-basin transfers from surface or ground water resources to other basins may reduce flows significantly and have adverse effects on the ecological balance of local wetlands, streams, rivers, ponds and lakes in the host basin. Depending on the location, out-of-basin transfers may also affect private wells and smaller water supply systems within the host basin. Climate change may compound impacts of increased water withdrawals from the host basin via interconnections.

- **Resources – Infrastructure and Land Use- Utility Infrastructure (UI-8)** The Infrastructure and Land Use Adaption Report, recommends that there is continued support for remedying the Combined Sewer Overflow (CSO) conditions. We support this continued effort and recommend adding the following resources:

  NRDC's Rooftops to Rivers II report (2012)
  https://www.nrdc.org/resources/rooftops-rivers-ii-green-strategies-controlling-stormwater-and-combined-sewer-overflows
  Green Infrastructure Feasibility Scan for Bridgeport and New Haven, Connecticut (2012)
  https://portal.ct.gov/DEEP/Coastal-Resources/Coastal-Management/Green-Infrastructure-Symposium
  Connecticut Clean Water Financial Assistance for Municipal Projects (2019)
  https://portal.ct.gov/DEEP/Municipal-Wastewater/Financial-Assistance-for-Municipal-Wastewater-Projects
  Camden, New Jersey Uses Green Infrastructure to Manage Stormwater
  https://www.epa.gov/arc-x/camden-new-jersey-uses-green-infrastructure-manage-stormwater
  DC Utilizes Green Infrastructure to Manage Stormwater
  https://www.epa.gov/arc-x/dc-utilizes-green-infrastructure-manage-stormwater

- **Recommended Implementation Action- Public Health and Safety. Develop an energy audit program for water systems (Water and Wastewater) to increase energy efficiency and reduce greenhouse gas emissions across the water industry.** We support this recommendation. One energy efficiency opportunity that is often overlooked is the energy savings that can be realized from water conservation; the distribution of water and the household use all consume significant energy. These conservation efforts target two key areas impacting and impacted by climate change.

- **Resources – Working and Natural Lands- Rivers.** We recognize the effort

that the many of the Working and Natural Lands Sub-groups have put into the effort finding a variety of reliable resources. We find the Rivers subgroup appendices incredibly valuable and as such, recommend anchoring the appendices into the main body of the report, especially Appendix A. This appendix is a thorough report in itself, and documents the critical cold water habitats mapped to date and the clear disproportionate impact cold water habitats will endure from thermal stress if adequate ground water recharge is not considered in land use decision making.

- **Resources – Working and Natural Lands.** We recommend adding the additional resources specifically for the Rivers group:

  Being Prepared for Climate Change; A Workbook for Preparing Risk-based Adaptation Plans
  https://www.epa.gov/sites/production/files/2015-01/documents/cre_2014workbook_appendix_f_508.pdf

  Vermont Surface Water Management Strategy/Thermal Stress
  https://dec.vermont.gov/sites/dec/files/documents/wsmd_swms_StressorPlan_Thermal_Stress.pdf

  Eastern Brook Trout Joint Venture (EBTJV) https://easternbrooktrout.org/

  Alliance for Water Efficiency https://www.allianceforwaterefficiency.org/

- **Recommended Implementation Action.** A few of the reports noted evaluating public access to waterways to increase public awareness and education. We support this essential step in awareness and education, and believe it should be a recommendation. We recommend the following resource for consideration in developing the final report:

  New York Department of Environmental Conservation (NYDEC) Hudson River Estuary Program is partnering with New England Interstate Water Pollution Control Commission (NEIWPCC) to promote flooding and SLR resiliency projects at numerous water access and scenic vista sites along the Hudson River corridor.
  https://www.dec.ny.gov/lands/5104.html

- **Recommended Implementation Action.** Conserving water and recognizing the constraints that climate change stressors can pose to water quantity is another consistent theme across several of the reports. We agree and recommend that the final report recognize the hydrological connections between water quantity and water quality are fundamentally important in effective land use decision making.

- **Recommended Implementation Action**. One key barrier to managing sustainable aquatic freshwater ecosystems is by an unintentional practice of addressing hydromodification through project-specific lenses. Increasingly adverse and complex impacts from hydromodification of our waterways runs the gamut from dam construction and maintenance to flow regulation, urbanizing stream channel

alterations, and stream bank and shoreline erosion. Emphasizing a more coordinated and holistic approach to managing hydromodification may widen the door to creative partnerships across myriad water resource management and conservation programs. (A resource example is the Moosup River Restoration project which can be made available upon request.)

We appreciate and applaud the efforts put forth to provide a multidisciplinary, wholistic approach to climate change mitigation and resiliency. Thank you for the opportunity to comment and we look forward to the final report.

/s/ Erik Bedan
Erik Bedan,
Supervising Environmental Analyst

Cc: Kate Knight, Environmental Analyst
Chris Malik, Environmental Analyst
Susan Peterson, Environmental Analyst
Eric Thomas, Environmental Analyst

UCONN
UNIVERSITY OF CONNECTICUT

**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect our nature preserves

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 8:59 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

---

**From:** Frymire, Erin L. <erin.frymire@trincoll.edu>
**Sent:** Wednesday, October 21, 2020 8:54 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect our nature preserves

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To Whom It May Concern:

I write to entreat you to protect and expand Connecticut's nature preserves. Despite the many serious and pressing matters facing our state today, none is as urgent as the environmental crisis. We cannot delay our efforts to take seriously the protection of crucial resources. Currently, only 1% of Connecticut is protected land. This simply is not enough to maintain the biodiversity we need to ensure a healthy ecosystem in our state or to provide sufficient opportunities for everyone to enjoy, learn, and connect to the natural world of which we are a part. We are stewards of this earth, and it is entirely our responsibility to take action and protect nature preserves for our future, planet, our community, and ourselves.

Sincerely,

Dr. Erin Frymire

Erin Leigh Frymire, PhD

Lecturer

Allan K. Smith Center for Writing and Rhetoric

Trinity College

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October 21, 2020

CT GC3 Mitigation - Buildings Working Group

Report Appendix

Sustainability and Production Potential for Biodiesel in CT

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**Biodiesel - Direct Path to a Sustainable Energy Future**


Biodiesel is a renewable replacement for petroleum diesel fuel and natural gas. It is made from used cooking oil, animal fats, brown (sewer) grease, and agricultural byproducts and co-products.

The feedstock used to produce U.S. biodiesel has become increasingly diversified, with waste products making up an increasing volume of feedstock used to produce fuel. Biodiesel offers an especially effective outlet for fat-based waste streams that can incur substantial disposal costs.

Several different types of plants, including soybeans and canola, can also provide feedstock for biodiesel production. It is important to understand that demand for protein meal used as livestock feed is the primary driver for the planting of soybeans since 80 percent of a soybean is comprised of protein meal. The remaining 20 percent of the soybean is comprised of oil, which cannot be digested by animals and must therefore be removed. The biodiesel industry helps to make economical use of this excess oil with the result that the net cost of protein meal is reduced.

Biodiesel achieves greenhouse gas (GHG) emissions of about 80% compared to oil-fired combustion systems and about 70% compared to natural gas-fired systems. Biodiesel thus provides a direct pathway toward achieving the common energy policy goals of 40% GHG savings by the year 2030 and 80% GHG savings by the year 2050.

New York and Rhode Island have addressed food and fuel concerns in their respective Bioheat® requirement laws by allowing only US EPA-approved “Advanced Biofuel” feedstocks, which must meet a 50% lifecycle greenhouse gas threshold. Recent reports and publications from Argonne National Laboratory state that biodiesel from virgin oil feedstock in fact now achieves greenhouse gas (GHG) savings of 66 to 72%, even with consideration of indirect land use change (ILUC), and up to 81% of direct carbon savings. US EPA regulations also preclude palm oil and palm derivatives as feedstocks for biodiesel.

The notion that biodiesel feedstocks are diverted from food supplies is a myth. Most biodiesel manufactured in New England is made from used cooking oil. But importantly, the virgin oils used for biodiesel production in the US are coproducts of protein production. For every gallon of biodiesel produced from soybean oil, 30 pounds of protein and 22 pounds of carbohydrates and dietary fiber enter the food supply.[1] The natural symbiosis of stored solar energy in the food supply is a reason to promote biofuels coproduced from food commodities. Sustainable energy systems and a circular economy should embrace the fundamental idea of harnessing more bioenergy from these natural systems that are essential to feeding a growing global population.

Between 2004 and 2011, global land in agricultural production declined by 60 million acres[2] and forested area increased by 19 million acres. This was possible because farmers produced more food per acre. They did so by growing less grass for beef and ruminant consumption, and by growing crops that produce more protein, fat, and soluble carbohydrates per area. Biofuels can improve both the economics of food production and the sustainability of energy supplies. The more efficient production of protein from fewer acres results in overproduction of fat beyond what can be consumed as food[3]. Biodiesel is a key outlet for this excess fat. Biodiesel also enables the transition to more efficient agriculture and more room for forests.

Other new sources of biodiesel feedstock under development include winter annual oilseeds, which can be planted in the fall and harvested in May or June of the following year. As an example, the promise for CoverCress (field pennycress with specific oil and fiber traits) stems from the fact that it fits into an existing traditional corn-soy rotation without materially affecting either of those crops. The crop can reduce runoff and loss of nutrients during the winter, thus improving soil biology and providing an additional revenue stream for farmers.

**Bioheat Emissions Reductions**

Biodiesel can be blended with heating oil (including No. 2 through No. 6 oils) to improve the operational and environmental performance of oil-fired systems. Biodiesel significantly reduces emissions that are harmful to human health and the environment including particulate matter, sulfur oxides, nitrogen oxides, carbon monoxide, and aromatic hydrocarbons.

[1] One gallon of biodiesel requires 7.5 pounds of vegetable oil. Every pound of soybean oil is coproduced with approximately 4 pounds of protein meal. 7.5 x 4 = 30 pound of protein meal.
[2] Taheripour et al. (2017), Taheripour, Zhao, and Tyner. "The Impact of Considering Land Intensification and Updated Data on Biofuels Land Use Change and Emissions Estimates,' Biotechnology for Biofuels (2017) 10:191; https://biotechnologyforbiofuels.biomedcentral.com/articles/10.1186/s13068-017-0877-y
[3] Taheripour et al. (2018). "Technological Progress in US Crop production: Productivity Gains, Abundant Supply of Crop Calories, Evolution in the Livestock Industry and Implications for Biofuel Production, International Conference of Agricultural Economists, August 2018 Vancouver; 10.22004/ag.econ.277291

PHOTO A. A B100-fired boiler in a Brookhaven National Laboratory testing facility.

The environmental and public health benefits of blending biodiesel with heating oil include direct reductions in particulate matter, sulfur oxides, nitrogen oxides, carbon monoxide, aromatic hydrocarbons, and lifecycle reduction for carbon dioxide and equivalent greenhouse gases. Emission benefits increase with the percentage of biodiesel from 5% (B5), 10% (B10), and 20% (B20), and are significant even at low blend levels.

**Carbon Dioxide ($CO_2$):** 100% biodiesel reduces lifecycle greenhouse gases (primarily $CO_2$) by 81%. The corresponding reductions for B5, B10 and B20 blends of biodiesel would be 4%, 8%, and 16%, respectively.

**Nitrogen Oxides ($NO_X$):** Study results vary as nitrogen oxide emissions vary with the type of appliance as well as the blend of biodiesel. For residential space heating equipment, typical biodiesel blends (B0-B20) can produce NOx reductions between 5 and 7.5%. Commercial boilers using higher blends can reduce NOx by as much as 35% using B100.

**Particulate Matter ($PM_{2.5}$):** Practically all particulate matter emitted falls in the $PM_{2.5}$ fraction. B20 reduces $PM_{2.5}$ by 15.7%.

**Carbon Monoxide: (CO):** Carbon monoxide reductions due to 100% biodiesel in heating oil applications vary between 40% for commercial boilers and 16% for residential boilers. Residential application can expect 5% CO reduction using B10 and 9% reduction using B20.

**Biodiesel is a Drop-in Replacement for Traditional Heating Oil**

Biodiesel is a drop-in fuel that can be implemented with only limited or no equipment modifications. Recent testing has shown that B100 neat biodiesel can be used in boiler systems via engineered conversions that incorporate cleaning and usually just limited hardware upgrades to fuel storage systems and burners. B100 biodiesel can enable buildings to immediately achieve the 80% GHG savings that are necessary for protecting our environment. Biodiesel can also be used as a supplement or replacement for natural gas in buildings that have existing or retrofit, dual-fuel capability in their boiler or furnace systems. Biodiesel provides a technically feasible pathway for gas-fired heating systems to achieve a sustainable energy future while maintaining clean emissions performance.

The National Oilheat Research Alliance (NORA) has been running cycling tests at its Liquid Fuels Research Center in New York. Final results have not been documented, as the full testing is not yet complete, however, interim findings are available. In the test procedure, NORA has run different blends of biodiesel (B0, B20, B50 and B100) on the most common fuel pump in the market. The procedure essentially has the pump turn on for a short time and then shut off, and this process is repeated continuously. NORA has established a goal of having 500,000 cycles, which would be equivalent to approximately 50 years of service. After that cycling is completed, a test to evaluate whether the seals hold pressure is done. NORA's results indicate there are no issues with B20 and B50 at 500,000 cycles, and B100 is now over 350,000 cycles with no issues. The B100 cycling will be completed in mid-July and a report will be issued thereafter.

Biodiesel blends up to at least B50 can and are currently being used successfully in residential and commercial heating applications. The field experience of retail home heating companies using biodiesel blends up to B50 has resulted in no operability issues and no need for appliance adjustments, cleaner burning appliances with less need for maintenance, and this is all achieved at no additional cost to the

consumer. It is simply the delivery of up to a 50% biodiesel blended fuel versus ultra-low sulfur diesel fuel.

In November 2018, Brookhaven National Laboratory (Sustainable Energy Technologies Department / Energy Conversion Group) reported "field experience with biodiesel blends has shown no clear technical issue compared to that of conventional No. 2 oil. Overall, the results of this work have not identified a clear technical barrier which would limit the use of biodiesel in home heating systems. It should be emphasized that these results are only applicable to biodiesel which has been properly processed from its parent oil/fat into biodiesel and that meets the stringent ASTM D6751 specification for B100 prior to blending."[4]

Further, Underwriters Laboratories (UL) has established a test procedure for B20 and is expected to begin establishing a procedure for blends from B20 to B100 in the near term. Burner manufacturers are now evaluating their equipment against this standard and doing the necessary research and testing to achieve UL approval. Currently, the barrier to having manufacturer approved equipment for higher blends is the process of development and approval of the UL test procedures. The biodiesel and oilheat industries are participating in the formal process of developing this UL standard.

Transportation

Biodiesel's overall emissions from internal combustion engines are significantly lower than those of petroleum diesel. Biodiesel emissions have decreased levels of all target polycyclic aromatic hydrocarbons (PAH) and nitro PAH compounds.[5] These compounds have been identified as potential cancer-causing agents.

Biodiesel is the only alternative fuel to voluntarily perform Environmental Protection Agency (EPA) Tier I and Tier II testing to quantify emission characteristics and health effects. That study found that B20 biodiesel blends provide significant reductions in total hydrocarbons, carbon monoxide, and total particulate matter.

Research also documents the fact that the ozone forming potential of the hydrocarbon emissions of pure biodiesel is nearly 50 percent less than for petroleum fuel. Biodiesel reduces sulfur dioxide emissions to virtually zero and complements Ultra Low Sulfur Diesel (ULSD) fuel as an alternative to sulfur-containing fuels.

Biodiesel offers a significant opportunity to reduce our carbon footprint for transportation and should be given equal consideration with electric vehicles as a pathway to a sustainable transportation system. Our view is that electric vehicles and biodiesel-fueled vehicles can work in harmony to reduce fossil consumption in the transportation sector.

[4] Brookhaven National Laboratory, Sustainable Energy Technologies Department/Energy Conversion Group, B20-B100 Blends as Heating Fuels, November 2018, pages 55-56

[5] Biodiesel Tier 1 Health Effects, S. Howell, MARC-IV, C. Sharp, Southwest Research Institute, TRU Workshop, October 2002

Biodiesel is Good for the Environment

Biodiesel is environmentally safe and is the most viable renewable fuel for transportation, power generation and thermal applications, based on its low carbon footprint and favorable air quality characteristics. A full life-cycle analysis performed by U.S. EPA for RFS2 shows that biodiesel reduces greenhouse gas emissions by as much as 81 percent compared to traditional heating oil and diesel fuel.

We would stress the importance of performing due diligence evaluation of all renewable resources, with emphasis on economic benefits and least-cost solutions including capital cost factors (e.g., upfront costs for heat pump equipment vs. drop-in application for renewable fuels) that can impact the level of economic burden on consumers and businesses during the transition to a renewable energy future.

Biodiesel is Good for the Economy

Connecticut is already a significant producer and user of biodiesel and also has good access to waste cooking oil and other, agriculturally derived feed stocks via economical rail and water transportation, and could thus further expand its existing biodiesel production capacity. Biodiesel production offers the opportunity for significant job creation in the agricultural and food industry sectors throughout the US. The economics of biodiesel can be favorable for small through large-scale, thus providing flexibility for locally based, feedstock and fuel production.

**Conclusion**

The National Biodiesel Board urges DEEP and the GC3 to implement a significant role for biodiesel during their energy planning activities. Biodiesel can enable Connecticut to achieve environmental sustainability while realizing the economic benefits that come from new job creation. The National Biodiesel Board would be pleased to work with you to further explore the issues that we have described above.

Sincerely,

Floyd Vergara, Esq., P.E.
Director of State Governmental Affairs

Dear Chair Hammerling and the members of the Forests Sub-Group of the Working and Natural Lands Working Group of the Governor's Council on Climate Change,

Please see the following document for our comments on the draft report prepared by the aforementioned sub-group. Thank you for your hard work on this important document and for advocating for the continued conservation of the state's forest resources.

Respectfully,

Frank Cervo, CT CFP #1252
Douglas Emmerthal, CT CFP #932
Andrea Urbano, CT CFP #1262
Nicholas Zito, CT CFP #1044
William Hochholzer, CT CFP #132
Jeremy Clark, CT CFP #993
Francis Trafidlo, CF

## Summary

The draft report from the Forests Sub-Group of the Working and Natural Lands Working Group to the Connecticut Governor's Council on Climate Change is a highly variable document with some excellent content and some content which raises serious concerns. This report is intended to inform the development of policies and initiatives which will support the sustainable future of our state in the face of climate change. It is our belief, as forestry professionals actively practicing in Connecticut, that although it makes many sound recommendations which should be adopted as policy, the report also contains unsubstantiated claims and partisan opinions to such an extent that it must be reviewed by a larger scientific community before it can be included in the final report. The most concerning examples are the attempted scientific justification of the term "proforestation" and the associated recommendations; the call for the creation of Core Forest Natural Area Preserves on State Lands; and the lack of consistency with regards to terminology, recommendations, and the role of active forest management in mitigating the negative impacts of climate change. We provide greater detail about these issues below. We also make specific recommendations about the content of the report which we believe should be either highlighted or removed.

# Recommendations

Management of Forests on DEEP properties, pages 8-10

- Add information detailing the considerable extent to which DEEP properties are currently managed to mitigate the negative impacts of climate change. Add recommendations for increasing the capacity of these lands to be used as a model for the implementation of climate-mitigation-focused forest management elsewhere in the state, particularly for private and municipal forestland owners

Adopt Statewide "No-Net-Loss of Forest" Policy, page 14

- Clarify and define explicitly which activities are considered allowable use of forestland and which constitute conversion. Ensure that timber harvesting and other forestry activities are allowed as compatible, non-converting forest uses.
- Add extra protections to prevent the loss of core forest on state lands via the conversion of adjacent lands. Examples include funding to purchase easements or a PA 490 amendment which allows small parcels adjacent to state-owned core forest to be enrolled in the forestland taxation program

4. Fragmented forests with permanent "edge" are more prone to degradation, page 17

- Remove "frequent rather than episodic timber harvesting" from the list of activities which create forest edge. Timber harvesting does not create or maintain edge, as it is an activity which manipulates conditions in the forest but does not result in a loss of forestland

Forest Management Approaches, page 19

- Remove the first bullet which calls for the creation of reserves

Mitigation Considerations for Connecticut's Forests, pages 24-31

- Remove this section

# Unclear and Inconsistent Terminology

In this draft report, there is a lack of continuity in language and terminology. It is imperative that the terms used throughout the report be explicitly defined and consistently used according to those definitions. One example of this is the term "protection." There are many ways to define protection, and the report leaves the definition of this term up to the reader. The report must define exactly what protection is. When the report calls for protecting forests, what are they being protected from? Does the protection allow for certain activities while prohibiting others? Leaving these questions unanswered and up for interpretation by the reader presents a serious issue when this report is to be used to create policy, as policy makers may create policies which do not reflect the intention of the report's authors. It also creates discrepancies within the report, whereby the various recommendations and actions outlined are using the same or similar terminology to describe very different things, which again creates opportunities for misinterpretation.

Forest protection is defined as the process by which forests are prevented from being converted to non-forest land use. Examples of activities which convert forests to non-forest land use include residential development, commercial development, and agricultural land clearing – these activities would be prohibited under a properly implemented forest protection program. Examples of activities which do not convert forests to non-forest land use include

logging, silviculture, and wildlife habitat management – these activities would be permitted under a properly implemented forest protection program.

Other examples of important terms which are not clearly defined and/or are used inconsistently throughout the report include, edge, fragment/fragmentation, intact forest, mitigation-focused forest management, nature/natural, and old-growth. It is imperative that the report's authors clearly define these and any other terms they use to refer to a specific action or condition and then only use those terms to match the provided definitions. This is standard practice in scientific and technical reporting, but is noticeably absent here.

## Longevity, Additionality, Leakage, and Substitution

The report highlights the importance of considering the challenges of longevity, additionality, substitution, and leakage when creating climate policy. It goes on to discuss the positive role timber harvesting in Connecticut plays in mitigating the negative impacts associated with those four challenges, and calls for creating strong markets for products and services with multiple benefits. However, the report also contains recommendations for creating reserves, which run contradictory to the strong markets recommendations, would create leakage, and do not adequately address longevity, additionality, and substitution concerns. Below are the serious concerns related to the four stated challenges and reserves:

- **Longevity –** Creating a permanent reserve means that you remove all of the available options for managing given area - <u>forever</u>. Taking this approach may sound good, to some people, right now, but no one can know what the future holds, and so by making a definitive decision like that, there is no way to react in the future to protect the longevity of the forest reserve. There will almost certainly be disturbances which we cannot forsee now. There may also be substantial differences in our societal needs or the needs of our native flora and fauna which the forest reserves do not meet. There is no guarantee that the carbon stored in a forest reserve will remain stored there permanently. Actively managing forests creates a full suite of options for ensuring that the forest is being best used to meet the needs of the moment, including minimizing the detrimental impacts to the forest from climate change and helping to mitigate the negative impacts of climate change on society.
- **Additionality –** Core forests, urban forests, actively managed forests, forest reserves, and fragmented forests all sequester and store carbon. The authors of the report claim that forest reserves create additionality in that they will store more carbon than the same land otherwise would have, but this claim is not substantiated. Depending on a multitude of different factors, the amount of carbon stored in a newly created forest reserve could be larger, equivalent, or smaller than the amount of carbon stored on the land if it was not in a forest reserve. Another additionality concern is that 33% of the land owned by DEEP is already passively managed.
- **Leakage –** Creating forest reserves in Connecticut would create substantial leakage issues from an in-state and a global perspective. Thinking only in-state, depending on where these reserves are placed, the lost timber harvesting potential from that land could result in the displacement of members of the forest products industry towards other industries with negative carbon footprints. Or, the timber could be harvested

from other lands which, again depending on where the reserves are placed, may not have the same amount of careful planning and oversight and thus could result in further degradation. If the reserves are to be placed on State Forest land, this would certainly be the case. Thinking globally, Connecticut supplies high-quality forest products to markets all over the world. Decreasing Connecticut's ability to meet this demand would send these buyers looking elsewhere for these products, and they would almost certainly come from areas with less stringent environmental regulations, weaker worker protection policies, and less emphasis on sustainability.

- **Substitution –** The report outlines the degree to which wood has the potential to be used as a substitute for much more carbon-intensive building, heating, and other energy-related materials. Restricting timber harvesting in Connecticut would take away from the state's ability to participate in this important substitution benefit.

## Core Forest Natural Area Preserves

The principal of leakage is completely ignored where core forests on state owned lands, which is arguably the most scientifically and best managed forests in Connecticut, would be placed in Natural Area Preserves thereby deflecting the industry's demand for wood to potentially less scientifically managed, or worse, unmanaged private forests. Annual reports submitted between 1997 and 2020 by all certified forest practitioners indicates timber harvest off of state lands contributes on average 10.5% of the standing timber purchased. During times of poor timber markets the percentage of wood supplied from state managed forests rose significantly, at time as much as doubling. This is a significant supply of wood derived from sound, scientific, climate change mitigation focused management that will now need to come from somewhere else. In addition, halting harvesting in core forests mean timber harvesting will be pushed to smaller areas of forests where harvesting costs are higher and the activity occurs closer to homes. The principal of additionality is also questionable, as there are already substantial areas (33% of all DEEP owned properties, 21% of State Forests) which are passively managed.

It is also questionable whether or not some State Forests and Wildlife Management Areas can become Natural Area Preserves based on how they were acquired. PR lands may have federally rules inconsistent with NAP's. State Forests acquired through gifts often have deed clauses requiring active forest management such as the initial gift that formed Mohegan State Forest and James L. Goodwin State Forest.

The proposed no net loss of forest lands is a sound policy with respect to climate change, but the concept of protecting core forests on state lands does not belong in the policy conversation on climate change. While it is important, it is a different discussion with its own solutions. <u>It does not matter to climate change if the forests is core or not, only that it exists and there is as much or more of it tomorrow than yesterday.</u> The loss of core forest is seemingly a private lands occurrence, only affecting state lands when the adjoining private lands are converted. No data was cited that any state owned core forest had been converted or that it was even under a credible threat. The policy proposal of creating Natural Area Preserves in state owned core forests appears to be protecting lands that aren't under the highest level of threat. The highest level of threat is very likely privately held core forests.

# Claims Not Substantiated by Cited Research

*Red lettering is used to highlight text which is quoted from the draft report

The claims made in the "Mitigation Considerations for Connecticut's Forests" section of the report (pages 24 – 31) are not substantiated by the cited research. There are far too many examples of this practice to fully list here, but several are noted below.

"Natural ecosystems (grasslands, wetlands, forests) are, on balance, the best and most effective climate solutions available both for the uptake ("sequestration") and long-term storage of carbon, whereas human-made carbon capture technologies are still in their infancy.85" – Citation #85 is a paper titled "Natural climate solutions for the United States." This authors of this paper "quantified the potential of natural climate solutions (NCS)—21 conservation, restoration, and improved land management interventions on natural and agricultural lands—to increase carbon storage and avoid greenhouse gas emissions in the United States." Nowhere in the paper do the authors mention natural ecosystems. Rather, the focus of the paper is the concept of natural climate solutions, which the authors carefully and extensively define. Again, the authors mention nothing to the effect of "natural ecosystems," but rather discuss the potential of natural climate solutions to increase carbon storage and avoid greenhouse emissions. The subject of human-made carbon capture technologies is mentioned once by the authors in the paper's introduction, at which point the authors cite the associated research discussing human-made carbon capture technologies before continuing to introduce the contents of their paper.

"Of these natural systems, forests sequester and store the most carbon and likely have the largest potential to remove additional CO2 from the atmosphere.86" – Citation #86 is the same paper as citations #85, #87, #118, and #125. In addition, in a similar manner as was previously noted, the author of the report uses the term "natural system," which is not once mentioned by the authors of the cited document. The authors of the paper cited as #85, #86, #87, #118, and #125 have quantified the potential of natural climate solutions to increase carbon storage and avoid greenhouse gas emissions, which has nothing to do with what the author of the report has called "natural systems."

The authors of the document referenced as citation #85, 86, 87, 118, and 125 have quantified the mitigation potential of 21 different natural climate solutions. They have ranked them according to their potential and cost, with the top two choices being reforestation and natural forest management. Reforestation, according to the authors, has the highest mitigation potential. In the reforestation analysis, they went to long lengths to ensure that they were not calling for the conversion of land which is currently not forested because of its use in providing other valuable services to human populations, its inability to support forest cover, or the presence of a native non-forest ecosystem. The authors of the report mention that "Reforestation (conversion from non-forest to forest) generally has the highest potential rate of carbon dioxide sequestration among these four solutions" without any cited evidence. The authors of the natural climate solutions paper cited as #85, 86, 87, 118, and 125 explicitly state that reforestation "has the single largest maximum mitigation potential" and go on to explain in great detail how they have arrived at that conclusion through their research. The authors of the report later state that "Moderate mitigation potential exists for reforestation on lands that were once forested and are not currently being used for agriculture" with no quantification of

what the term "moderate" is being used relative to. This claim of "moderate" mitigation potential goes directly against the conclusions drawn from the previously cited research, which states that the mitigation potential from reforestation is the largest of any of the methods under consideration.

The authors of the document referenced as citation #85, 86, 87, 118, and 125 state that "Natural forest management of privately held forests has the second largest maximum mitigation potential." They have defined natural forest management as "Additional carbon sequestration in above- and belowground biomass gained through improved management in forests on private lands under nonintensive timber management." They go on to explicitly define the ways in which forest management can be improved in order to achieve the maximum mitigation potential. All of the methods under consideration in the document assume that long-term wood harvest levels are maintained. The improved forest management practices which they have called "natural forest management" include constraining near and mid-term harvest levels, reduced-impact logging, and thinning treatments. As stated earlier, all of these practices assume that long-term harvest levels are maintained.

They also note that "Public forests are generally already managed with longer rotations, such that the potential for increasing carbon storage on these lands through the improved management practices considered here is negligible." So, according to the authors, public forests are already being managed in such a way as to maximize their potential mitigation. This point goes directly against the later statements made by the authors of the report, who call for drastic changes to the management of public forests in order to increase their mitigation potential.

In short, the authors of the paper titled "Natural climate solutions for the United States," which is referenced in the report as citation #85, 86, 87, 118, and 125, have concluded that the two most effective means of mitigating the negative impacts of climate change with regards to forests are reforestation and natural forest management. Reforestation is the conversion of land from non-forest to forest, and natural forest management is constraining near and mid-term harvest levels while maintaining long-term harvest levels, applying reduced-impact logging practices, and using thinning treatments. There is no evidence in this publication to support any of the claims made in the "Mitigation Considerations for Connecticut's Forests" section of the report.

"Avoided conversion of forest to non-forest sustains the mitigation value of forests and is a prerequisite for both proforestation and improved forest management.87" The paper cited as #87 does not once mention "proforestation." The contents of this paper are not relevant to the statement.

"Proforestation (natural forest growth in areas protected from timber harvesting) is likely the most effective solution to preserve and foster further growth of accumulated carbon storage in woodlands. 88,89,90." The language used in this statement indicates that it is an opinion and not a fact. The intention of this report is to render facts and other objective information and not to state opinions. Neither paper #89 nor paper #90 mention the word "proforestation" once, and so neither of those papers support the claim made by the author of the report.

Paper #89, titled "Forest carbon storage in the northeastern United States: Net effects of harvesting frequency, post-harvest retention, and wood products," does conclude that in

their simulation of carbon storage in northern hardwood forests, the "no management" scenario resulted in the most carbon storage. This is an important conclusion which is relevant to the report. The authors note, however, that this conclusion does not account for substitution or displacement of timber harvesting to other properties or regions. It also lists several other management options which demonstrated a measured possibility of creating additionality in terms of carbon storage. The authors go on to note that "The methodologies used in this study provide a simple framework, with broad geographic applicability, for assessing C sequestration effectiveness in managed forests. With nationally available FIA data, and a widely accessible simulation model, our general methodology can be replicated in other regions." This is an important note, because they have conducted an analysis on specific forestry practices which are common in a specific geographic region in a specific forest type. The results of the reported analysis are definitely important and relevant to conditions in Connecticut, but a study replicated based on data and variables which are more relevant to Connecticut is needed in order to make the types of definitive claims which the authors of the report have made. The forest type used in the modeling, northern hardwoods, represents less than 10% of forestland in Connecticut; the data analyzed are from plots in a different climate zone than Connecticut; and the types of timber harvests simulated are not the most common types of timber harvests in Connecticut.

On page 19, in the section titled "Forest Management Approaches," the first bullet calls for increasing the amount of reserve, or passively managed, acreage in the state "to promote local and landscape/regional resilience (e.g., as buffers against extinction/extirpation2 ) and to provide controls to assess the outcomes of experimental manipulations." The claims made in this bullet are unsubstantiated and unreasonable. There is no reason to believe that reserves are a means of increasing resilience on a local, landscape, or regional level, and there is no citation associated with this claim. The research elsewhere in the report constantly refers to using various active forest management approaches in a balanced, carefully planned, and systematic manner as a means to increase resilience; resilience is not associated with reserves. Further, the example given by the authors of the report "eg., as buffers against extinction/extirpation," is unsubstantiated and inaccurate. Citation #2 is completely unrelated to buffers, extinction, or extirpation – it is a link to the CT DEEP webpage for greenhouse gas inventory reports. If the report seeks to address the pressing concerns for preventing extinction and extirpation in Connecticut, then its authors must consult the relevant research and professional knowledge on the subject and make informed conclusions about how to benefit and protect vulnerable wildlife species. The authors go on, in this bullet, to say that the increased reserve acreage is necessary "provide controls to assess the outcomes of experimental manipulations." This claim is also not cited or substantiated. In order to make such a claim, that authors must point to some kind of demonstrated lack of experimental controls, which they do not do. There is considerable research cited throughout the report which documents the results of peer-reviewed, scientifically rigorous experimental studies – none of these identify the need for more reserves to provide suitable controls to actively managed areas.

Fred Behringer
Old Lyme
October 20, 2020

To: The 2020 GC3

Comment on the Electricity Chapter of the Progress on Mitigation Strategies Group draft report

I strongly support many of the recommendations of the report. Reducing demand for electricity, increasing renewable capacity, and building out smart grid technologies will go a long way toward reducing CO2 emissions. That said, the scale of the changes needed, and the time frames are very aggressive. It is good to set the bar high, but I'm concerned that there may be too much reliance on wind and solar energy. The tradeoffs and costs may not be fully appreciated.

One tradeoff concerns the siting of utility solar. The recommendation to avoid "greenfield" development and use previously developed areas is critical to maintain valuable forest/agricultural land.

Another tradeoff of concern is that a lot of renewable technology relies on materials and products from countries with flagrant human rights and environmental problems (e.g., solar panels from China, minerals from Congo). It is commendable that ecojustice has played such an important part in all the 2020 GC3 discussions, and that should extend beyond CT's borders. As we build renewable infrastructure, we must support, not diminish, human rights and the environment around the globe.

A general comment is that more quantitative analysis would help guide decision making. As an example, CT currently uses about 36 TWh/year, a little over half of which is supplied by natural gas. Replacing the approx. 20 TWh of electricity from natural gas with wind and solar would require extensive installations because of capacity factors in the range of 25 -35%. For example, Park City Wind has a plate capacity of 804 MW, but it's actual average power output will be about 33%, or 265 MW, supplying approx. 2.3 TWh per year. In other words, about 8 Park City Wind projects are needed to replace natural gas at its current level. Solar will of course contribute, but a significant amount of area is needed to supply meaningful amounts of energy. I believe the value of the report would be increased by providing the best estimates available for the infrastructure needed to replace fossil fuels.

A better understanding of the large amounts of infrastructure needed for renewables should point out the incredible value of Millstone. I appreciate the report recognizing the significant contribution of Millstone in reducing CO2 emissions. However, the report should strongly recommend the continued nuclear energy beyond 2030 to increase the likelihood of "zero" carbon electrical generation by 2040.

A report such as this raises many questions. Perhaps it would be helpful to address the following:

1) Is it possible to obtain more energy from Millstone? If Millstone were to supply all its output to CT we would already be nearly 50% CO2-free.

2) Will enough battery storage or other means of environmentally friendly storage be available as more wind and solar come online? Large amounts of battery capacity will be needed to avoid natural gas as a backup when the wind is not blowing and sun not shining.

3) How will renewable energy impact electricity bills – particularly LMI consumers? Will costs of new technology decline enough to offset investments? Electricity is already relatively expensive in CT.

4) Are there good estimates for electrical demand in the future? Efficiency and conservation will reduce demand. On the other hand, electrification will increase demand. What is the net result and is it possible to model this to help plan the electrical system of the future?

Thank you for considering my remarks and best wishes guiding the state toward an environmentally responsible future that considers the well-being of all – here in CT and around the globe.

Fred Behringer
Old Lyme
October 20, 2020

To the 2020 GC3:

Comments on Science and Technology Working Group draft report

I strongly support the recommendations to expand research and data collection to understand the impacts of climate change and effective responses. Investing in high quality data is needed to make intelligent decisions. Given the economic impact of the epidemic, financial support will likely be difficult to provide. The good news there are many resources within CT to help with this effort. The report provides "References for action" providing a great start for recruiting support. Perhaps a committee should be formed for overall coordination and make the best use of available resources.

I also strongly support expanding opportunities for education across all age groups to learn about climate change and the environment. While legislation will be needed, it is best when people become motivated to act on their own. With knowledge, people will make the right decisions and protect the environment as well as contribute to better legislation. This may also face funding constraints, but as with research there are many organizations that can be recruited to become involved.

Echoing recommendations of the Forests Sub-group, the preservation of forest land should be a priority for the many reasons stated. Related to this, Biomass should be removed as a Class 1 renewable.

For overall greater impact, it may be worthwhile considering combining and condensing the 17 tables outlining "Initial Recommendations". One of the great things about the GC3 working groups is the incredible amount of information they have provided. However, it is also overwhelming. While it's always a concern that good ideas are not captured, as a practical matter actions need to be prioritized. A shorter, prioritized list I feel would be more effective. I think this can be done without loosing significant content since some recommendations overlap (e.g. the 2$^{nd}$ - 4$^{rd}$ concerning Long Island Sound).

I suggest dropping the paragraph beginning "regular sleep and quality food" (p 21), related text and the recommendation regarding mental health. While an important topic it seems tangential.

Some hopefully constructive criticism is that it would have been good to learn more about technology that can be used to address climate change (e.g., battery storage, heat pumps, fuel cells). Technology is discussed throughout many working groups. A better understanding of the pros and cons of different technologies and what the future might hold, particularly with regard to cost, would help figure out the best plans. Perhaps this can be addressed in the next GC3. It may also be an area for economic development in CT.

As mentioned in the report, an important aspect of CT's effort addressing climate change is leading by example. As a state that comprises 1% of the nation's population and economy, the practical impact of our actions on a global problem are minimal. To increase the impact of our efforts, I'm wondering if a relationship could be formed with a sister state somewhere else in the world that we could both support and learn from. Climate change is a global problem and global outreach of some sort may be worth considering. I'm not sure which working group would be best to explore this. Perhaps the Science and Technology group would be in a good position since members may have international connections.

Thank you for considering my remarks and I appreciate the efforts by all to be so inclusive.

UCONN
UNIVERSITY OF CONNECTICUT

**Alec Shub <alec.shub@uconn.edu>**

# FW: TNC CT Comment letter on GC3 Draft Reports

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 6:24 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Frogard Ryan <fryan@tnc.org>
**Sent:** Wednesday, October 21, 2020 6:21 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Cc:** Joseph Wraithwall <j.g.wraithwall@TNC.ORG>; Nathan Frohling <nfrohling@TNC.ORG>; David Sutherland <dsutherland@TNC.ORG>
**Subject:** TNC CT Comment letter on GC3 Draft Reports



Dear Commissioner Dykes and DEEP staff,

Please find an attached letter with The Nature Conservancy in Connecticut's comments on the draft reports developed by the Governor's Council on Climate Change working groups. It is also available for download here. Thank you for this opportunity to provide comment.

I look forward to serving on the Adaptation and Mitigation subcommittees of the Governor's Council on Climate Change in order to further review and strengthen the substantial work represented in the draft reports.

If you have any questions, please do not hesitate to reach out to me (fryan@tnc.org) or our chapter's Director of External Affairs Nathan Frohling (nfrohling@tnc.org).

Best,

Frogard

**Frogard J. Ryan**

*State Director*

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Follow us on social media:

*At TNC we work flexibly, and while it suits me to email now, I don't anticipate a response outside your normal work hours.*



**TNC CT Comment on GC3 Draft Reports_10.21.pdf**
271K

The Nature Conservancy
Protecting nature. Preserving life.

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nature.org/connecticut

October 21, 2020

Commissioner Katie Dykes
79 Elm Street
Hartford, CT 06106
Via email: deep.climatechange@ct.gov

Dear Commissioner Dykes,

The Nature Conservancy in Connecticut appreciates the opportunity to comment on the draft work group reports developed for the Governor's Council on Climate Change.

Appended to this cover letter is our detailed analysis and comments of several of the reports, which are the result of review and consideration by our staff. We have been engaged throughout the working group processes, and we have a great deal of respect and appreciation for the hard work and broad participation across so many venues this year.

In addition to our comprehensive review of the reports, we have also provided general suggestions for the Council as it anticipates finalizing recommendations to the Governor and the Legislature. I would like to make special note of these ten key recommendations as priorities of The Nature Conservancy:

- **Executive Summary for Policymakers**: We assume there will be, and strongly urge the development of, a short executive summary for policymakers to summarize the most important concepts and recommendations.

- **Importance of Natural Climate Solutions**: Various reports address the role of healthy ecosystems in reducing atmospheric carbon through sequestration and in protecting human and natural communities from the impacts of climate change. We strongly recommend that the final council report reflect these critical benefits of natural infrastructure.

- **Zero-Carbon Power by 2040:** We want to express our firm support for the goal discussed in Executive Order 3 and reiterated in the work group reports. Energy decarbonation is key for transitioning toward a cleaner energy future while reducing energy costs, improving system reliability, and minimizing negative environmental impacts. We highlight here our new recommendation re the Electricity sector (ref page 43) that would assure that DEEP and PURA have the guidance, authority and

responsibility for its permit and other decisions to be consistent and supportive of realizing the State's decarbonization goals.

- **Transportation Emission Reduction Programs**: We ask that the State fully endorse the Transportation Climate Initiative and strive to communicate the importance of reducing transportation emissions. We recommend that outreach to various communities be done to discuss the wide range of environmental and socio-economic benefits from such programs.

- **Off-Shore Wind Development**: Off-shore wind (OSW) is disproportionately critical to meeting the State's zero-carbon goals and measures to support its deployment should be given corresponding weight. To that end we highlight and support the OSW recommendations in the Progress on Mitigation Strategies report on page 48 and 49. We particularly ask that the State address grid constraints to OSW and assure that OSW be given priority in regional power markets. We also recommend that DEEP contribute to efforts being made to establish environmental standards for OSW that would protect marine life and in so doing help expedite OSW development by streamlining the extensive permitting process. More specifically, this would strengthen DEEP's utilization of the role of the Commission on Environmental Standards (CES) established by PA 19-71 and for DEEP to participate where appropriate in efforts within the region (e.g. Regional Wildlife Science Entity (RWSE)).

- **Annual Bond Funding of $35 Million for Resilience**: Significant state financial assistance is required to enable communities to prepare for, and avoid the worst of, the impacts of climate change. Failure to make these investments will result in much greater costs to the state and communities if these impacts hit without risk reduction projects having been completed. An interactive, online portfolio has been compiled by TNC, municipalities, and Councils of Governments with over 450 such priority projects, almost all of which will create jobs and other benefits for towns and cities.

- **Access to Climate Funding**: We ask that any funding programs developed for climate adaptation and/or mitigation be available to non-governmental organizations and community groups. To maintain maximum flexibility, we strongly recommend that non-state entities be able to administer funding programs for the State.

- **Integrated Policy Implementation Across Plans**: We encourage CT DEEP to review all public policy recommendations across working groups to identify and prioritize and increase awareness of opportunities for integrating co-benefits into agency planning and management sectors. For example, elevating crossings to reduce road flooding, increasing culvert size to enhance wetland flushing and reducing vectors of mosquito borne illness requires interagency coordination to implement and communicate successfully. Integrating climate adaptation across sectors requires commitment to flexible, preventive and forward-looking approaches that may involve legal, institutional and policy changes as well as shared investments.

- **Resilient and Connected Landscape Vision:** For more than 10 years, a team of 150 scientists in TNC have developed a comprehensive map of resilient lands and significant climate corridors across North America: the Resilient and Connected Network (RCN). These sites, together with mapped climate corridors and movement zones incorporated in the RCN, will facilitate species range shifts and sustain Connecticut's biodiversity into the future and in the face of climate change. The RCN maps and underlying data are ready for Connecticut to use. We encourage CT DEEP to retain existing references to the RCN in the Climate Action Plan. We strongly recommend that CT DEEP use it as a unified vision to focus conservation strategies like carbon storage, siting energy infrastructure, mitigation of road crossings, and land and water protection. DEEP can also use it to inform effective management for resilience and carbon storage. Working with TNC and other partners on shared priorities can lend additional resources and a higher probability of success to conservation projects.

- **State-supported Program for Local Adaptation Planning**: The importance of developing a statewide program for local adaptation planning is clear across multiple reports. We agree that The Nature Conservancy's Community Resilience Building program, which started in Connecticut and has been used as the foundation for statewide local adaptation planning programs in Massachusetts (MVP) and Rhode Island (MRP), is the ideal model to build upon for this repeated recommendation. Identifying the steps for this recommended policy and facilitating a dialogue amongst state, regional, and local stakeholders will be key to effectively launching and sustaining this critical action, and we are ready to co-lead this work as we have done in Massachusetts and Rhode Island.

Thank you for your leadership and hard work in preparing these reports. We are grateful to be part of Connecticut's community of invested stakeholders in developing the state's climate change policies, and we appreciate the opportunity to participate in all aspects of the Governor's Council on Climate Change and its associated report development processes.

If you have any questions, please do not hesitate to reach out to me (fryan@tnc.org) or our chapter's Director of External Affairs Nathan Frohling (nfrohling@tnc.org).

Sincerely,

Frogard J. Ryan
State Director, The Nature Conservancy in Connecticut

*Please find our detailed comments starting on the next page.*

**General Comments**

These 10 separate reports reflect an extraordinary amount of work and expertise across the community of engaged advocates, citizens, and civil servants in Connecticut. However, creating a cohesive body of work that recognizes the overlapping focuses, recommendations, and needs among these reports while covering gaps and clarifying clear, actionable steps will take some additional time. These comments provide additional ideas and guidance for some future steps.

- We suggest that all recommendations clearly list who should or will implement the recommendation; while some reports include this information, there are many recommendations without an identified implementing body. Many recommendations list many actors to implement a recommendation, and in some of those cases we believe that a single leads or multiple co-leads as responsible entities could be noted. The GC3 should be involved in communicating with state agency leadership to understand their capacity and the feasibility of implementing the recommendations for which they would be responsible.
- We believe there is still a strong need for a review of all policy recommendations for clarity and impact. There are several overlapping areas of interest, and we believe there are also some conflicts between some recommendations.
- One key opportunity for high-level integration across working group reports is providing clear, actionable policy recommendations to the Governor and Legislature on water resource planning and water system vulnerability assessments. As noted in the State Water Plan (2018), Connecticut's approach to water management can be fragmented. We assessed water resource recommendations across multiple working group reports and noted several opportunities for increased integration of recommendations for vulnerability assessments and management actions. Prioritizing integrated water resource climate vulnerability assessments that consider the full cycle, value and uses of all water – including surface water, groundwater, drinking water, stormwater and wastewater and ecological integrity – will provide greater opportunities for innovative, multi-benefit and cost-effective solutions, and set the stage for policy improvements and shared investments that ensure Connecticut's water is safer, cleaner and more resilient. Based on these reports, we see a clear opportunity across water resource sectors to evaluate and clear state policy barriers, reduce fragmented water management and strengthen incentives for lower-impact land use practices and water conservation at the local level. Rather than following these siloed policy recommendations as written, we encourage the State to work across agencies and with communities to identify policy intersections between watershed management, wastewater systems, drinking water systems, public health, and stormwater and flood management. State agencies should then adapt regulations, update standards and practices, and explore new business and governance models for improved equity, resilience, service and efficiency in the water sector.
- We recommend that language, style, and format be made consistent across reports. A summary of all recommendations would be helpful. We appreciated those recommendations that were supported by references, resources, and data, and we recommend that approach be normalized for all major policy recommendations.
- We suggest a clear identification of who should or will implement the recommendation throughout, and we think the GC3 should be involved in dialogue with state agency leadership to understand their capacity and the feasibility of implementing the recommendations for which they would be responsible.

**Financing and Funding Adaptation and Resilience Work Group Report**

The Financing and Funding Adaptation Work Group report includes many critical and clearly crafted assessments of the challenges that Connecticut faces regarding the impacts of climate change, as well as crucial recommendations to address those challenges before they become disasters. There are serval sections and aspects of this report that warrant strong support and attention; we would call out three in particular:

- The focus on Nature-based Solutions (NbS) is critical to ensure that Connecticut utilizes existing and future natural assets to address climate adaptation in the most sustainable and resilient ways possible. While the discussion of NbS may be more precisely appropriate for inclusion in the Adaptation and Planning Implementation Workgroup report, it is certainly relevant to the Financing report, and is crucial for inclusion in any final GC3 reports.
- The emphasis on Environmental Equity and Justice reflects Executive Order #3, and the pertinent recommendations are an essential start to ensuring that Connecticut adequately prepares for the impacts of climate change and addresses historical inequities that have resulted in communities of color bearing a disproportionate share of those impacts.
- The sections on insurance provide very clear background and sound recommendations regarding an industry that will be deeply affected by the impacts of climate change and that has to play a crucial role in helping residents, businesses, and communities prepare for and recover from, those impacts.

*Substantive comments (please note that CAPITALIZED words are suggested for insertion or addition)*

- On page 6 in the Executive Summary, and on page 25, this sentence would be more informative and relevant if it included a shortened description of the factors included on page 15 in the discussion of Disproportionate impacts on vulnerable communities:

  > Equity starts by recognizing that there are disparities and inequities in living conditions, WHICH HAVE BEEN EXACERBATED BY HISTORICAL INEQUITIES IN GOVERNMENT POLICIES AND SOCIETAL PRACTICES.

- This sentence in the first paragraph on page 20 is not correct. It could be corrected as so: "Additionally, the cost of maintaining Many LARGE OR HAZARDOUS damS is about $2,000 annually."
- The recommendations on page 28 under State-funded and Initiated Infrastructure and Buildings Projects are critical, but primarily address new infrastructure investments that the state and municipalities make. We should ensure that the Adaptation Planning Work Group report addresses existing infrastructure and prioritizes that which is in most critical need of resilience upgrades.
- On page 30, under "Build Outreach and Capacity and Tracking for the Increased Uptake of Flood Insurance", this recommendation should include brief explicit reiteration of the serious flaws in the NFIP program mentioned on page 16:

  > "2) Consideration should be given to developing a community flood insurance program as an additional layer of coverage alongside the National Flood Insurance Program (NFIP). Such a program, creatively designed using insurance vehicles, AND AVOIDING THE FLAWS IN THE NFIP WHICH RESULT IN PUBLIC SUBSIDY FOR COSTLY AND RISKY DEVELOPMENT AND/OR REDEVELOPMENT IN FLOODPLAINS, could ultimately protect the

community by providing a greater level of flood insurance uptake for business owners and residents.

- Under that same section, recommendation 3, which reads "Assistance should be provided to communities to help them qualify for greater flood credits under the FEMA Community Rating System (CRS) program." is critical, but the recommendation should include what is necessary to provide such assistance, such as increased agency staff, if that is the need.
- Appendices II and III, on pages 69 and 72, include recommendations by the Forests and Working Lands Subgroups to "Expand use of Regional Greenhouse Gas Initiative (RGGI) funds to forest land conservation." While The Nature Conservancy strongly supports forest conservation, the role that healthy forests play in sequestering carbon from the atmosphere, and initiatives that increase forest resilience, we are also very concerned about the many attempts that have been made to utilize RGGI revenues for purposes other than those for which the program was originally established. When the original RGGI statutes, which are now in Section 22a-200c, were developed in 2007, The Nature Conservancy proposed that the phrase "measures to…mitigate the impacts of climate change", meaning resilience and adaptation initiatives, be included in paragraph (c) (22a-200c(c)), which as passed, reads:

  > "The regulations adopted pursuant to subsection (a) of this section may include provisions to cover the reasonable administrative costs associated with the implementation of the Regional Greenhouse Gas Initiative in Connecticut and to fund assessment and planning of measures to reduce emissions, mitigate the impacts of climate change and to cover the reasonable administrative costs of state agencies associated with the adoption of regulations, plans and policies in accordance with section 22a-200a. Such costs shall not exceed seven and one-half per cent of the total projected allowance value…."

  We would note that RGGI funds have never in actual practice been used for resilience and adaptation, and would support, as we did in 2007, a use of a limited amount of the funds, as provided in the statutes, for such initiatives. We recommend, however, that this proposal in Appendices II and III note the statutory limit on the use of RGGI funds for adaptation, and that this work group recommendation be focused on using funds within the statutory limit, and not on expanding that limit. Connecticut's RGGI regulations also allow the use of initiatives for "Sequestration of Carbon due to Afforestation" as offsets for utilities to meet emission requirements. Due to various factors, the use of offsets has been non-existent or very limited. We would support a very limited use of RGGI funds directly for carbon sequestration, but only for projects that clearly demonstrate sequestration benefits.

*Comments regarding syntax, semantics, or grammar (please note that CAPITALIZED words are suggested for insertion or addition)*

- On the first page of the Executive Summary, this lengthy sentence would be more readable if broken apart, perhaps as so:

  > Framing: The report frames the needs for climate resilience financing and funding through a discussion of unmet disaster recovery needs following numerous past storms with national disaster declarations in Connecticut., THE REPORT notES thAT insured assets are at greater risk from climate change, and reviewS the impact of climate change on the financial markets., THESE IMPACTS

includE~~ing~~ the current regulatory practice of not informing investors of physical and transitional climate risks, warnings of a potential mortgage default crisis, and the potential downgrading of state and municipal bond ratings due to increasing costs if adequate, dedicated and recurring funding sources are not budgeted and invested in proactive natural hazard mitigation and climate resilience projects from planning through operation.

- On Page 8, spell out the abbreviation of "ADU" – Accessory Dwelling Unit.
- This sentence on page 10 does not appear to be a complete sentence:

  While more discussion and planning are necessary, preliminary feedback from these limited work groups suggests that a state invest~~ing~~MENT in the range of $2-3 million per year for environmental justice and community planning activities and $35 million per year for nature-based solutions WOULD BE NEEDED TO ADDRESS CRITICAL GAPS.
- The phrase "leading the way" in this sentence "While Connecticut has been leading the way…" at the beginning of page 12 is unduly vague. It would better be phrased: "While Connecticut has been ~~leading the way~~ DILIGENT with its forward-looking investments in recovering with resilience from Sandy,…"
- On page 12, under "Unmet Recovery Needs following Storms", this "sentence": "$158 million in identified unmet recovery needs after Sandy" is not a complete sentence and repeats what was stated earlier in the paragraph. It is redundant and unnecessary.
- This sentence on page 17, under "Difficulty Obtaining Grant Funding", should be changed to read: "In m~~M~~any aspects of resilience such as cutting-edge building technology, life-cycle analysis, health impact analysis, and community capacity building have not been advanced SUFFICIENTLY FOR CONNECTICUT to be competitive for national demonstration and research funding." The following sentence "CIRCA has modeled an initiative that has resulted in the knowledge and capacity necessary to secure funding for sea level rise." needs to be clearer as to what CIRCA is doing regarding sea level rise. It could be assumed that it is primarily research, but will CIRCA also be doing planning or implementation of protective measures? If not, which entities or organizations will in fact be on point for planning and implementation? Clarity would be welcomed here in this section.
- On page 18; although much of the previous sections have addressed Connecticut conditions, it is assumed, but not clear, that the "Take-up Rate of the National Flood Insurance Program (NFIP)" section refers to national statistics. That could be made clearer by editing: "It is estimated that approximately 50% of single-family homes located in the 100-year floodplains IN THE NATION[?] IN CONNECTICUT [?] are covered by flood insurance. It is also estimated that more than 29 million properties NATIONALLY have at least a high or moderate risk of flooding and THERE ARE only 5 million policyholders in the NFIP.
- On page 19, this sentence does not include the number of feet or projected sea level rise: "Connecticut is also planning for up to _____ feet of sea level rise by 2050, which will worsen coastal erosion and coastal flooding."
- In the second paragraph on page 20, this sentence should read: "These constructed gardens collecting rainwater AND absorbing it back into the ground and groundwater system."

- In the first paragraph on page 21, this sentence should read: "The shoreline will erode MORE slowLY~~er~~,"
- Two minor edits are needed on page 23: "We suggest there be a small amount of state funding designated for long term monitoring OF the efficacy of these nature-based solution projects." And "The river restoration working group, formed under the Long Island Sound Study has been a highly ~~a~~ successful model that has allowed practitioners and agency experts to learn and improve restoration techniques AND LINK FUNDING DIRECTLY WITH COLLECTIVELY AGREED UPON, PRIORITY PROJECTS."
- This sentence in the box on page 27 under "Incentivize Private Developers…" is unclear and may be clearer if "for example" is deleted: "Although private businesses are largely unregulated with respect to floodplain management statutes, ~~for example,~~ we know businesses suffer the impacts of climate change and natural disasters and those damages impact the people of Connecticut through the loss of jobs, services, and tax dollars to pay for recovery."
- The reference to $1 million in this sentence on page 30 under "Create Central Governance Authority" sounds artificially precise in a sentence that is otherwise vague. It may be improved with wording such as: "Large-scale resilience infrastructure projects for flood protection can cost in the tens of millions for flood walls and pump stations, but COMPARABLE green infrastructure solutions can COST CONSIDERABLY LESS, ON THE ORDER OF be less than $1 million."
- On page 76, under Nature-based Solutions, this sentence is unclear and should be worded: "Any legislative authorization must allow for third party administration and incorporate an allowable USE OF UP TO 10% OF FUNDS FOR administrative PURPOSES fee of 10%."
- Since some readers will only consult Appendix II and not Appendix I, Table 1 in Appendix II, which starts on page 64 would benefit from an explanation of the headings, similar to that provided in Appendix 1, either by noting to refer back to Appendix 1, or repeating that Legend with added terms not included in the one for Appendix I. For example, there are two headings in Appendix II which refer to "match"; a description of what each means would be helpful.

**Equity and Environmental Justice Work Group Report**

The Equity and Environmental Justice Draft Report represents the essential work that the working group has been doing as part of the larger process. The time and effort expended by working group members throughout a difficult process has resulted in critical recommendations for the GC3, and we strongly support this work. We highlight various specific details we find most important in these comments.

We hope that we can be partners in supporting and furthering the goals of this report and working group if and where appropriate.

*General comments (please note that CAPITALIZED words are suggested for insertion or addition)*

- We agree with the report's recommendation on page 2 and page 5 and that a ***funded*** public participation process should take place in 2021 to inform the further development and implementation of Connecticut's climate policies and plans. We believe that outreach to state legislators, municipal leaders, community advocates and grassroots organizers,

and the general public is all critical for highlighting the importance of equity and climate justice in the State's response to climate change.

- As part of the public participation process, we recommend also identifying a working group of environmental justice experts and community advocates. Work to inform the State's climate planning process should be compensated by the State. The Nature Conservancy would be interested in serving as a resource if it would be useful to environmental justice experts and community advocates.
- We appreciate the work to develop definitions and clear explanations of the importance of equity in the development of policies to mitigate and adapt to climate change. We recommend that the first sentence under "What is Equity" on page 7 be amended: "A commitment to equity starts by recognizing that HISTORICAL INEQUITIES IN LAW AND SOCIETAL PRACTICE HAVE RESULTED IN disparities in health outcomes, inequities in living conditions, and lack of political power THAT place many communities of color, including Black, Indigenous, and other People of Color ("BIPOC"), low-income communities, people with disabilities, and other historically disadvantaged people at greater risk and limit the capacity of their communities to adapt to climate change."
- On page 10, the section with examples of equitable policies and approaches could be improved by moving this section into or, ideally, incorporating relevant policy examples in the table immediately preceding it for each type of equity there: distributive, procedural, contextual, and corrective. The section "More Details on Components of Equity" on page 11 should also be added to the table instead of being listed two pages later. There seems to be considerable repetition in this subsequent section.
- We recommend further developing the basic principles listed on page 10 and 11. The principles vary widely in their scope, specificity, and applicability to the GC3 policy recommendation development process. We support the development of principles for equity and environmental in state climate policymaking. Such principles should define key terms like "cumulative impacts" and "just transition."
- Additional resources that may be helpful for reference in this section are the State of California's Resiliency Guidebook Equity Checklist and Sustainable CT's Equity Toolkit, which is already being used with many municipalities in Connecticut. Custom-designed resources for the implementation of GC3 principles could help translate consensus climate equity principles into a format for policymakers to review key questions related to equity.
- We agree with the concluding assessment on page 41 that more time and structure is needed to adequately integrate and communicate equity into Connecticut's developing climate change policies and activities. We hope to continue to support the ongoing work on equity, environmental justice, and climate change adaptation and mitigation.

*Public participation-related comments*

- The recommendations, guidance, and resources provided on pages 12 through 32 on public participation are very thorough, and we support the GC3, DEEP, and other State of Connecticut agencies utilizing and adopting it for further work.
- Creating discrete resources out of key tables and information could be helpful in making sure this useful and necessary work is utilized in the future. The tables on pages 26-29 and page 30 should be formatted as stand-alone files, made available for the public, and distributed to state agency staff for use.

- We also recommend the Government Alliance on Race and Equity's Racial Equity Toolkit as a reference and example of a clear and actionable tool for decisionmakers in state and local government.

*Mapping-related comments*

- We strongly support the top priority action of developing, launching, and maintaining a state tool that identifies communities at greater risk from environmental and climate hazards. While the group has focused on a mapping tool, the designation of census tracts per a methodology informed by pollution burden and demographic characteristics could be an important first step if the development of a GIS viewer would delay the publication of this data.
- We strongly support the use of the environmental justice mapping tool to direct shares of state funding to the communities at greatest risk; the report should include the recommendation that the Legislature and Governor use the tool to direct a minimum percentage of funding to those communities (per California's SB 535 and AB 1550).
- We commend the work of the mapping subcommittee and Max Teirstein on the selection of geospatial data available for the creation of an environmental justice mapping tool titled "Sources of Statewide Data." We are grateful for the work being done in the Department of Public Health and at CIRCA that could support the development of a statewide environmental justice mapping tool.
- We urge caution around developing a quantified assessment of physical climate risks that is applied across all communities in Connecticut as part of this tool; the complexities of climate threats will be difficult assess in a standardized way, and we hope this tool would be used to direct a minimum share of funds to communities found to experience the greatest impacts from pollution and have the greatest vulnerability according to selected demographic characteristics. While we have seen other comments asking for the environmental justice mapping tool to incorporate physical climate risk, natural resources, and other important geospatial information, we recommend starting this project with a streamlined focus on environmental justice. As additional geospatial tools are designed and/or required to inform policy decisions, they should of course be coordinated with an environmental justice screening tool as well as existing geospatial resources at CIRCA and elsewhere. However, a focused approach may be critical for the State developing a tool that is used to direct a greater share of funding to communities that are experiencing the brunt of environmental racism and have demographic characteristics that make them most vulnerable to both pollution and the ongoing and projected climate impacts.
- A standing committee to evaluate the coordination and development of climate and environmental geospatial tools may be helpful as part of the GC3 process moving forward. As compiled in the document "Overview of Existing Publicly Available, Statewide Mapping Resources," there are already a great deal of mapping resources. The Nature Conservancy has additional geospatial resources and science. Of note, TNC maintains CoastalResilience.org (which includes mapping and visualization tools as part of a large suite of resources being used in Connecticut and around the country for coastal resilience). TNC has also developed the Resilient and Connected Network, which has associated new tools and information to supplement initial mapping applications like the Resilient Land Mapping Tool. Both initiatives already guide decision-making about climate change by state, regional, local, and nonprofit entities. Even for a geography as

relatively small and homogenous as Connecticut, there is no way to create "one map to rule them all"; instead, we support the focused development of tools for specific purposes. We see a need to channel more funding to communities experiencing environmental injustice and are composed of individuals known to be more vulnerable to climate impacts, and a targeted screening tool can serve that purpose while being coordinated with additional statewide mapping resources and approaches to addressing and understanding climate impacts.

- On page 38, step 7 in the table should be clarified so that "relative cumulative impacts" is understood to refer to environmental pollution burden. The relative cumulative impacts of the myriad of climate threats facing Connecticut are too complex and unquantifiable to be included in an index.
- On page 39, we recommend that step 9 more explicitly discuss the policy rationale behind using the environmental justice screening tool to direct state funds to the most vulnerable communities as discussed in the bullets above.

*Mitigation-related comments*

- We support the mitigation subcommittee recommendation on page 40. Specifically, we want to emphasize the potential of Natural Climate Solutions for bringing co-benefits to low-income, historically under-resourced communities. Urban greening, urban forestry, green stormwater infrastructure, and other Natural Climate Solutions provide extensive air and water quality benefits, resilience capacity, quality of life improvements, job opportunities, and other co-benefits while sequestering carbon and aiding in other mitigation strategies. We appreciate how this is communicated in the questionnaire and throughout other reports; we hope the power and potential of Natural Climate Solutions will continue to be highlighted if these reports are compiled into a cohesive format.

*Adaptation-related comments*

- We support the development of a priority program for municipalities to develop local adaptation plans with the support of State guidance, geospatial information, and funding for implementation. We have long strongly advocated for the State of Connecticut to support local climate adaptation planning at the municipal level, via several programs TNC has co-created using the "Community Resilience Building" process including the Massachusetts' Municipal Vulnerability Preparedness Program and Rhode Island's Municipal Resilience Program. Both programs depend on the "Community Resilience Building" process to define and advance municipal-based resilience priorities. This process was first pioneered in Connecticut and has already been held in over 40 municipalities across the state. The Nature Conservancy has partnered with the Community Foundation of Eastern Connecticut, Sustainable CT, Council of Governments, municipal leaders and staff, business communities, faith-based organizations, public health providers and districts, NGOs, and academic institutions, among many other groups on the development and implementation of local capacity-building to address the impacts of extreme weather and climate change.
- While there are some connections in the "Review of Financing Adaptation and Resilience Working Group Report" and other sections across the GC3 draft reports that bring together the full scope and implications of related adaptation funding and policy recommendations, we see a clear need for more discussion, coordination, and consolidation of a clear set of recommendations around these interrelated topics. It may take additional time – and will certainly require the inclusion of key working group

participants in conversations with the GC3 members assigned to the Council's adaptation committee that will convene in November – but there would be a real benefit for the ultimate report to the Governor and Legislature if there is focused and comprehensive overview of the interrelated recommendations in the EEJ, Adaptation, Natural and Working Lands, and Financing Adaptation reports.

- Many of the 40 municipalities in Connecticut that have gone through the Community Resilience Building process have indeed forged a direct connection between FEMA Local Hazard Mitigation Plans and Plans of Conservation and Development – specifically on actions (i.e. capital expenditures, policies, projects, etc.) to improve resilience and reduce risk. This synergy highlights the opportunities for implementing comprehensive climate planning within existing municipal planning processes – an important consideration. For example, California has required integrated climate adaptation planning supported by state guidance and resources as part of mandatory Local Hazard Mitigation Plans that are incorporated into the Safety Element of General Plans (SB 379); the integration of climate impacts across all local planning efforts can then inform many forms of local decision-making. Additionally, the inclusion of certain projects and concepts in Local Hazard Mitigation Plans can facilitate post-disaster FEMA funding for resilience projects that may otherwise not be fundable.

*Comments regarding structure, syntax, semantics, or grammar*

- The heading of the section "How does equity relate to climate change?" on page 7 is followed directly by a section with the same title on page 8. The two sections are somewhat repetitive, though all the information is good. The first section could be retitled, "Why is equity an important consideration in climate policy development?" The second section could be retitled, "How should climate policy incorporate equity?"
- On page 23, there should not be a comma after "Clearly and frequently".

**Science & Technology**

We appreciate this broad and optimistic overview of the state of climate science in Connecticut. We believe that the recommendations relating to climate science across all the reports can be developed to be made more specific and integrative. There is a clear need for the State and/or CIRCA to provide more information and guidance for basic modeling and downscaling approaches that can be used by all entities in Connecticut.

For example, we developed these two recommendations that compile information and needs across the Rivers, Wetlands, Utility Infrastructure, and Public Health and Safety sections related to water vulnerability assessments that directly relate to climate science needs also communicated across the recommendations detailed in the latter half of the report:

- There is a need to conduct integrated watershed-scale assessments using a common modeling approach that incorporates climate change to identify risks, assets, and community vulnerabilities to water in our ecosystems, drinking water supply, stormwater and wastewater. Evaluating and managing water resources in a more integrated and inclusive way provides opportunities to focus on water-related investments that achieve multiple economic, environmental, and societal benefits.
- Once this work is done, state and local governments should overlay those technical water vulnerability assessments that incorporate climate impacts (natural ecosystem, geology, hydrology and infrastructure) with social, economic and population data to ensure investments are equitable and targeted to the most vulnerable communities and

populations. (This recommendation connects with the environmental justice screening tool recommendation in the Equity and Environmental Justice report.)

*Page-specific comments (we suggest that the report include page numbers)*

- We strongly support the recommendation to join the International Association to Combat Ocean Acidification (OA Alliance) on page 29. We support the recommendations in this report, but we wanted to note the special benefits and importance of this action.

**Public Health and Safety Work Group Report**

We appreciate this report's focus on complex, varied and dynamic public health impacts of climate change and applaud the working group for their effort to address the many challenges to health and safety driven by climate change through the lens of seven domains. The report appropriately brings attention to the ongoing need to assess current and potential future health risks to vulnerable communities, while also establishing suitable interventions and supporting their implementation at multiple scales – including state, regional, municipal and hyper-local levels. This report highlights the inextricable links between public health and safety and the resilience of both the built and natural environment and we are happy to support its critical content in the Council's final report to the Governor and Legislature.

*General recommendations:*

- Commit to collaborative, inclusive planning and communication approaches to resilience across multiple sectors, including municipalities, utilities, and businesses and residents. Identify, prioritize problems and co-develop solutions with communities to ensure local needs are met and avoid unintended consequences and inequities. Avoid developing strategies, then informing stakeholders.
- Incentivize regional collaboration and multi-sector innovation on water management solutions.
- Evaluate and clear state policy barriers, update standards and practices to better protect human health and safety, reduce fragmented water management and explore new business and governance models for improved service and efficiency.
- Sustain adequate funding for water infrastructure, prioritize and target investments in vulnerable communities. Explore options to increase grant and loan flexibility by combining multiple programs for increased impact and reach. Require or incentivize best management practices to enhance project benefits.

We also wanted to repeat these two recommendations from the Science and Technology report that directly relate to the actions identified above:

- Conduct integrated watershed-scale assessments using a common modeling approach that incorporates climate change to identify risks, assets, and community vulnerabilities to water in our ecosystems, drinking water supply, stormwater and wastewater. Evaluating and managing water resources in a more integrated and inclusive way provides opportunities to focus on water-related investments that achieve multiple economic, environmental, and societal benefits.
- Overlay technical water vulnerability assessments that incorporate climate impacts (natural ecosystem, geology, hydrology and infrastructure) with social, economic and population data to ensure investments are equitable and targeted to the most vulnerable communities and populations. (This recommendation connects with the environmental justice screening tool recommendation in the Equity and Environmental Justice report.)

*Page-specific recommendations*

- On page 23, we strongly support the recommendations for evidence-based standards to establish local heat and air quality response plans and recommend including socio-economic and environmental data to both assess vulnerable geographies, at-risk populations and opportunities for urban trees and green infrastructure. Increasing urban trees and other natural systems provide a range of physical health benefits including improved air and water quality, mitigating the heat island effect, and helping to alleviate noise pollution (see EEJ Draft Report, page 2, Theme 6: Natural and Working Lands; Forest Subgroup Report, pages 30 - 38).
- On page 53 we support the recommendations to develop water conservation measures & communication guidelines to manage droughts. We recommend establishing an integrated approach to water communications that promote a vision for all Connecticut residents to enjoy safe and reliable water.
- On page 60, the PHS report provides an excellent overview of health risks associated with increasing harmful algal blooms. While increasing temperatures and changing precipitation patterns are driving these increases, research shows groundwater nitrogen pollution is also a driver. We recommend evaluating emerging science related to increasing harmful algal blooms and where needed, update water quality nutrient standards to address climate impacts of warming temperatures, changing precipitation patterns and sea level rise.

**Infrastructure and Land Use Adaptation Work Group Report**

- We are concerned about the prioritization of priority actions in "Recommendations for Further Review in 2021." Who, how, and when will these priority recommendations be reviewed and provided the same status as those that received a full description?
- We would like to see recommendation "LUB-1 – Establish State-wide Storm Water Utility" elevated to a priority action for 2020 versus relegation to the "Recommendations for Further Review in 2021".
- TNC has led the implementation of the Community Resilience Building process across the state (i.e. 40 CT municipalities to date). Massachusetts (MVP – over 300 municipalities to date), and Rhode Island (MRP – 13 municipalities to date) have created statewide community resilience programs using Community Resilience Building as the foundation for planning and developing local resilient action plans. We would be willing to co-create and co-lead the advancement of "Recommendation LUB-3 – Establish Connecticut Community Resilience Program" based on our experiences in Connecticut and neighboring states. We would appreciate the explicit inclusion of TNC as an implementation entity on page 15 under LUB-3.
- On page 15 under LUB-3, "The Nature Conservancy Municipal Resilience Program https://www.communityresiliencebuilding.com/" needs to be corrected to "TNC's Community Resilience Building Program – www.CommunityResilienceBuilding.org" in the "References for action" box. We also recommend including "State of Rhode Island Municipal Resilience Program" as a specific reference for action alongside "Resilient Rhody."

**Progress on Mitigation Strategies Work Group Report**

*General comments:*

- Overall, we are pleased that the recommendations in the Mitigation report are achievable and would strongly reduce GHG emissions in Connecticut. The report serves as an example of what stakeholders across diverse backgrounds and needs can accomplish together on behalf of planning for climate mitigation. We are proud to be part of this effort.
- We are concerned that there are various overlapping recommendations from each sub-working group that would benefit from a larger discussion with the entire Mitigation team to create a clearer and more concise list of recommendations. Then, policy recommendations should be reviewed and discussed, regardless of working group and intent, by the entire GC3. By doing so, redundancy evident across sub-working groups and working groups could be avoided. This will then create a cleaner and clearer picture of policy the GC3 would like the state to consider.
- The language, style, and formatting from each sub-working group was not consistent. This was likely due to many people constructing each sub-report and the differences in backgrounds from each sub-working group member. For example, the Mitigation report would strongly benefit from 1 person copy-editing the entire report to create a cohesive report. Effort should also be made to create cohesiveness between the Mitigation report other working group reports.

*Chapter 2: Buildings*

- We would first recommend making recommendations more concise with clearer points for comprehension and impact. To this end, consider taking out unnecessary adjectives and superlatives. In addition, recommendations would be more credible if they were backed by numbers or statistics with references (example: the first strategy could list the actual dollar amount of diverted funds).
- There were footnotes and hyperlinks throughout the report. We would suggest that hyperlinks are not useful in this context, and footnotes are preferable. Footnotes would make the report more accessible for those who read the report in print and/or those who do not wish to open multiple windows in their browser to understand the point of the aforementioned hyperlink. Where hyperlinks are helpful, they could be included in the footnote.
- We also question whether all appendices for this sub-sector report are needed or complete. For example, Appendices 2, 4, 5, and 7 could be footnotes rather than an additional page of text. The focus should be on policy recommendations, and the appendices listed are better listed as references. Appendix 6 is a list of data fields with no added information, please consider taking out this appendix. And finally, Appendix 9 does not appear to be complete.
- On page 16, the third recommendation on this page, the workgroup recommends the creation of a Building Energy Concierge function, and we support this recommendation. This would provide invaluable, consistent information for builders and owners in their goal of creating structures that are efficient and sustainable. Such a function has worked well in other states, and following examples from New York and Massachusetts could allow for ease in creation and implementation.
- On page 17, third paragraph, renewable thermal technology (RTT) expansion in the building sector is discussed, and we strongly back this recommendation. Reducing the "winter peak" in energy consumption is important as most winter energy currently comes from high GHG fossil fuel sources. Promoting RTT was discussed in the 2018 GC3

report, and there were statistics used to validate this recommendation, but these were not mentioned in this report. Updating and referencing those statistics would strengthen this policy recommendation.

- In last two paragraphs on page 20 and first bullet point on page 21, there is a new policy recommendation targeting natural gas infrastructure as it relates to adoption of RTT in buildings which we support and appreciate. Given that the recommendation to limit the expansion of natural gas infrastructure is also discussed in various other reports and sub-reports, we recommend making reference in the Buildings report to those other similar policy recommendations. This will help strengthen each recommendation while also tying them together for the big picture.
- In the fifth bullet on page 21 and the first paragraph on page 22, biodiesel is discussed. We share concern with other members of the working group about biodiesel being included in the recommendations and suggest a more careful weighing of all relevant factors before including it. The reasons for this concern are primarily life-cycle emission issues, reduction in energy density when adding biodiesel to fuel mix and needed technology/additives to run B100 biodiesel at low temperatures, all of which contribute in some way to GHG emissions or other problems. Additionally, the Science and Technology working group report discusses the drawbacks of biofuels and strongly advocates against the use of biofuels.

*Chapter 3: Electricity*

- We had been active in the drafting of this section, and as such, have already made policy recommendations to the Electricity sub-working group. We appreciate that these suggestions and edits were incorporated into the report.
- We fully support energy efficiency measures and the renewable energy transition recommendations outlined in this report, particularly highlighting the importance of offshore wind (OSW). OSW is a critical component to meeting state 2040 renewable energy goals, as well as 2030 and 2050 emission targets. OSW is the largest potential source of renewable energy during winter months, and as such, promotion of and planning for OSW should be prioritized.
- We support of all the recommendations in this draft GC3 report in relation to the electricity sector. However, there is considerable overlap with the Buildings report in terms of infrastructure and energy efficiency. As stated previously, we would strongly recommend that the language be consistent and referenced across sub-working groups.
- In the last paragraph on page 38, the discussion regarding how the creation of the Killingly natural gas plant will prevent Connecticut from meeting energy and emission goals is valuable, but we do not believe that this topic is addressed in any of the policy recommendations. To that end, we suggest that language be included as a new recommendation that seeks to assure DEEP has or will have the legal authority to take into account energy and emission goals when making decisions on construction/permits or other measure needed for new energy sources and/or related infrastructure. Although it is common sense that aligning State decisions with State climate mitigation policy and goals is critical to meet such goals, it may not be sufficiently established in the State's day to day direction or procedures. Suggested wording for this new recommendation could be: "Determine and establish measure(s) needed (administrative, legislative or other) to give DEEP/PURA/the State of CT authority and responsibility to assure that it's decision-making (e.g. for permits and other forms of State approval) is in conformance

with and supports the State's climate mitigation/zero-carbon goals. This should include development of a plan for phasing out building new fossil fuel energy generation and infrastructure so the State, DEEP and PURA have the guidance and direction to implement such decision making."

- In the fourth paragraph on page 42, the workgroup acknowledges the role battery storage will play in future energy transmission is crucial for distributed energy resources (DER) like solar and wind. While a discussion of battery storage was included in the report, results from the 2020 Integrated Resource Plan (IRP) Value of DER study have not been fully incorporated. We think this is important information that should be included in the report and could be done so by noting that it is "incorporated by reference." Reference to the 2020 IRP should be explicit regardless of the timing of its release.
- In the last paragraph on page 51 (continuing on page 52), discussion of micro-grids was brief, and we believe the current Connecticut Microgrid Program should be mentioned and discussed in more detail in this report given it has been around since 2012. This program is mentioned in the Infrastructure report, and a cross-reference here would be beneficial as well.
- On pages 57-58, Appendix 3 is not complete. Many definitions are not included. We would recommend including the missing definitions.

*Chapter 4: Non-energy*

- The Non-energy sub-working group report covered a small number of policy recommendations but contained some important references and data. Although only a few recommendations, these covered a wide range of topics, some of which were briefly discussed in the 2018 report.
- As previously stated, formatting across sub-working groups should be consistent. We would also like to point out that the chapter summary table is incomplete. This may be a reoccurring copying issue, as evident by incomplete appendices in previous chapters. It is important that this table be fixed as soon as possible.
- Many of the recommendations regarding forestry and agriculture are also included in the Natural and Working Lands, Forestry and Agricultural reports. There is a strong need to remain consistent in policy recommendations across working groups.
- In the third paragraph on page 60 (continuing onto page 61), a hydrofluorocarbon (HFC) phase out was recommended, which we strongly support. HFCs are extremely potent GHGs and should be explicitly targeted in state policy. As stated in this sub-report, the state has already begun the investigation into a state-wide phase-out of HFCs. Given widespread industry support and that most of the Northeastern states are already implementing refrigerant management and HFC programs, this policy recommendation should be highlighted.
- In the third paragraph on page 62, the workgroup discusses limiting agricultural emissions. We support this policy recommendation but would again stress the importance of referencing the policy recommendations from the Natural and Working Lands, Agriculture sub-working group.
- In the first paragraph on page 67, the workgroup recommends policy to limit waste emissions. TNC supports efforts to reduce emissions from waste. This is an area that warrants further investigation and would benefit from public comment and expert analysis. We recommend input be added or referenced from the Bureau of Waste

Management, as this policy recommendation would be enhanced by more Connecticut specific information.

- In the last paragraph on page 68, the workgroup recommends urban tree planting. While TNC has worked extensively to promote urban greenspace and planting, this policy recommendation should be more closely aligned with policy recommendations given in the Natural and Working Lands and the Infrastructure and Land Use Adaptation working groups. Overall, we support efforts and policy to plant trees in urban and suburban areas and will continue to work with communities in these types of endeavors.

*Chapter 5: Transportation*

- The 2018 GC3 report extensively covered mitigation policy for the transportation sector, which was critical given that the largest source of state-wide emissions comes from the transportation sector. This report followed up on those recommendations while creating several new recommendations, all of which we support. Given the importance of transportation emission reduction programs, TNC strongly supports efforts like the Transportation Climate Initiative (TCI) and the Electric Vehicle Roadmap.
- Given that the clearest goal of most of the recommendations is to electrify and decarbonize the transportation sector, policy recommendations to decrease energy consumption must consider the increased demand from the transportation sector. We recommend adding a reference that would estimate the impact the State's EV deployment goals would have on the electric sector. Establishing the infrastructure necessary to power all light, medium, and heavy-duty vehicles as well as e-bikes and e-scooters will require intensive cooperation across state agencies and landowners. To this end, we also strongly believe that the EV Roadmap plan put forth by DEEP and DOT should be mentioned in this Transportation report with a recommendation to fully implement it.
- In the second paragraph on page 93, TCI is specifically referenced as a strategy to reduce transportation emissions. While many references are given, the Transportation, Equity, Climate and Health (TRECH) Project report from the Harvard School of Public Health should also be referenced. One of the key findings of this report is that the estimated health benefits under the TCI climate mitigation policy scenarios are substantial and are larger than estimated TCI program proceeds. This should be highlighted.
- In the second bullet point on page 94, the workgroup references a survey done by TNC that shows rural communities would support a program like TCI. In August 2020, TNC released a report titled: Supporting Rural Communities through Clean Transportation Investments, which lists several benefits to rural communities through the proposed investments from TCI. This study should be referenced to illustrate how all communities would benefit from TCI (https://www.nature.org/content/dam/tnc/nature/en/documents/TCI_Report_Rural_Aug_2020.pdf)

**Natural and Working Lands Work Group Reports**

We strongly recommend that DEEP adopt TNC's Resilient and Connected Network data (as described on page 3 of the cover letter to these comments). It provides a unified vision for the conservation community that will result in a protected network of landscapes that support Connecticut's plants and animals into the future. Specifically, we recommend that the vision and supporting data are incorporated into a) the Connecticut Wildlife Action Plan, b) criteria for public grant programs that support land protection, restoration, and management, c) resilience

data support tools for the Community Resilience Building program and any other resources associated with the implementation of the recurring recommendation for a local adaptation planning program, and d) priorities and criteria for state land protection funding.

*Forests Subgroup Report*

We appreciated the excellent summary and policy recommendations, and we support the discussion of core forests and their importance throughout.

- We believe the document's recognition of U.S. Climate Alliance work is important and should remain in the final draft. We believe that Connecticut can further support the Natural and Working Lands initiative and hope to further support our state's contributions to the USCA's work in this area.
- We recommend a greater focus on the need for investment in active reforestation of riparian areas and floodplains. When the highly productive soils in riparian areas are reforested, they tend to lead to faster and greater carbon benefits than upland soils. The benefits to water quality, such as reducing streambank erosion and filtering pollutants, are also well worth the investment. There is the opportunity for reforestation on lands that are frequently flooded in Connecticut. Programs such as the Natural Resource Conservation Service cost-share programs provide one potential funding source for active reforestation (tree planting) in these areas. State funding through wildlife habitat grants and aquatic restoration grants, for example, should also be expanded to support riparian reforestation. From an ecological and climate change perspective, reforestation of streambanks and floodplains is a no-regrets action. As Connecticut considers how to compensate for forest loss due to development (e.g. No Net Loss policies, or mitigation), these areas may be prime opportunities to increase our forest acreage.
- In the section about active and passive forest management (pages 9 and 10), we recommend further emphasizing the importance of expanding activities eligible for tax credit for forest management. TNC, American Forest Foundation, and New England Forestry Foundation are launching initiatives in carbon incentive payments. Furthermore, TNC's Working Woodlands, TNC/AFF's Family Forest Carbon Program, and NEFF's Pooled Timber Income Fund are examples of existing programs that could have a lot of promise if brought to Connecticut.
- On page 11, the second paragraph in the section titled "Forests mitigate climate change and clean the air" is drawn from a paper that was further built upon by later research that served as the basis for the United States Climate Alliance (USCA) work referenced in the preceding paragraph. We recommend a review of the paper "Natural climate solutions for the United States" by Fargione et al. that was published in Science Advances 4 (11) in November 2018 for additional key information about the activities cited in the USCA fact sheet cited in endnote 22 and the global work cited in the Griscom et al. paper cited in endnote 23. The USCA work is drawn primarily from the team led by TNC scientist Joseph Fargione, and we would be happy to follow up with further information about the models and information developed by TNC and partners for Connecticut and other USCA states as part of the Natural and Working Lands initiative.
- On page 24, we do not believe that proforestation should be presented as the most effective solution to preserve and foster further carbon storage. We are concerned about valuing one natural climate solution over another, and the science coming out of TNC's global science team contradicts this claim. This claim may be relevant for very particular

geographies, but we are not sure that Connecticut is one of them. There is a great deal of scientific debate about the viability of proforestation to be a major climate sequestration contributor in many regions around the world, and Connecticut may not necessarily be an area where natural forest growth has the greatest potential. We absolutely do need forests to help us address climate change in many ways, so we recommend focusing on the importance of keeping forests as forests, and then on managing them in a range of ways (including creating new forests through reforestation and urban tree planting). It may be better to list management practices for natural and working lands as a package rather than promoting one strategy as better than the others. We ask for additional conversation around the language in this bullet so as to not miscommunicate the important benefits of proforestation and other natural climate solutions.

- We support the language in the section on timber harvesting in Connecticut on pages 25 and 26. We recommend a shift away from high grading to sustainable forest management, and we urge this recommendation to be more explicit. A message of harvesting as an afterthought risks backlash. Consulting the New England Forestry Foundation on this topic could be powerful; this outreach could help diplomatically make the case that relying on other states for wood needs is not climate friendly.
- We found the discussion of reforestation on page 27 to be very helpful, and we strongly support the action plan to maintain and increase forest cover over the next twenty years.
- While the other recommendations regarding the avoidance of core forest destruction target all forms of conversion, this recommendation on page 28 inappropriately singles out solar development:

  > "Actively discourage conversion of forest, particularly core forest, for industrial solar projects, while increasing incentives for renewable energy projects on the built environment, such as on brownfields or along highway infrastructure."

  The valuable features of core forest will be destroyed with most types of development, whether it be housing, commercial, or industrial, and most other types will not have the same emission reduction value of solar, so solar should not be targeted in this manner.
- On page 30: Rather than setting a target percentage (70%) of large forest reserves on state land in the short-term actions section, we recommend that the report recommend considering a target *range* in percentage of large core forest areas on state lands, or a process to determine which core forests should be reserves and which might have recreation, model forest, or other values that would be more suitable to manage for. A fixed target can lead to a focus on total area rather than on the quality or suitability of those forest areas.
- At the bottom of page 31, we suggest adding under Longer Term Actions, "Promote American Forest Foundation/TNC's Family Forest Carbon Program, a new approach that gives forest owners with relatively smaller parcels an opportunity to bring in income from their land, in exchange for implementing sustainable forest practices that help sequester and store more carbon." We would be happy to provide more information about this developing initiative being implemented in Massachusetts and Vermont.
- On page 49, we believe further examination of the assumption that forests sequester carbon equivalent to 20% of emissions is needed. We strongly urge deleting the suggestion that natural climate solutions could sequester 20% of greenhouse gas emissions in the state for multiple reasons. We should not be portraying natural carbon sequestration as an excuse to only reduce carbon emissions by 80%. Sustained effort

towards reducing as much emissions as possible over the long-term is the only feasible option for minimizing destruction from climate change. Additionally, we should have a clearer sense of the actual science behind the specific annual carbon sequestration rate on Connecticut's natural and working lands before referencing them in policy recommendations. We also need a better understanding of the climate and human threats to our state's natural carbon stocks into the future.

*Wetlands Subgroup Report*

- On page 21, we believe it is very important that Recommendation 2020.W.2.1 "Continue to develop and update all municipal emergency preparedness plans for extreme weather events" more explicitly incorporate climate science. Under the approach recommended explicitly and implicitly in the Science and Technology report, common approaches to modeling and downscaling climate impacts should be incorporated into all planning. Even if appropriate updated sea level rise, hydrology, and extreme weather event information is not available for the model severe weather event planning at regular intervals, it is important to provide clarity and guidance about how the ongoing and projected impacts of climate change can be addressed in these processes. This recommendation also dovetails with the recommendation to support local climate planning that is reiterated in many reports; it also directly relates to our suggestion about how Local Hazard Mitigation Plans are a key piece of the comprehensive integration of climate considerations into all state and municipal planning processes. Identifying all of the resources and references that are included in this recommendation and throughout this report that do not incorporate sea level rise and climate change would be a useful exercise to show the baseline resources that need to be addressed for coordinated and climate-smart planning to occur.
- On page 29, TNC is very interested in being a partner to provide information and approaches related to Recommendation 2020.W.3.1 "Update and develop wetland protection policies, including regulatory programs, to ensure that they include protection for climate change mitigation, adaptation, and resiliency benefits of wetlands and near coastal waters." TNC's CoastalResilience.org site provides many resources powered by years of research that would be useful, including the Future Habitat app. We believe this resource, among others, could be a helpful reference for action on page 30.

*Rivers Subgroup Report (note that we recommend adding CAPITALIZED letters and words)*

We want to highlight general recommendations for the implementation of integrated water management approaches that are discussed in the Rivers report, but are also important for recommendations in the Wetlands, Public Health and Safety, and Land Use and Infrastructure reports. These central principles should be adopted for planning, communication, and education of stakeholders and communities for water policy in Connecticut, and we urge state agencies to adopt them as part of new practices to address the challenges of climate change for water planning:

- Commit to collaborative, inclusive planning and communication approaches across multiple municipalities, utilities, and private entities.
- Identify and prioritize problems and co-develop solutions with communities to prioritize needs and avoid unintended consequences and inequities. Avoid developing strategies, then informing stakeholders.

- Incentivize regional collaboration and multi-sector innovation on water management.

*Page-specific comments (capitalized words are for addition)*

- On page 6, we suggest clarifying the definition of nature-based solutions by adding this phrase: "Nature-based solutions ARE ACTIONS THAT ARE INSPIRED BY PROCESSES AND FUNCTIONING OF NATURE TO increase the resilience..."
- On page 6, we suggest adding land protection to the description of actions.
- On page 6, under Targets, Indicators and under the first bullet, replace "river systems with the most capacity for being resilient to extreme weather" with "RIVER NETWORKS THAT WILL LIKELY MAINTAIN DIVERSITY AND FUNCTIONAL INTEGRITY INTO THE FUTURE, EVEN UNDER SHIFTS DUE TO CLIMATE CHANGE..."
- On page 6, under Targets, Indicators and under the first bullet, add the purpose of the freshwater resilience data: "...protecting the ecosystem services of inland waters. THE RESULTS CAN BE USED TO EXPLICITLY GUIDE LAND ACQUISITION, INFORM WATERSHED MANAGEMENT, AND PRIORITIZE DAM REMOVALS TOWARD THE GOAL OF MAINTAINING THE RESILIENCE OF STREAM NETWORKS."
- On pages 7 and 8, we suggest including UConn CLEAR for their spatial analysis of all riparian areas in the state. University of Connecticut researchers have also done innovative analysis of flooding and locations for riparian corridor improvements.
- We suggest that TNC be included in the list of implementation entities on page 7, especially since we are explicitly listed in the first action on page 6.
- On pages 7 and 8, we recommend adding the following resources to the list of "References for action":

  Naturally Resilient Communities - http://nrcsolutions.org/
  EPA Green Infrastructure - https://www.epa.gov/green-infrastructure

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature reserves

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 1:38 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Nelson, Gabby A. <gabriell.nelson@trincoll.edu>
**Sent:** Wednesday, October 21, 2020 12:42 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature reserves



Hi there,

I am writing as a lifelong Connecticut resident hoping to advocate for continued preservation of land in CT. We need additional land preserved for recreation, environmental protection, research, and agriculture. We are proud of our open space in Connecticut- our hikes, beaches, protected expanses of fall colors. It makes sense not only for our enjoyment, but for our safety and economic expansion. Please set aside additional protected land in Connecticut for all of us and for future generations.

Warmly,

Gabby

Gabby Nelson

Assistant Director, Urban Engaged Learning

Trinity College

gabriell.nelson@trincoll.edu

Pronouns: she, her

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protection of Nature in CT

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 10:48 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: Hornung, Gabriel F. <gabriel.hornung@trincoll.edu>
Sent: Wednesday, October 21, 2020 10:13 AM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: Protection of Nature in CT

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To Whom It May Concern:

As a Hartford resident, I write to express my support for the protection of public natural resources in CT. It is my understanding that only 1% of the beautiful nature in this state is currently protected — a number that is troublingly low.

Since I understand this commission to be currently working on issues of science, climate change, food, health, and equity, I urge those involved to consider seriously the importance of preserving our forests, rivers, parks, and trees. As countless studies have now shown, our larger environment affects so many of us in profound and unequal ways, and I remain hopeful that a state as forward-thinking as CT will take swift and decisive action on this critical front.

Thank you very much for your consideration and work on this important matter.

Gabriel Hornung

**Comments on Draft Report from Governor's Council on Climate Change (GC3)**
*CT Department of Energy & Environmental Protection (DEEP). October 21, 2020*

On behalf of Operation Fuel's clients and supporters across the state of CT, thank you for the opportunity to comment on the 2020 update to the Governor's Council on Climate Change (GC3) report. We are grateful for the Herculean efforts of so many DEEP staff and advocates across the state to develop a statewide plan to address climate change. We especially appreciate our many regular coalition partners, with whom we work tirelessly to increase coordination across state programs and agencies to help CT reach our energy affordability, energy efficiency, and 100% renewable energy goals.

Operation Fuel works on the front lines to ensure that aid and weatherization programs reach those who need them, while we advance toward a 100% renewable energy grid. In 2020, the GC3 process has prioritized Equity & Environmental Justice with a new commitment, which Operation Fuel wholeheartedly supports. Energy affordability and efficiency are key policy areas that incentivize individuals to contribute collectively to Greenhouse Gas (GHG) reduction actions. Cutting demand for energy lowers household bills alongside carbon emissions. Expanding weatherization investments are a win for the household, state, and region. Informing residents of available services is an entry point to engage consumers about efficient and renewable energy. We see many opportunities to expand these programs.

Operation Fuel was founded in the late 1970s as Low & Moderate Income (LMI) households in CT struggled to pay heating bills during the oil crisis. In 2020, we primarily assist with electricity bills, helping families avoid shutoffs with emergency grants. Our state's energy affordability gap is over $400 million and growing each year. Together, our agency and federal heating and energy aid (LIHEAP) don't cover a quarter of the resources needed to close the deficit. Then as now, our mission is to look out for folks who've fallen through the cracks. We encourage policy makers to consider the diversity of LMI communities across CT, which span geographical, urban/ rural/ suburban, age, disability, gender, race, and many other demographics. At Operation Fuel, many of our clients are younger, living on variable incomes as their work hours change or vanish; they are likely to be women with children. We also work with many older couples, living on fixed incomes, without flexibility for rising costs. While these different clients may share similar a common income band, and may benefit from similar assistance programs, they do not necessarily access or share information in the same ways – and as such require different outreach strategies to engage. We encourage the GC3 during Phase II, and DEEP at large, to consider how specific populations engage with climate change, collectively pursuing policies that draw in the public and seek environmental justice.

In reviewing the GC3 report, equity principles require us to consider how our actions address two urgent needs in our state: climate change, and egregious inequality. Historic, intentional, structural disinvestment in LMI communities across our state has created a structure of regressive economics, where LMI residents currently pay for benefits that largely

flow to higher income residents. Two examples from the GC3 context are energy efficiency fees and electric vehicle infrastructure.

While the agency has regular processes for seeking and acquiring consultant services, we believe that DEEP should establish similar budgets and procurement protocols to compensate the public for participation and feedback. DEEP should particularly seek out residents who would not be represented in the typical proceedings, and thus are sharing knowledge that policy makers don't otherwise have access to. We also encourage investing in community based partners who can highlight key recommendations for lay audiences. As CT policy makers address our long term environmental and equity goals, let's keep Science & Technology's harm reduction, and Equity & Environmental Justice's public participation frameworks, top of mind. As such, we recommend that in Phase II, the council commit funds to compensate members of the public for sharing input on the state's climate planning process.

For the past year, Operation Fuel has steadily engaged in stakeholder discussions, brainstorming sessions, and editorial efforts to inform the GC3 process. Informing our comments are a review of the report with particular attention to sections on Forests; Rivers; Infrastructure & Land Use Adaptation; Progress on Mitigation including Buildings, Electricity, and Transportation; Science & Technology; and Equity & Environmental Justice. We also took part in webinars and public discussions in several GC3 working groups. We highlight common issues that are co-identified by different working groups, and share thoughts about next steps toward action. Five themes in particular stand out to Operation Fuel; they offer approaches to energy affordability, energy efficiency, environmental equity, and Greenhouse Gas reduction all at once. Additionally, these recommendations encapsulate findings and proposals from cross-cutting working groups. These are to improve how energy affordability and efficiency funds reach people who need them, in accordance with the state's climate goals; to accelerate equity index mapping; to embed GHG reduction and public health considerations into all state decisions; to invest in CT's young people and green economy; and to expand public awareness, understanding, and participation in climate change planning.

I. We must ensure that our state **maximizes energy assistance and weatherization funds that can draw down demand and reduce GHG emissions while advancing environmental equity goals**.

We support legislative options that would strengthen protections and expand access to assistance for CT residents who've been hit hardest by the pandemic. We also recognize opportunities to address these urgent issues without updating the statutes. In Fiscal Year 2018, CT Department of Social Services spent $500,000 on energy efficiency of their roughly $80M expenditure. Between FY 2014-18, DSS carried over an annual surplus ranging from roughly $1.5-8 million (PURA Pro Track 1 Report, 6/3/2020, 17-12-03RE01). Currently, we are not taking full advantage of the flexibility allowed to spend these funds, and as such are a) not distributing sufficiently to residents who should receive them b) are not positioned to accept additional funds, despite known need, and thus are declining grants from the federal government. States are allowed to invest up to 25% of those federal dollars into weatherization and hazard remediation. Contributing excess CEAP funds to energy efficiency would augment and leverage

the funds that the ratepayers currently contribute. We support the Council's recommendation that the legislature protect these funds from future raids, possibly with a lockbox mechanism.

II. The state should **develop an equity index and map, which would track environmental hazards, toxic pollutants, air conditions, building remediation, public health risks, and other data to efficiently and innovatively direct state resources,** in an effort to comprehensively address and reverse decades of documented disparities. *Mentioned by Mitigation, Buildings sub group; Equity & Environmental Justice; and Infrastructure & Natural Lands groups.*

The Equity & Environmental Justice working group identifies that state agencies DEEP and Department of Public Health are already working on a mapping project around public health contaminants and air pollutants (EEJ Draft Report, 36). The Mitigation, Buildings sub group identifies key barriers to energy efficiency and demand reduction, which include home health hazards such as mold, vermiculite, and vermin (Mitigation Report, 11). The Infrastructure & Land Use group, responsible for emergency climate planning considerations, recommends "T-6. Create a statewide GIS database of culverts, flood gates, tide gates and other water control structures that restrict flow. Develop a framework for continued identification and documentation of such structures." We pull together common threads among these proposals – we must comprehensively map environmental, health, energy, housing, pollution, and related needs across our state.

Health hazards are present in roughly 30% LMI housing in CT (according to DEEP's estimates), which prevents low income ratepayers who contribute to energy efficiency funds from benefiting from their investments in either loan or grant form. Operation Fuel continues to advocate that we should use the energy efficiency audit process to identify areas for further remediation and conservation measures. Mapping tools such as Cal Enviro Scan will show where these conditions are concentrated, helping collaborating agencies to identify census tracts and neighborhood environmental conditions that deserve further investment. We appreciate the great detail the working groups put into the report on this matter, and look forward to carrying the momentum toward our next steps.

III. We should **embed core state goals, particularly around climate change, public health, and civic participation, into all agency and planning processes**. *Mentioned by Cross-Sector; Mitigation, Transportation Sub groups.*

Embedding equity concerns into the foundation of a process creates the most genuine opportunity to adeptly advance shared ideals. The Mitigation, Transportation sub group describes opportunities for the state of CT, from the internal agency to long term statewide planning processes, to better implement climate change and equity strategies. The report mentions several "lead by example opportunities," such as electrifying the state fleet by 2030 (Mitigation, Transportation) and reducing the carbon footprint of state owned buildings. In pursuit of both GHG reduction and public accessibility goals, Operation Fuel suggests that state agencies be required to evaluate accessible public transportation when planning public events. Similarly, we support the Cross Sector recommendations that GHG reduction goals and public

health considerations should be analyzed for all long term planning processes, and should be embedded in the building code.

To understand why embedding public participation, especially from traditionally marginalized populations, is so important for the state of CT, let's discuss the state's current emergency plan, described by the Infrastructure & Land Use Adaptation working group. The group refers to CT's 2019 Natural Hazards Mitigation Plan, developed for DEEP's Emergency Management bureau. The "public participation" portion of the report that impacts climate hazards and emergency response for the entire state consists exclusively of an online survey with 41 responses. Given that our state has a population of over 3.4 million people, this level of public awareness is not statistically significant. How can state planners accommodate disabled, non-vehicle owning, elderly, poor, isolated, and other vulnerable populations without listening to their needs? As Dr. Mitchell presented on DEEP's Environmental Justice webinar series this fall, we must learn and apply emergency management plans from the aftermath of Hurricane Katrina. Understanding the vulnerabilities of diverse communities across our state is necessary to create an effective emergency plan. In order to meaningfully gather and incorporate this data from communities that are accustomed to disregard and disinvestment, outreach efforts must be ongoing and genuine. Waiting to engage until a disaster actually happens will be too late for meaningful action.

IV. The best time to **invest in young people and CT's green economy** was in the past. The second best time is in the moment. *Mentioned by Forests; Mitigation, Buildings, Electricity sub groups; Equity & Environmental Justice; Science & Technology.*

As the home energy audit & efficiency upgrade market continues growing quickly, we must drastically expand training for homegrown workers who can do these improvements. The Electricity working group mentions off shore wind and shared clean energy as opportunities to enhance renewable energy infrastructure while also directing jobs toward historically disenfranchised Environmental Justice Communities. Science & Technology working group stresses the importance of climate education, both in and out of public schools. Green infrastructure is another cross cutting investment that several groups support, as it increases carbon storage and produces local jobs. The Forests working group recommends a "youth conservation corps" (Forests, 20), paying young people to plant trees across the state. The idea of engaging young people in climate adaptation and mitigation, through educational and economic opportunities, enjoys broad support across the GC3 and to a large degree, the political establishment broadly. It's difficult to imagine how we will come close to meeting our environmental justice and GHG reduction goals if we don't sustainably invest in these initiatives. So, how do we get it done?

Science and climate education, green technology certification, and tree management are just a few examples of growth fields that can transform educational and economic opportunities for our state by investing in our environment. For each of the recommended goals, stakeholders should map out, step by step, on the individual human level, how to advance these objectives. Let's go from where the child is – possibly in a crowded classroom with an old science text book at a high school in Bridgeport. What paths take him to green economic opportunities in his city – from a tech school certificate, to a state funded renewable

energy training program, to Home Energy Solutions installation, to running his own company. How many Bridgeport residents will be qualified and hired for high salaried Off Shore Wind jobs? The city of Hartford developed a nationally recognized Tree Plan. Let's use it as a model to expand our urban canopies across the state. Our regional hub, the city of Boston, recently announced an over $1 billion investment the city's urban forest. How can we accelerate CT businesses to meet a growing forestry demand?

These are just a few examples to explore. The common themes of engaging young people around climate science and a green economy are particularly important to Operation Fuel, because they address climate and equity goals coherently and comprehensively. We are excited to join other stakeholders on mapping out how these widely agreed upon concepts can become our future reality, and improving climate education at all levels. To that end, we are involved with Home Energy Solutions outreach among other weatherization programs. We constantly evaluate opportunities to share energy efficiency information with our clients requesting assistance. Indeed, climate education is a lifelong process.

V. Through Phase II and beyond, the **GC3 should explore and model new ways to continually improve and engage the public in policy planning.** *Detailed by Equity & Environmental Justice working group.*

To genuinely pursue deeper engagement, not just around the GC3 report but climate change in general, we must recognize that our current systems are inequitable, and analyze how we can change current practices in pursuit of environmental justice. Operation Fuel appreciates the vast workload the Equity & Environmental Justice committee took on, in particular taking time to review different groups' reports while also working on their own. Generating robust public engagement would serve not just the GC3 process and report, but also other DEEP efforts to embed equity goals deeper into its work. We hope that the public engagement phase will generate shorter and simpler versions of the reports, designed for public consumption. This is another project that the Council could enlist frontline communities to collaborate on. Some creative ways to encourage and compensate CT residents for participating in the report are cash gift cards for taking surveys; monthly stipends for attending meetings; or even a credit on one's utility bill. We look forward to the next phase of the GC3 process, where these recommendations for public engagement can be implemented.

In addition to several PURA proceedings, Operation Fuel is involved in DEEP's Conservation & Load Management proceeding, which determines how the state invests in energy efficiency. The 2020 update is especially focused on making these programs more equitable. The October 2020 groundbreaking announcement from the New England Council of States Committee on Electricity notes

> the States, supported by NESCOE, will convene a series of online technical conferences in Fall 2020 that are open and accessible to all members of the public. Those technical conferences will seek to introduce the principles and other aspects of this Vision Statement, seek presentations and proposals from interested stakeholders, and solicit comments and dialogue with all interested stakeholders on this Vision and a path to achieving it. We welcome broad public participation and engagement in this process, and the States intend to report to their respective Governors in the first quarter of 2021 on findings and recommendations for action steps to advance this Vision" (P. 8).

We are also following CT's efforts toward the Transportation & Climate Initiative, a multi-state agreement to cap carbon and invest in clean energy. All these complicated policy initiatives are better informed and supported with robust public involvement. Intentionally incentivizing diverse public participation will strengthen DEEP's efforts to modernize our region's electricity system through these important proceedings and others that will arise in the future. We look forward to the upcoming technical discussions and working together to involve more under represented voices in our energy and climate planning.

Thank you for the opportunity to participate with stakeholders from across the state in the Governor's Council on Climate Change, 2020 update. Operation Fuel appreciates the hard work of the multiple hat wearing public servants, experts, and activists from across the state to produce this extraordinary roadmap. We are also grateful for the opportunity to engage in the GC3 process and look forward to next steps.

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Alec Shub <alec.shub@uconn.edu>

# FW: Comments on Forests Sub-Group Draft Report by the Garden Club of New Haven

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 2:28 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Garden Club of New Haven, Inc. <gcnhtreesandpower@gmail.com>
**Sent:** Wednesday, October 21, 2020 2:22 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Comments on Forests Sub-Group Draft Report by the Garden Club of New Haven



Comments on the Forest Sub-Group Draft Report for the Working and Natural Lands Working Group:

We commend the Forest Sub-group for its thorough and detailed report, and its recognition of the significant benefits of street and roadside trees, in storing carbon and reducing the negative effects of climate change. We have the following comments for your consideration, and indicate page numbers where we suggest changes or additions. Additions are underlined and deletions are in [brackets].

We suggest the following changes to address this and other issues, which are explained in Notes following the suggested changes as necessary:

Page 25, last sentence under "The Settled Treescape: Because of these significant benefits, removals and aggressive pruning of large trees by utility companies and highway departments can result in disproportionately large effects on climate mitigation. Removals [and] should be limited to trees in poor condition that are imminent threats to people or electric infrastructure. Pruning should focus on protecting the structural integrity, strength and health of the trees and not risk creating hazardous tree in the future. (Note: The term "aggressive pruning" is subjective and ambiguous. A specific description of pruning desired removes ambiguity.)

Page 30- 31, Short Term (1-5 year) Actions, in "Retain and Plant Large Trees and Forest Cover in Settled Landscapes"

o Do not permit [aggressive pruning and] removals of healthy street trees, and [focus (or target) pruning and] limit removals to trees in hazardous poor condition that are imminent threats to people or electric infrastructure. If trees are removed, PURA should require a plan and support funding for utilities to remove stumps and replant trees, especially in EJ communities with higher percentages of impervious surfaces and related heat island impacts.

o Pruning should focus on protecting the structural integrity, strength and health of the trees, and not risk creating hazardous trees in the future by adherence to rigid clearance standards.

o Street/roadside trees (preferably those that will become large) should be planted wherever they do not exist, with priority to residential areas, and especially in EJ communities with higher percentages of impervious surfaces and related heat island impacts. (Note: The working group is better able to identify appropriate sources of funding than we are, but it is definitely worth funding by the state to help municipalities address climate change mitigation, adaptation and resilience.)

o The overhead pole and wire electric and communication distribution system should be converted to an underground system, and all new wires and upgraded circuits placed underground, to the extent possible, in order to better protect existing large street/roadside trees and allow for planting and replanting of trees that grow into large trees. To maximize the benefits of large trees, statewide planning and establishment of priorities for conversion should begin. (Note: The current overhead pole and wire grid is a major impediment to realizing the full benefits of a robust tree canopy along municipal streets and roads. Because of modern technological developments, damage to existing trees can be avoided to a significant extent when converting to underground wires. It is beyond the scope of this report to tackle this complex and long term issue, but it is important that the report recognize that undergrounding would protect and allow planting of large trees and that it is not just important for electric and communication reliability.)

o Create and promote model municipal ordinances to encourage replacement of and mitigation offsets for [non-emergency] removals of street trees within the municipal road right-of-way. (Note: Given the benefits of trees, even those whose removal is due to an emergency should be replaced or planted elsewhere, if conditions prevent replanting.)

o Establish new Connecticut standards for state roads and highways that minimize losses of healthy trees.

(Note: We do not attempt to rewrite the opening paragraphs preceding the bulleted list of short term actions, which you may find necessary. It might also be a good idea to note that these recommendations do not cease to be applicable beyond 5 years, unless they are only needed or must be fully accomplished within the five year period.)

Respectfully submitted,

Mary-Michelle (Mikey) Hirschoff

Spokesperson for Trees and Power

The Garden Club of New Haven

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**Alec Shub <alec.shub@uconn.edu>**

# FW: CG3 Working Group Feedback

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 10:47 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Glenn Boyle <gbmicrosoft1@gmail.com>
**Sent:** Wednesday, October 21, 2020 9:52 AM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** CG3 Working Group Feedback



Agree that building codes need to reflect required insulation in all new buildings - specifically that all residential housing use the equivalent of 2x6 studs for outside walls or, R19 or greater insulation be installed. Similar requirements for insulation be updated for ceilings and floors.

Only with building code revision can we ensure that energy efficient buildings are constructed.

Given the COVID pandemic, ensure that ALL new buildings have minimum recirculation HVAC systems with appropriate filters installed (limits to be based on scientific research to determine exact levels needed to prevent transmission of virus), despite the deleterious impact on energy requirements. This change is based on the premise that the future will bring new pandemics and we need to build with this likelihood in mind.

Best,

Glenn Boyle

Newtown, CT

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Comments on Draft Reports of Working & Natural Lands Working Group, Rivers Sub-Working Group and Wetlands Sub-Working Group

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 1:39 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Greg Sharp <gasharp44@gmail.com>
**Sent:** Wednesday, October 21, 2020 12:46 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Cc:** alicea <alicea@riversalliance.org>; Aarrestad, Peter <Peter.Aarrestad@ct.gov>
**Subject:** Comments on Draft Reports of Working & Natural Lands Working Group, Rivers Sub-Working Group and Wetlands Sub-Working Group



I write as a retired environmental lawyer with more than 30 years in practice, who worked for the Department of Environmental Protection in the 1970s, served as the Chairman of the Council of Environmental Quality in the 1980s, and has been a member, and former chairman, of the DEEP Fisheries Advisory Council for 25 years. I have been involved with the Inland Wetlands and Watercourses Act for more than 45 years.

The reports from the two sub-working groups are excellent in laying out what the state must do going forward to address the threats to rivers and wetland resources from Climate Change, but they could be strengthened by highlighting the need for legal protection of lands adjacent to rivers and wetlands necessary to protect these resources as functioning ecological entities.

The Fisheries Division of DEEP has been on record for many years advocating for riparian corridor protection associated with the state's aquatic resources Riparian corridors, according to the Fisheries Division, would provide natural filtration of sediments and pollutants from overland run-off, maintain stream water temperatures suitable for resident finfish, stabilize stream banks and stream channels, supply large woody debris to streams to provide instream habitat for aquatic organisms, provide a food source for aquatic insects on which finfish rely, and serve as a reservoir in storing surplus runoff for gradual release into streams during low flow periods. See "POLICY STATEMENT: RIPARIAN CORRIDOR PROTECTION," by James C. Moulton, Acting Director, Inland Fisheries Division, December 13, 1991.

Unfortunately, the General Assembly has not adopted provisions sufficient to provide protection of riparian corridors in the Inland Wetlands and Watercourses Act ("IWWA") or other legislation. Attempts to amend the IWWA to provide for effective ecological "buffers" around wetlands and watercourses have failed.

The existing legislation does allow a local agency to regulate activities in areas around wetlands ("upland review areas"), it limits such regulation to apply "only to those activities which are likely to impact or affect wetlands or watercourses." General Statutes, Section 22a-42a(f).

Moreover, while the existing legislation defines "wetlands or watercourses" broadly to include "aquatic, plant or animal life and habitats in wetlands or watercourses" and defines "habitats" to mean "areas or environments in which an organism or biological population normally lives or occurs" (General Statutes, Section 22a-41(c)), it provides that a local agency, as opposed the DEEP Commissioner, **shall not deny or condition** any application for a regulated activity in an area outside wetlands or watercourses on the basis of an impact or effect on aquatic, plant, or animal life **unless** such activity will likely impact or affect the **physical characteristics** of such wetlands or watercourses. General Statutes Section 22a-41(d). (Emphasis added). The term "physical characteristics" is not further defined.

Compounding the difficulty for local agencies in giving effect to even this limited power to regulate areas adjacent to wetlands or watercourses are decisions from the courts requiring a high burden of proof to support a denial of or impose significant conditions on an activity in an upland review area. Evidence of general environmental impacts, speculation, or general concerns are not sufficient. In addition, to the extent that the issue involves scientific or technical issues, the record to support a denial or significant condition must be based on supporting expert testimony in the record. The cases indicate that expert testimony will generally be necessary to support an agency's determination that a proposed activity in the upland review area would likely impact or affect the physical characteristics of the wetland or watercourse. In many cases, local agencies do not have experts readily available to provide such testimony and, even if they do, the courts have required a level of certainty that experts in many cases simply cannot provide.

**Recommendation**: The Working and Natural Lands Working Group should recognize that there is an impasse on this issue and propose to the Governor and the General Assembly to propose legislation to clearly provide the legislative authority to establish protective riparian corridors to preserve Connecticut's fragile inland wetlands and watercourses.

**Minor Text Corrections:** I should add a few minor comments on some typographical errors in the Draft Report of the Rivers Sub-Working Group:

On Page 4, first line, "Changing precipitation patters" should be "patterns."

On Page 4, line 14, "We face the loss of viable native and migratory aquatic species that are valuable not only to our ecosystems, but to our sense of place and culture."

On Page 5, first paragraph, second line, the text reads "We must continue to take further action in ensuring that local land-use decisions result in further loss of coldwater habitat and degradation of high quality rivers and streams." I believe the writer intended the text to read that "…local land-use decisions do not result in further loss…."

Thank you for consideration of my comments.

Sent from Mail for Windows 10

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Public Comment / GC3 Working and Natural Lands Working Group Draft Report

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 1:42 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

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FYI. He asks for acknowledgement of receipt. Rebecca, shall I do that or will you?

-----Original Message-----
From: Harry White N1QVE <harry15@mindspring.com>
Sent: Wednesday, October 21, 2020 1:40 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: Public Comment / GC3 Working and Natural Lands Working Group Draft Report

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Friend,
Please accept the attached letter as a Public Comment regarding the GC3 Working and Natural Lands Working Group Draft Report.
I would appreciate an acknowledgement of receipt.
Kind regards,
Harry

--
H. White
Forest Ecologist

Wild River Farm
Colebrook, Connecticut

Wilderness is an anchor to windward. -Clinton Anderson

Look deep into nature, and then you will understand everything better. -Albert Einstein

**GC3_Forests_PublicComment_HWhite_3-signed.pdf**
154K

Harry White
Forest Ecologist
199 Sandy Brook Road
Colebrook, CT 06021

October 20, 2020

I am writing this letter as a public comment on the GC3 Working and Natural Lands Working Group draft report. I have been working in Connecticut's forests for over 25 years as part of the land trust community and have a deep working knowledge of the state of the forest as well as the State's management activities on public lands. I have personally worked on the permanent protection of over 15,000 acres in Connecticut and over 20,000 acres elsewhere in New England. My work is wholly based in the peer-reviewed scientific literature.

Some of Connecticut's forests rank among the most important ecosystems on the planet, and are considered Tier I Climate Stabilization Areas in the Global Safety Net (GSN) Program that was created by analyzing 11 published biodiversity layers, including everything from wilderness areas to important sites for rare plants. The GSN indicates that we must protect existing forests, almost triple the amount of protected high-quality lands, and build corridors to connect them if we are to stem the catastrophic loss of biodiversity on Earth.

By high quality lands, I mean intact, fully functioning, native forests.

1. The Invasive Plant Threat

This leads me to my first challenge to the Working and Natural Lands Working Group draft report. Because of industry pressure and the existence of an outdated harvest-oriented paradigm in the silviculture community and at DEEP, forests are not being viewed as complex ecosystems. They are seen first as a source of timber with all other values being of less importance. This culture has led to the explosive expansion of non-native invasive species on the landscape. Invasive species are disturbance specialists, and logging is a disturbance that provides invasives with the substrate and growing space for proliferation. Here in NW Connecticut, old log jobs rank among the most powerful sources of invasive plant propagules that radiate across the landscape. Contrarily, forests that have not been subjected to logging are comparatively free of invasive plants. Foresters and loggers regularly give lip service to the existence of invasives but rarely pre-treat or post-treat their cuts. The same goes for the DEEP's New England Cottontail clearcuts: they are transitioning into massive invasive sources and they are contaminating the greater landscape.

Biologist E.O. Wilson called non-native invasive plants "the greatest threat to biodiversity on Earth". Couple this with climate change, and we are facing a massive and imminent threat to life itself.

2. The Abused Concept of Forest Health

This leads me to my second challenge to the Working and Natural Lands Working Group draft report: the concept of forest health. DEEP and the silviculture community almost always cite forest health as a

justification for logging. The actual health issue, however, is never quantified. How logging maintains or improves forest health is never quantified. The fact is, non-native invasive plants are THE primary forest health issue in Connecticut. Logging creates invasives habitat. Their existence in our woodlands threatens the existence and regeneration capacity of our forests. There are Japanese barberry – dominated stands in NW Connecticut that are in an intermediate absorbing state where there is no regeneration of the tree community. Additionally, barberry in particular is strongly linked to forest rodents that harbor the ticks that carry Lyme Disease and its cousins. The problem is so great that I do not allow my staff to enter dense barberry stands. This is a major public health issue that is being facilitated by logging.

Thus, to truly protect the health of Connecticut's forests, we need to change the focus from a harvest-centric paradigm to one that actually aimed at protecting forest health. We need to create and foster programming – led by DEEP Forestry – that targets existing problems and does not create new ones. The forest health threat is clearly invasive plants. This should be the primary, daily focus of DEEP Forestry.

3. Connecticut Forests Rank Highest in New England Carbon Storage

Regarding carbon, Tolland, Litchfield, and Fairfield County forests rank highest in New England for above-ground carbon storage. This is because our forests are older and more complex than most in New England. I regularly work across Northern New England and understand why Connecticut's forests are at the forefront of carbon storage – it is because they are often intact and have less logging-related impacts. The Northern Forest has been devastated by logging and therefore it ranks low on carbon storage. We need to not increase logging in Connecticut and should actually and effectively regulate it.

The Working and Natural Lands Working Group draft report does not properly identify the fact that the most powerful and least-expensive route to climate mitigation is proforestation, allowing trees to grow. It does not recommend this route because it challenges the small but vocal logging community that refuses to face the science and threat of climate change. Our forests are young compared to the life expectancy of our tree species – to 800 years old. By simply allowing the forests to grow without interventions such as logging, our forests will continue to lead in carbon storage and will develop complexity and biodiversity that has not been seen since European colonization. It is an effortless approach and one that would be widely embraced by the citizenry.

4. Proforestation

First, the term "proforestation" is a new scientific term to describe a management activity that is not favored by CT DEEP or the logging community. Again, it simply means allowing the forest to exist without manipulation. The term was coined by a Nobel Prize-winning scientist of great regard. Within the Working and Natural Lands Working Group and in several public comments, the term has been derided and dismissed, with no alternative term offered to describe the management option of leaving the forest alone. The logging culture sees the term as a threat to their control of Connecticut's forests. Proforestation is not an all-or-nothing descriptor. Proforestation is simply one of a landowner's options.

5. Core Forests

I endorse the recommendation to protect at least 50% of Connecticut's medium and large Core Forests. This recommendation needs to be further enhanced by putting the maximum level of protection on the cores, i.e., establishing them as forest reserves that will never be logged. The idea is to get these trees into advanced age and size where carbon storage is exceptional and complexity and diversity foster resistance and resilience to disturbance. The science is clear: logged forests are simplified systems with reduced resilience. Again, this is the least expensive and one of the most powerful routes to carbon storage. Non-native invasive plant management and catastrophe-conscious safety valves should be built into the management regulations for such places.

6. Natural Area Preserve Program

The Natural Area Preserve Program should be greatly expanded to encompass all DEEP-designated Critical Habitats (as inventoried in the CT Natural Diversity Database), all headwaters and riparian forests on state lands, and all intact state forestland that shows little to no invasive plant proliferation. We must protect these areas from invasive plants, the greatest threat to forest health, by banning logging within them. Such areas serve as baseline ecosystems against which to measure the effects of logging and other disturbances. The NAP Program is the perfect management repository for such lands at virtually no cost to the state. The Working Group's recommendation to protect some cores is a good recommendation but it does not go far enough. There should be many NAPs in Connecticut so that all forest types and stages are represented.

7. The Market Value of Carbon

DEEP must consider the value of carbon when determining awards for logging contracts on state lands. If the standing trees are worth more to the carbon markets than the highest logging bid, the project should not be awarded. Furthermore, CT DEEP must stop losing money on log jobs and maximize the return to the state's coffers. The state forests and foresters do not exist to subsidize the logging economy.

8. No Biomass.

The science is clear. Biomass is not a renewable fuel, is more polluting than coal, releases carbon into the atmosphere, and worsens climate change in several realms. A 70-year-old tree is vaporized in 17 seconds in an industrial biomass burner. How is that sustainable?

9. Create Programming to Keep Logging Economically Viable

The cost of mechanized logging equipment is extraordinary, and forces loggers to cut more to pay for the equipment. DEEP should help create a centralized shared-equipment depot wherein loggers can rent expensive equipment instead of having to own it. We only need to look to industrial agriculture and the farming economy to see the true cost of large farm equipment on farm economic viability.

10. Expand the Open Space, Watershed, and Land Acquisition (OSWA) and Recreation and Natural Heritage Trust (R&NH) Programs

OSWA and R&NH are critical elements in any effort to expand the protection of Connecticut's forests. I have personally worked on dozens of OSWA projects, most of which would not have been preserved had this funding not been available. OSWA in particular allows conservationists to leverage significant private matching funds, greatly decreasing the burden on the state. The Working and Natural Lands Working Group call for $25 million in annual appropriations should be the absolute minimum for these programs.

11. Connectivity and Wildness

State lands management should always consider the role of Connecticut's forests at both local and regional scales – beyond the boundaries of the cut. For instance, lands that lie in the Eastern Wildway corridor should be considered Wild Areas. Such areas foster biodiversity, climate resiliency, and resistance to non-native species invasions. Our state is fortunate to be located in the Eastern Wildway, and we should contribute wild places to the corridor, not degraded, invasives-dominated, logging-simplified places. There are plenty of lands that will always be logged – let's protect the special places.

Closing

Through GC3, we have a powerful opportunity to mitigate climate change in Connecticut. It is imperative that we see beyond old-school paradigms, bad science, and economic self-interests to recognize that true native forest protection is the most cost-effective tool to counter this grave threat to the planet. I respectfully submit that DEEP, foresters, and loggers must face this truth and evolve and support the true preservation of some places on the landscape. This is not an all or nothing argument.

I thank you for taking the time to read my comments.

*Harry White*

Harry White
Colebrook, CT

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Alec Shub <alec.shub@uconn.edu>

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 8:59 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Ieke Scully <scullies@hotmail.com>
**Sent:** Wednesday, October 21, 2020 8:54 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change,

Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit.

Nature is essential for the future, for evolution and for everything we need, and serves the public good now and for the long term.

We have so many beautiful natural areas, and some need to be protected for nature study, hiking, and places that people can count on. This has never been more important.

We need systems that support good jobs, local resource use, AND natural areas.

Our public land is held in the public trust.

We need your leadership.

Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

Ieke Scully

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Ct's Environment

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 5:38 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

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**From:** James Hourdequin <jwhourdequin@gmail.com>
**Sent:** Wednesday, October 21, 2020 5:20 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Ct's Environment



Please preserve CT's natural environment for future generations. Forests are critical for the future of our state's and to our residents' health.

Sent from Mail for Windows 10

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:48 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

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**From:** Jane Hannah <jane@crhannah.com>
**Sent:** Wednesday, October 21, 2020 11:13 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

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To DEEP Climate Change,

Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit.

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Meanwhile - we are burning and exporting our public forests? Who benefits? This is beyond disturbing.

We need systems that support good jobs, local resource use, AND natural areas.

Our public land is held in the public trust.

We need your leadership.

Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

Connecticut School Transportation Association

171 Market Square, Suite 209, Newington, CT 06111 (860) 953-2782 Fax (860) 953-8404

October 21, 2020

Governor's Council on Climate Change Members,

The Connecticut School Transportation Association (COSTA) appreciates the opportunity to offer comments on the Governor's Council on Climate Change (GC3) recommendations, particularly on the Draft Report of the Progress on Mitigation Strategies Working Group. COSTA is a statewide trade association comprised of owners and operators of school buses and school transportation vehicles. Together, our companies operate more than 10,000 school buses and student transportation vehicles that transport nearly 500,000 children to and from school safely each day.

The focus of the Progress on Mitigation Strategies Working Group was to review the Council's 2018 report which was designed to achieve a 45 percent greenhouse gas reduction by 2030, assess the progress of those recommendations and advise the council on additional actions that should be taken. This group compiled a 144-page report which looked at five different sectors, including Building, Electricity, Non-energy, Transportation and Cross Sector.

The report's Transportation section talks about establishing emissions standards for medium-and heavy-duty vehicles, including school buses, similar to California's emission standards. In July 2020, Connecticut joined 14 states and the District of Columbia in announcing a joint MOU, committing to work collaboratively to accelerate the market for *zero* emission medium-and heavy-duty vehicles. As a result, **the working group recommends that the GC3 build on this MOU be establishing a goal of electrifying 50 percent of the state's school buses and other school vehicles by 2030.**

COSTA views this as a very ambitious 10-year goal and would like to point out several concerns with this recommendation for the working group and council members to consider. Our concerns are as follow:

- The cost of an electric bus is $330,000 versus $80,000-$100,000 for a diesel bus
- Each electric bus will require approximately $15,000 in infrastructure upgrades, and additional power capacity would need to be brought into the school bus facility by the power company to charge these vehicles.
- The space required per bus at each facility will increase by approximately 50 percent as a charging station would be needed for each bus

- The efficiency of the electric bus will decline in the winter months as tests at one large school bus company in Canada and Chicago have revealed that the cold weather impacts the battery.
- An electric school bus is cheaper to operate than a diesel bus in terms of equipment and parts, but the cost upgrades will take 7 to 8 years before they are cost neutral.
- Municipalities pay for the purchase of new school buses through their contracts with school transportation providers. The duration of these contracts is typically 5 years to allow for the amortization of the cost of these new vehicles. An electric school bus will cost three times the amount of a diesel bus and may be too expensive for certain towns to pay, without some type of subsidy.

As you can see from our concerns, the cost of purchasing electric vehicles will be very expensive, and this does not even include the facility infrastructure upgrades that would be needed in order to charge the vehicles each day. This cost would be paid by the municipalities through their school transportation contracts, and these same municipalities are currently dealing with their own budgetary struggles as they make unexpected infrastructure and other changes necessitated by the COVID epidemic. Only a handful of our member school bus companies have even been approached by their respective school districts regarding the topic of converting to electric school buses. Once the electric vehicle prices and infrastructure upgrades are mentioned, the topic has been quickly dropped.

Clearly, the state would need to provide some type of grant program to help defray the costs of purchasing electric school buses. Some funding has been made available through the Diesel Emissions Reduction Act (DERA) grants in recent years, but this is not nearly enough to cover the replacement of the more than 10,000 school buses that operate in this state each day. At the 50 percent electric replacement by 2030 goal, the municipalities would need at least $16.5 million for 5,000 vehicles, and this does not include the necessary infrastructure upgrades.

COSTA would recommend a more realistic approach of developing a pilot program to operate a fleet of electric school buses in one or two towns in the state for at least a year to see what the costs, practicalities and pitfalls would be. Based on the outcome of the pilot, the state could decide what further electrifications or other actions would be warranted and under what timeframes. State or federal funding would be needed to assist with the purchase of these vehicles.

COSTA would be happy to work with the GC3 Council, DEEP or any other entity to discuss solutions to school bus emissions. Thank you for allowing COSTA to share these concerns with you.

Respectfully submitted,

Brad A. Cohen
President
COSTA

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 5:35 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

**From:** Jean-marc Edeline <jean-marc.edeline@universite-paris-saclay.fr>
**Sent:** Wednesday, October 21, 2020 4:49 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

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To DEEP Climate Change, Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit. Nature is essential for the future, for evolution and for everything we need, and serves the public good now and for the long term. We have so many beautiful natural areas, and some need to be protected for nature study, hiking, and places that people can count on. This has never been more important. Meanwhile - we are burning and exporting our public forests? Who benefits? This is beyond disturbing. We need systems that support good jobs, local resource use, AND natural areas. Our public land is held in the public trust. We need your leadership. Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

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**Alec Shub <alec.shub@uconn.edu>**

# FW: CT forrests

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 12:23 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

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**From:** jeanne hammer <jeannehammer44@gmail.com>
**Sent:** Wednesday, October 21, 2020 12:07 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** CT forrests



I am writing to plead with you to protect our forrests for future generations and for those here now whose lives depend upon carbon sequestration. There is no comparison in the amont of carbon an old growth tree takes up vs a younger one of equal size. There is so much we are losing before we may know of its real longterm value to ourselves and our posterity.

Jeanne Hammer

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**Alec Shub <alec.shub@uconn.edu>**

# FW: protect nature preserves

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 8:35 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Jen Allen <jenallenmusic@gmail.com>
**Sent:** Wednesday, October 21, 2020 7:46 AM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** protect nature preserves



Please protect nature preserves! This is an important issue and we need to protect our environment as much as possible. We are connected to our environment so deeply and need it for our enjoyment, science, and survival. Please do the right thing and protect as much of our earth as possible especially here in CT.

Thank you,

Jen Allen
--

**Jen Allen**
www.jenallenmusic.com

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Comments Regarding the GC3 Forests Working Sub-Group Draft Report

From: Jill Humphreys

October 21, 2020

Governor's Council on Climate Change, Working and Natural Lands, Forest Sub-Group:

As a certified forester in the state of Connecticut, I would like to submit my comments to this working group. I believe this report makes many sound recommendations that should be adopted as policy. However, there are also concerning sections of the report that seem biased towards claims or opinions that are not substantiated by studies, particularly studies in Connecticut forest systems. There are also inconsistencies between different sections of the report that make contradicting recommendations. I will point out some areas that stuck out to me in more detail; my comments are not completely comprehensive but hopefully point out some of the main areas that need follow up throughout the entire report.

It's alarming that the Forests Sub-Group members did not included more perspectives of foresters who actively manage the land in Connecticut or landowners who actively manage their land. In particular, many of the recommendations in the report are specifically for DEEP state land but, perhaps because there was not more inclusion of anyone who works in these forests, the recommendations do not fully or accurately include how state lands are currently managed. I think the fact that this perspective was lacking led to a lot of the concerns that stand out in the Report. In comparison, the GC3 Agriculture Sub-group included members of state organizations and active farmers; the Agriculture Draft Report considers how active farms can continue to work to mitigate climate change. The Forests Draft Report, without representation from active managers, failed to consider how active forests can continue to be managed while incorporating silvicultural principles that would help mitigate climate change.

Proforestation (referenced may times throughout the report) should not be presented as a scientifically established fact and forestry recommendations should not be based around it. If it is included in the report, it should be presented as what it is: a perspective that is newly emerging and unproven to be effective long-term in Connecticut forests. Two of the citations (numbers 88 and 89) used to support proforestation principles do not mention the use of proforestation as an effective management tool and discuss the critical importance of accounting for carbon stored in wood products and carbon saved by using wood products over other resources. Reducing the ability of forest managers to respond to climate changes is not forward-thinking. On the other hand, the Yankee Division of the Society of American Foresters recently released an opinion on forest management in the era of climate change that supports sustainable and climate-minded silviculture, referencing timely and regional studies. Generally, there is agreement that old forest areas should not be disturbed and maintaining undisturbed forests is important from a landscape-level perspective.

This report draft also describes proforestation as low-cost alternative (page 29). The revenue generated from timber harvests on state lands goes directly back into the forest; it is used to fund invasive management, road building and maintenance, boundary marking and encroachment problems, and other activities essential to well-managed, publicly-accessible forest lands. With passive management, no revenue would be generated and taxpayers/the State of Connecticut would cover the costs that are now funded through sustainable forest management.

Also on page 29, the idea that “control” areas need to be established in state forests speaks to the fact that there was limited involved from managers of state forests. Over half of State Forest land with management plans is passively managed already; if all State Forests had management plans, the percentage of passively managed land would be similar in these new plans. Other lands owned by different agencies of the State Government are not managed. Large land trusts and research forests across the state either chose to not actively manage their lands or set aside acreage as a control. A majority of private land owners with forested acres chose to use their land for recreation alone or do not have enough land to economically perform harvests. There are already multiple Natural Area preserves across the state. There is not a lack of land that can be used as a “control”.

On page 38, I think that supporting a local wood market, especially where it can replace more climate-impacting alternatives, is an important topic. The discussion of the off-sets of using local wood over internationally-sources wood products is great and should be incorporated more throughout the report. However, this section seems to be focused on the use of damaged or dying urban trees to reach these goals; this would not be an economically sustainable source for a wood products economy. There is an existing economy around wood products that already exists in Connecticut, but it is in sustainably managed forest in more exurban/rural areas of the state.

In other areas of the plan, the group suggests harvesting in large forested areas in Connecticut is essential to supporting a sustainable local wood economy and avoiding placing the pressure on less-stable/sustainably harvested areas of the world, but this is not support by other areas of the report that call for a reduction of cutting on public lands. Placing the hopes of sustaining a forest economy on management of private land is also contradicted by the statement that over 70% of private landowners do not have an interest in managing for timber resources. A majority of Connecticut landowners do not own enough land to make sustainable harvesting an economic option. Outreach to landowners who are largely uninterested in managing their land would be a tremendous effort when sustainable harvesting can be achieved on managed public lands. I agree with the idea that outreach to landowners could be directed to encouraging easements/ deed restrictions/ other tools that provide a benefit to the landowner and can keep lands maintained as forest in the long term. State Forest lands are already protected from conversion to anything other than forest- more focus should be placed on forested land that could be at risk of becoming converted to other uses.

Finally, I was surprised that there was little discussion of Connecticut forests in relation to wildlife habitat and recreation. If the ability to manage forests is reduced, that would affect the amount of young and variable habitat types created in critical areas for critical wildlife species. Also, as a Connecticut resident and forester, some of the most significant damage I see to forest systems is unauthorized recreation, particularly the creation of new trails and use of trails by motorized vehicles. This creates small-scale habitat fragmentation and increases wildlife disturbance and erosion in areas that would otherwise only see foot-traffic. When the report mentions “protecting Core Forest”, does this include protection from the effects of recreation? Wildlife and recreation concerns should be more directly addressed.

Thank you for your work on this report, and I appreciate the fact that many perspectives were included when creating the sub-committee group. I think work could be done to include additional perspectives that might more fully represent all stakeholders in Connecticut forests. There is so much uncertainty about how our forests will be effected by climate change and a lot of the research needed to create a

firm strategy for moving forward is ongoing. I'm sure my comments echo the comments of many other concerned members of the forestry community in Connecticut, but I wanted to add my voice in support of revisiting sections of the report.

Sincerely,

Jill Humphreys

UCONN
UNIVERSITY OF CONNECTICUT

**Alec Shub <alec.shub@uconn.edu>**

# FW: Environmental Resilience in the Face of Climate Change

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 9:25 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Jim Knox <jknox@beardsleyzoo.org>
**Sent:** Wednesday, October 21, 2020 9:20 AM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Environmental Resilience in the Face of Climate Change
**Importance:** High

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Connecticut DEEP Officials and Fellow Connecticut Residents,

As a conservationist and educator working in the field and in our Connecticut communities from Bridgeport to Greenwich and beyond, I have witnessed firsthand the response of individual species and natural communities to the advancing phenomenon of climate shift in our home state.

Our native species--critically endangered and non-protected alike--do not differentiate between prevailing competing bodies of scientific or political thought. They simply respond to the world around them. In witnessing rapid species shifts, contracting ranges and regional extirpations, scientific knowledge and cold logic force me to acknowledge this phenomenon as anthropogenic fact. With that recognition comes the responsibility of sharing this scientific knowledge with you, my fellow Connecticut residents. Please add my voice to those who advocate for stringent legislative measures to ensure we do our utmost to protect and advance Connecticut's biosecurity, natural resilience, and heritage of beauty.

Sincerely,

Jim Knox

Curator of Education

Connecticut's Beardsley Zoo

Connecticut Zoological Society

**HOME BUILDERS & REMODELERS ASSOCIATION OF CONNECTICUT, INC.**
435 Chapel Road, Suite B, South Windsor, CT 06074
Tel: 860-500-7796 Fax: 860-500-7798 Web: www.hbact.org

*Your Home Is Our Business*

**October 21, 2020**

Governor's Council on Climate Change
CT Energy & Environmental Protection
79 Elm Street
Hartford, CT 06106-5127

(Submitted Electronically: deep.climatechange@ct.gov)

Dear Council Members:

Thank you, for the opportunity to provide comment during the Working Group Draft Report Public Review Period. The Home Builders and Remodelers Association of Connecticut (HBRA-CT) is a professional trade association with nearly 900 hundred business members statewide, employing tens of thousands of Connecticut residents. Our association of small businesses is comprised of residential and commercial builders, land developers, remodelers, general contractors, subcontractors, suppliers and those businesses and professionals that provide services to our diverse industry. We build between 70% to 80% of all new homes and apartments in Connecticut each year and engage in countless home remodeling projects.

HBRA-CT acknowledges the realities of climate change and the need to mitigate its effects but we must stress the need to balance these efforts, with other important factors such as the health of the economy, housing affordability and accessibility, to name a few. The HBRA has concerns that the following recommendations made by the working groups do not strike that proper balance and should not be endorsed by the full council at this time:

- Recommendation to set end dates for expansion of the gas grid and new gas installations on the existing grid
- Prohibit the installation of fossil fuel infrastructure in new buildings and major retrofits; align strategic electrification plans to fill needs for new buildings.
- End state and ratepayer funded incentives to convert customers to gas, and for fossil fuel combustion equipment and appliances. Incentives should be redirected to high efficiency electric alternatives/heat pumps. Align strategic electrification plans to fill needs for high-efficiency electric alternatives. Address different needs of residential and commercial markets.
- Address the need for new transmission or transmission constraints to enable zero-carbon emissions electric grid taking into account land acquisition/enviro impacts.

Current codes for new homes have never been more energy efficient and resilient. In this day in age builders are commonly building to HERS scores in the 40s and low 50s with the use of

natural gas. Compare those numbers with resale homes with average HERS scores of 130. Connecticut's older housing stock is a significant contributor to the emission of greenhouse gasses. As such, the HBRA would encourage the Council to focus its efforts on retrofitting existing homes. We can make some of the greatest strides as a state by focusing on retrofitting older homes with newer technology systems of electric or natural gas to meet energy efficiency goals as laid out by the CT Global Warming Solutions Act.

With rising lumber costs, supply chain disruptions, increasing land costs, discriminatory land use practices, stresses that contribute to the rising cost of home construction have never been more acute. Studies show that on average 25% of the cost associated with the construction of a new single-family home can be attributed to regulatory costs. The percentage increases to 30% with new multifamily construction. Rather than increase regulatory burdens on new construction which is already very efficient by comparison, this body should endeavor to incentivize green construction by encouraging the administration to provide a tax credit to buyers of new green homes that exceed the current code (see HB 7366 introduced by the Planning & Zoning Committee in the 2019 session for sample legislation).

While Connecticut has seen a recent pandemic related influx of new residents, we are still experiencing a net loss of residents year over year. This trend in outward migration is due, in part, to an unaffordable and insufficient housing stock that makes it virtually impossible for many residents to live where they work. A recent study done by NAHB titled, NAHB Priced-Out Estimates 2020 indicates that nationally a $1000 increase in the median new home price would price 158,857 families out of an already difficult market. In Connecticut, a whopping 49% of renter households are housing cost burdened, meaning they spend more than 30% of income on housing. If these working group recommendations where to make their way into law or regulation it would only serve to exacerbate these growing affordability problems.

If adopted, these recommendations would have the effect of picking winners and losers. For example, caping extensions of gas will curb the economic potential of our rural communities just as we begin to see an influx of new residents leaving the cities for the relative refuge of suburbia. If adopted these recommendations will serve to increase the economic and racial divide between our urban centers and leafy bedroom communities. Those communities with decades of devious land use practices that have served to limit the number of multifamily and affordable housing will be rewarded and will use the lack in infrastructure as an excuse not to do their fair share.

The state of Connecticut does not reside in a vacuum. Daily, we compete with neighboring states for business. This is particularly true as New Yorkers flee the City for the refuge of suburbia. Many of these transplants will bring their small to medium size businesses with them. We as a state are not even building at a rate to replace housing units that have fallen out of use. The growing demand to expand existing homes and the need to build new homes will not be met and another generation of growth opportunity will be lost to more hospitable states should these recommendations be adopted.

Inclosing, there are better ways to encourage increased energy efficiency in our homes. Greatest gains can be made by bringing existing housing stock up to existing code by further incentivizing the retrofitting and remodeling of existing homes which can be less than half as energy efficient as home built to current code standards. In addition, the state could provide

modest tax incentives to new homebuyers that purchase new homes with energy efficient standards beyond what is required in existing code. This approach would alter consumer habits, thereby increasing demand and incentivizing the market to produce more energy efficient homes. In the end, a modest state tax credit targeting purchasers of new energy efficient homes would more than pay for itself in the economic activity it would create and the new property, sales, and income taxes it would generate. A tax credit would achieve better results without the heavy hand of government mandating which in the case of these working group recommendations would potentially price thousands of potential households out of the market.

Sincerely,

Jim Perras, Esq.
CEO, HBRA of CT
435 Chapel Rd., Suite B
South Windsor, CT 06074
860-500-7796 (w)
860-500-7798 (f)
860-327-3800 (c)

UCONN
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Alec Shub <alec.shub@uconn.edu>

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 6:23 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Joan Maloof <joan@oldgrowthforest.net>
**Sent:** Wednesday, October 21, 2020 5:59 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change,

Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit.

Nature is essential for the future, for evolution and for everything we need, and serves the public good now and for the long term.

We have so many beautiful natural areas, and some need to be protected for nature study, hiking, and places that people can count on. This has never been more important.

Meanwhile - we are burning and exporting our public forests? Who benefits? This is beyond disturbing.

We need systems that support good jobs, local resource use, AND natural areas.

Our public land is held in the public trust.

We need your leadership.

Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

**Joan Maloof** *Executive Director,* Old-Growth Forest Network

*Professor Emeritus,* Salisbury University

Joan@OldGrowthForest.Net 410-251-1800 (mobile)

author of:

- *The Living Forest: A Visual Journey into the Heart of the Woods (2017)*
- *Nature's Temples: The Complex World of Old-Growth Forests (2016)*
- *Among the Ancients: Adventures in the Eastern Old-Growth Forests (2011)*

*Teaching the Trees: Lessons from the Forest (2005)*

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 11:40 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: sitomer@everyactioncustom.com <sitomer@everyactioncustom.com>
Sent: Wednesday, October 21, 2020 11:27 AM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Dr. Joan Sitomer
55 Hemlock Trl  Trumbull, CT 06611-3344
sitomer@icloud.com

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Comments on Forests Sub-Group Draft Report by The Greenwich Tree Conservancy

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 6:43 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: JoAnn Messina <treeconserv@optonline.net>
Sent: Wednesday, October 21, 2020 6:36 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Cc: Cheryl Dunson <cvdunson@yahoo.com>; Francia Alvarez <falvarez01@snet.net>; Eric Hammerling <ehammerling@ctwoodlands.org>
Subject: Comments on Forests Sub-Group Draft Report by The Greenwich Tree Conservancy

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

We applaud the time and focus that that GC3 committee and its many subgroups have devoted to assessing and preparing for climate change impacts on our state and our resiliency. We have attached the Greenwich Tree Conservancy comments to the draft report.

Thank you for the opportunity to comment on this report.

--
JoAnn Messina
Executive Director
Greenwich Tree Conservancy
PO Box 4215
Greenwich, CT 06831
203 622-7380
https://gcc02.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.greenwichtreeconservancy.org%2F&data=04%7C01%7CDEEP.ClimateChange%40ct.gov%7C3dc093eca6b3459df9bf08d87611b09b%7C118b7cfaa3dd48b9b02631ff69bb738b%7C0%7C0%7C637389165837909860%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=LwKQO412%2Fm6P7zx1nDd%2FDCShX9U5Q426GnsxiXjzgME%3D&reserved=0

“To exist as a nation, to prosper as a state, to live as a people, we must have trees.”
— Theodore Roosevelt

**GC3 Forest Report GTC Comments 20Oct21.pdf**
1006K

October 21, 2022

**Re: GC 3 Comments from The Greenwich Tree Conservancy**

The Greenwich Tree Conservancy is a non-profit group of over 800 supporters whose mission is to preserve and enhance Greenwich's urban forest to benefit the community, its health and its quality of life. We applaud the time and focus that that GC3 committee and its many subgroups have devoted to assessing and preparing for climate change impacts on our state and our resiliency. Greenwich is proud to be a Sustainable CT award-winning community.

Although we are solely submitting comments on selected reports, we note that there is considerable overlap among the Working and Natural Lands subgroup reports, which is to be expected as forests/rivers/wetlands are interrelated and form an eco-*system*. While we recognize that there is a timeline to be adhered to, we hope that another subgroup or new committee can be established to develop an over-arching consolidated Working and Natural Lands report.

We are submitting general comments on and specific suggestions for the Working and Natural Lands Forests subgroup report. Additionally, we are submitting general comments and recommendations on the Science and Technology and Infrastructure and Land Use Adaptation group reports. **Recommendations are in bold.** We reviewed these reports through the lens of an "urban forest" organization.

Thank you for the opportunity to submit comments on the draft reports. We appreciate the dedication and commitment of the working groups and thank Governor Lamont and DEEP for recognizing the importance of taking action to both mitigate and adapt to climate change.

Respectfully submitted,
Cheryl Dunson, President
The Greenwich Tree Conservancy
www.greenwichtreeconservancy.org

SCIENCE AND TECHNOLOGY REPORT

We commend the committee for the comprehensive and interdisciplinary view of the impacts and adaptation strategies and the urgency it notes to take action on known impacts. The report notes that indices reflect higher and more frequent temperature events, drought risks are expected to increase, continued high winds and precipitation from storms are probable. We wholeheartedly concur with:

- the need to strategically underground electric utility lines
- observation that excessive vegetation management leads to undesirable environmental impacts

- need for judicious and evidence-based tree removals and pruning.

Strategic rather then universal undergrounding means that roadside trees will remain. The State and UCONN have worked together to develop the STORMWISE program, which as noted on their website, is designed "to tackle the challenge of maintaining the aesthetic appeal of forested Connecticut byways while reducing the potential of tree-cause damage to the utility infrastructure during severe storms." **The STORMWISE program promotes managing for healthy roadside forests, which not only improves reliability but also aesthetics and the ecosystem services provided. This valuable work should be explicitly referenced.**

**We note that much reference is made to the power lines and recommend incorporating *telecommunications lines* in the same references.** Both are critical and rely upon the same antiquated 100+ year distribution system approach.

We urge a strong statement to protect electric and telecommunications distribution systems from climate changes. As noted in a recent NY Times article, Key Biscayne is among the Floridian cities and towns experiencing real estate drops due to climate change and is burying power lines to "to avoid wind damage and power cuts as storms worsen."
*(https://www.nytimes.com/2020/10/12/climate/home-sales-florida.html)*

**We urge the incorporation of recommendation/s such as "Encourage adaptation strategies that will ameliorate the effects of severe weather on our power and telecommunications distribution systems, particularly strategic undergrounding."**

INFRASTRUCTURE AND LAND USE REPORT

Our urban forests provide many benefits in mitigating the effects of climate change, yet are subject to threats "by a thousand cuts" from clear-cutting of highway and rail corridors (photos below Forests Report comments), utility "vegetative management", roadway straightening and widening to name a few. The Infrastructure and Land use Adaptation working group report would benefit from the same sense of urgency and "multi-solving" approach as reflected in the Science and Technology report.

**Given this report's focus on infrastructure, it is critical to note that our antiquated 100+ approach to distributing power and telecommunications is vulnerable to increasing severe weather disruption. We urge the committee to include strategic undergrounding of utilities as a priority action item. Recognizing that not all areas will be suited to undergrounding and that even if undertaken it will take decades to underground strategic sections, the work of the STORMWISE program also should be referenced as noted above.**

As is happening in communities across the country, from San Diego's 50-year plan *(https://www.sandiego.gov/undergrounding)* to Key Biscayne (*https://www.nytimes.com/2020/10/12/climate/home-sales-florida.html)*, our infrastructure must be adapted. As you'll see from this Greenwich postcard from the early 1900s, we have been using essentially the same distribution approach for over a 100 years!


**We also note that there is little mention of telecommunications which is just as vulnerable given the antiquated distribution system and urge its inclusion whenever utilities are referenced.** Additionally, with higher heat levels anticipated, it may see our telecommunications cables suffer similar fates as our catenary cables for our railroad, ie, drooping in extreme heat (*https://www.ctpost.com/local/article/Heat-slowing-Metro-North-trains-11213759.php*) which may lead to adverse impacts on the distribution system.

**We urge Land Use and Adaptation report to include same observations and recommendations as in the Science and Technology report:**

- **need to strategically underground power and telecommunications lines as an adaptation/resiliency strategy**
- **excessive vegetation management leads to undesirable environmental impacts**
- **need for judicious and evidence-based tree removals and pruning. The Stormwise Program provides such an approach.**

**Below is testimony from one of our members to the Energy and Technology committee regarding utility storm response to Tropical Storm Isaias which exemplifies the multi-solving spirit and urgency as reflected in Science and Technology report.**

FORESTS REPORT

The Forests report is a tour de force in its comprehensive approach and analysis to managing and protecting Connecticut's forests to maximize achievement of climate change goals.

The Greenwich Tree Conservancy wholeheartedly endorses "no-net-loss of forest" (NNLF). From our perspective, healthy forests equate to healthy resilient communities.

The report provides USDA Forest Service analysis *(p.4)* noting that Connecticut is a heavily urbanized state with nearly 3 million people living in urban areas. It further notes that "*The importance of urban trees is magnified by their proximity to people and co-benefits for health, energy savings, flood retention, and more (FIA).*"

**Our main concern about the Forests report is that an urban forest focus needs to be more explicitly articulated, i.e., that urban forests provide benefits that are magnified by being close to people but that proximity also leads to additional stressors that are apart from those in core forests.** Urban forest components are in the report throughout but are "co-mingled".

As colloquially noted in a 10/9/20 climate change article "Trees Are Time Machines" in The Atlantic:

> *"City trees lead difficult lives. A lot of things are trying to kill them, particularly the trees planted on sidewalks: Tightly compacted soil with high alkaline content makes it harder for them to absorb nutrients. Tiny plots of land admit very little rainwater. They've got dogs peeing on them, people dropping cigarette butts nearby, and cars belching pollution."*

To this harrowing list, we can also add wanton pruning by utilities, removals for sightlines and/or road widening "congestion mitigation", transportation corridor clear-cutting, chopping of roots for granite curbing installation where none existed before (see picture below) and much more.

**In terms of stressors on urban forests, therefore, a noticeable omission in the background info is infrastructure generally and transportation and utility corridors specifically.** A significant deterrent in meeting the goal of increased urban tree canopy is the impact of our infrastructure corridors: railroads, highways, parkways, power and communications. In fact, we should view these corridors as Settled Treescapes. These Settled Treescapes along highways and railroads provide significant noise reduction and reduce carbon emissions. Recent aggressive tree removal along these transportation corridors has created significant environmental setbacks to our towns that takes decades to mitigate. (See photo examples of clear cutting along transportation corridors below) There is no policy in place that addresses the harm our coastal communities and inland routes bear with high speed trains, highways, and transmission and distribution lines passing through residential neighborhoods. In addition, there is no tracking of this specific type of tree loss. We need to know what we have now, what we have lost, and what we need to replace to meet our statewide 2040 60% tree canopy goal.

Finally, as suggested earlier, municipalities and their land use approaches have significant impacts on their respective urban forests. We strongly suggest that their role in preserving and enhancing their forest be noted and have provided a minimum recommendation to be included in the report.

**We believe that providing a distinct statement on urban forests could be done relatively easily. The Wetlands report provides a good model in which it highlighted at outset the two types of wetlands (inland and tidal) even though the wetlands recommendations that follow generally apply to both.**

**If the committee agrees to providing a more focused statement, an approach could be to:**
**From page 4, use this as an opening sentence for a short focus:**
***The importance of urban trees is magnified by their proximity to people and co-benefits for health, energy savings, flood retention and more.***
**Then continue with language from page 30:**
***Urban treescapes typically contain larger trees on average…as a small tree<3 inches in dbh.***

**Also, would be the need to add the types of stressors unique to urban forests as noted above. There is more in the report that can be repeated and/or moved up to make a more distinct statement at outset.**

**Some specific language recommendations:**
**Page 2**
**Forest resiliency: within the mix of factors include *infrastructure impacts***

**Page 13**

- **Retitle last section to "open up" to: *Urban Forests make communities more livable***
    - **Second paragraph: "Connecticut should balance public safety *and infrastructure requirements* with…or municipalities."**
    - **Add to this section:**
        - **"*Additionally, municipalities need to recognize how their practices are making urban forests less resilient, eg, widespread installation of granite curbing which chops tree roots and weakens trees over time"***
        - ***Every community should adopt a tree policy containing standards and regulations governing the planting, maintenance, removal and protection of trees on municipal lands.***

**Page 14**

- **Pt. 4 Provide Incentives for Stewardship, Forest Retention and Forest Resiliency: need to include municipalities among the "landowners" needing incentives. They note 71% of woodlands owned by individuals, corporations and land trusts. Noting how much owned by municipalities would be helpful here.**

Roots chopped for granite curb installation

Clear cutting along transportation corridor

**ADDENDUM:**

**Subject:** LCO No. 3920 Testimony -- Bury the lines -- Let's do it!
**Date:** Mon, 7 Sep 2020 22:20:43 -0400
**From:** Elizabeth Hopley
**To:** ETTestimony@cga.ct.gov

Dear CT Legislators,

I am writing you to ask that you address the serious and persistent issue of our antiquated, failing electrical infrastructure in Connecticut. Recent tropical storm Isaias caused power outages across Connecticut leaving more than 1 million households without power and without communications (cable, phone) for a week and more. Unfortunately, outages are not unique to this storm, but rather have become commonplace with every passing storm, due to our vulnerable, outdated infrastructure.

During 1983-87, I lived in Europe and ALL of the local transmission and distribution lines were buried - never a power outage. Then from 1992-2008 living in Manhattan, through many strong storms, I continued to have reliable service because the lines are buried. However, since moving to Greenwich in 2008, I have been dismayed by the unreliability of electrical distribution, constant outages, as well as the visual clutter of what looks like Third World infrastructure. In the last two years, our family has lost power at least 12 times — one outage lasted 9 days, and twice we had outages caused by a squirrel that shorted the line. It is unacceptable that our infrastructure is so fragile that a squirrel can derail it. But it is equally unacceptable that winds, ice, falling trees can also derail our services. Severe weather is a fact of life in New England, our infrastructure must be tailored to the realities of the conditions. During all of the outages over the years, we have never once lost our natural gas or water service. Why? Because their pipes are underground and protected.

Our standards and expectations of Eversource must be elevated. We cannot continue to accept multiple power outages that disrupt residents' work, businesses, schools, and lives, and in many cases endanger, their lives. Trees and storms are not the problem. Overhead lines and poor planning are. **Overhead lines are the "horse-and-buggy" of electrical distribution. Buried lines are the current standard for new construction, so we must update our existing infrastructure to the current standard.**

Some points and information to consider:

There is broad consensus on the **BENEFITS** of burying the lines:

- **Reduced Maintenance**
  - Weather-related outages are eliminated.
  - Significant cost savings to ratepayers once the initial undergrounding cost has been paid.

- **21st Century reliability**
  - Your constituents rely on electrical, cable and phone utilities to run their businesses, further their education, and show up for remote jobs and internships. Lack of these services can jeopardize job security, cause lapses in education and disables emergency communications.
  - Hospitals, police and fire stations, and EMS need power and communications to save lives.
  - School cancellations due to outages also would be avoided with buried lines.
- **Aesthetics**
  - Overhead lines only detract from the beauty and historic charm of our communities. Eliminating the visual clutter of overhead lines creates a more beautiful, park-like feel with benefits to mental health.
  - Trees would not have to be pruned so aggressively and could grow in a more balanced, natural shape, making them more structurally sound and resilient.
  - Improvement projects such as adding or widening sidewalks are made possible without utility pole obstructions.
- **Safety**
  - Burying lines eliminates the risk of fire hazards, electrocution from falling lines.
  - Utility line work is one of the most dangerous jobs in America with about 40 of every 100k workers killed on the job every year. Many more are injured. The fatality rate is more than twice the fatality rate of police officers and firemen. Less necessary maintenance brings less exposure to workers to “hot” wires and less need for workers to do their work at precarious heights, reducing overall risk.
  - Reduce automobile accidents as motorists will no longer strike utility poles, often with fatal consequences.
  - Police, Fire, EMS, Hospitals and nursing homes rely on electricity to power critical communications as well as life-saving equipment.
  - Vulnerable residents reliant on CPAP machines, refrigerated medicines, and monitoring equipment will not have to worry about the next outage.
- **Environmental**
  - Save the trees/forests: carbon-sequestering pine trees are used as utility poles (In the US, there are 120-180M wood utility poles with about 6M more harvested per year). One study found that stopping deforestation is AS important as reducing carbon emissions to combating climate change.

        - Eliminate contamination of soil/water: Utility poles are treated with toxic chemicals, like creosote and arsenic, which off-gas and run off, contaminating our soil and water table.
        - Health risks of exposure to electromagnetic radiation fields (EMF's) are reduced and possibly eliminated.
    - **Economic Development**
        - Funding infrastructure upgrades employs local workers, who return their earnings into local and state economy.
        - Increase property values: Studies show that real estate values can increase up to 15% when utilities are undergrounded. Higher real estate sales and valuations create a vibrant economy and more tax revenue.
        - Local businesses may benefit as customers are drawn to the improved appearance in local business areas. Stronger businesses equals more happier, stable business owners, more employees, as well as increased state tax revenue.
        - Reduce interruptions economic activity (impacts on businesses, tax revenue) due to power outages are eliminated. Some storm-related outages have had estimates in the billions of dollars in lost economic output.
        - Historic sites, scenic vistas, parks and historic towns in our state will be beautified and revitalized which will bring more tourism.
    - **Equity**
        - Many wealthy neighborhoods have pooled resources to underground their lines. In Greenwich, a few examples are Belle Haven, Mead Point and Conyers Farms. These neighborhoods should not be the only ones to receive reliable service. The fact that these neighborhoods can continue to work remotely and learn online, while others cannot, widens the disparity of resources and education.
        - Generators for an average home, installed, cost $10k and up. This is unaffordable for most households in CT. Median household income in CT as of 2017 was $73,781 pre-tax.
        - Communications from our Town's Emergency Management cannot get through to our vulnerable populations for emergency instructions and information like where warming or cooling centers are when power and phones are out.
- Many cities and towns are burying their lines: San Antonio, TX; Colorado Springs, CO; New Castle, DE; Saratoga Springs, NY; Williamsburg, VA; Tacoma, WA; Palm Beach, FL; and Frederick, MD. Many more have already done it.
- Some **EXCUSES** cited for not burying the lines do not hold up to scrutiny:
    - ***"There is too much ledge/rock"*:** Eversource has the technology and equipment to do "pipe jacking" as they have done it when needed in Greenwich. Pipe jacking is a trench-less method of installing underground pipes horizontally using hydraulic power and a navigation system. In addition, there are so many other "trench-less technologies" that go

through rock. Think of fracking equipment and their ability to drill down 2 miles and then horizontally for miles beyond that. The technology is readily available. In the past, the trenching was cited as the most expensive part of an undergrounding project, so using trench-less technologies saves money.

- ***"There are too many coastal areas that flood and can't have underground wires"*:** Low-lying areas can be undergrounded. Underground lines are protected in waterproof pipes or casings. Think also of the transmission lines that run under water from Cape Cod to Nantucket - water and electrical can safely co-exist. Also, waterfront communities in Greenwich like Mead Point and Belle Haven have not had problems with water on their underground lines. There are safety "trips" that will shut down power if it comes in contact with water.
- ***"It's too hard to pinpoint an issue with underground lines and easy with overhead lines"*:** Actually, there are low-cost sensors that are now routinely placed along underground lines so that issues can be detected quickly. And of course, there will be many fewer maintenance/repair issues in the first place with underground lines.
- ***"It's too expensive"*:** If this is a 30 year project (as Eversource has said), then let's start now. Interest rates are low. Overhead lines only detract from the beauty and historic charm of our communities. Maintenance costs of overhead lines are saved as more lines are buried. Buried lines also result in increases to property values, so that could play into future property assessments, bringing in more revenue for towns. In addition, the federal government also currently offers low cost loans for electrical infrastructure projects. Let's lock it in!

Please let me know if I can help in any way on moving this forward. I'd be happy to provide the information resources for the above points if needed. Thank you for considering undergrounding our State's wires, as it is a unique opportunity to promote a project which will benefit ALL citizens of Connecticut.

Sincerely,
Elizabeth Hopley

UCONN
UNIVERSITY OF CONNECTICUT

**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 5:39 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: Joe Treacy <joetreacy872@yahoo.com>
Sent: Wednesday, October 21, 2020 5:22 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change,

Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit.

Nature is essential for the future, for evolution and for everything we need, and serves the public good now and for the long term. The current pandemic has more people enjoying nature than ever before, it must be protected.

We have so many beautiful natural areas, and some need to be protected for nature study, hiking, and places that people can count on. This has never been more important.

Meanwhile - we are burning and exporting our public forests? Who benefits? This is beyond disturbing.

We need systems that support good jobs, local resource use, AND natural areas.

Our public land is held in the public trust. Forests must be managed not destroyed!

We need your leadership.

Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

Sent from my iPad

UCONN
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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 6:23 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: John Galt <john.galt5@verizon.net>
Sent: Wednesday, October 21, 2020 5:59 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change,

Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit.

Nature is essential for the future, for evolution and for everything we need, and serves the public good now and for the long term.

We have so many beautiful natural areas, and some need to be protected for nature study, hiking, and places that people can count on. This has never been more important.

Meanwhile - we are burning and exporting our public forests? Who benefits? This is beyond disturbing.

We need systems that support good jobs, local resource use, AND natural areas.

Our public land is held in the public trust.

We need your leadership.

Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 8:32 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: John Schaefer <johnschaefer56@gmail.com>
Sent: Wednesday, October 21, 2020 8:10 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change,

Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit.

Nature is essential for the future, for evolution and for everything we need, and serves the public good now and for the long term.

We have so many beautiful natural areas, and some need to be protected for nature study, hiking, and places that people can count on. This has never been more important.

Meanwhile - we are burning and exporting our public forests? Who benefits? This is beyond disturbing.

We need systems that support good jobs, local resource use, AND natural areas.

Our public land is held in the public trust.

We need your leadership.

Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

We need forest open spaces that are allowed to mature naturally for the sake of the environment and our society's psychological and physical health.

Thank you for your work.

Judy & John Schaefer

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 5:33 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

**From:** Geiger, Jonathan <jonathan.geiger@und.edu>
**Sent:** Wednesday, October 21, 2020 4:35 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change,

Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit. Nature is essential for the future, for evolution and for everything we need, and serves the public good now and for the long term. We have so many beautiful natural areas, and some need to be protected for nature study, hiking, and places that people can count on. This has never been more important. Meanwhile - we are burning and exporting our public forests? Who benefits? This is beyond disturbing. We need systems that support good jobs, local resource use, AND natural areas.

Our public land is held in the public trust and we desperately need your leadership.

Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

Thanks and all the best!

Jonathan

---

Jonathan D. Geiger, Ph.D.

Chester Fritz Distinguished Professor

UND School of Medicine and Health Sciences

Department of Biomedical Sciences

504 Hamline Street, Room 110

Grand Forks, ND 58203

(701) 777-2183 (P); (701) 777-0387 (F)

Jonathan.geiger@und.edu

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Alec Shub <alec.shub@uconn.edu>

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 5:34 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Jonathan Gorham <jon@jongorham.com>
**Sent:** Wednesday, October 21, 2020 4:41 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** GC3 Comments



Dear DEEP representatives,

I commend the various Connecticut working groups convened by the DEEP for your extensive research and analyses of various climate change mitigation strategies. Thank you for inviting public input as you forge a pathway forward. In response, I urge the commission to consider bold action in the following areas based on my personal experience in past commercialization efforts and through involvement in hands on programs at the local (Woodbridge, CT) level.

Specifically, I urge the DEEP's Office of Climate Planning and the Governor Lamont to consider actions in the following areas:

Sustainable agriculture practices, food production and nutrition education

Use of renewables on small farms

Massaro Community Farm (Woodbridge, CT) has just completed build out of additional Solar PV on its barn and farmer's residence

Experimental land use practices

Massaro has been a field site for pollination research and is currently part of a study on no-till farming

The personal and environmental benefits of a plant rich diet

Massaro works with Griffin Hospital in Derby, CT to teach nutrition education in the schools and the health benefits of local, organic produce

For the many benefits of this recommendation See: https://bit.ly/34gpIbL

Auditing building energy use in residential, municipal and institutional settings

Widespread use of energy audits, with subsidies for investments in efficiency

We developed the Cornerstones residential audit in 1978 spawning a national industry of utility energy audits, first used in CT

The deployment of Solar Thermal - hot water - a proven technology

Jimmy Carter put solar hot water on the White House in 1979; Reagan took it off. See: https://bit.ly/3jg13bB

Establishing programs to combat window energy heat loss

Simple R-2 interior storm windows are very cost effective and create jobs: See: https://bit.ly/3o6sOXQ

Municipal energy demonstrations projects

Solar PV Power Purchase Agreements on commercial, institutional and municipal buildings

The Jewish Community Center in Woodbridge has one over its parking lot and on its roof: See: https://bit.ly/3m8aH1R

Solar Systems on capped landfills
There are multiple examples in MA, but few in CT See: http://www.harvardsolar.org/ and https://bit.ly/3kjKHAh
Municipal-scale composting in association with food waste programs in schools
Massaro has begun model program with the Woodbridge-based, Beecher Road School and the town (COVID-19 has shut it down)

**Bottom line:**
There are numerous technologies with very cost-effective returns on investment. There are also many examples in Massachusetts and neighboring states where these technologies are delivering multiple benefits. Connecticut has some encouraging examples, as well. As a state, we have an opportunity to be leaders to create a sustainable planet for ourselves and for future generations of all species. To do so we need to:

- Re-establish and enhance the solar and conservation tax credits on state and federal levels
- Demand the good faith collaboration of DEEP, utility and municipal officials to design and implement demonstration programs
- Support sustainable agriculture at the local level.

As recently as October 2020 both Prince William of England (See: https://bit.ly/3dNrLHr) and Pope Francis (See: https://bit.ly/3jffBZ7) have put out urgent pleas to the world to get on with it. Let's do the equivalent of an "Earthshot" here in Connecticut as Prince William and his father, Prince Charles urge citizens of the world to do.

**My background**

Jonathan W. Gorham**:** Education: Harvard, BA 1971, Yale School of Management, MBA, 1986.

Over 40 years, professional experience in the renewable energy and conservation fields. I co-founded companies or organizations that: developed the country's first residential utility energy audit program; commercialized window energy products with billions in cumulative sales; commercialized microbial soil restoration techniques; co-founded a 57-acre organic farm (Massaro Community Farm); helped secure SustainableCT bronze designation for the town of Woodbridge, CT as Chair and ongoing member of the town's Sustainability Committee, 2006-2020.

Jonathan Gorham
President
Massaro Community Farm
41 Ford Road
Woodbridge, CT 06525
www.massarofarm.org

Cell: (203) 376-2871
Farm: (203) 736-8618
jon@jongorham.com

“We learn from
our gardens
to deal with
the most urgent
question of the time:
How much is enough?”
— Wendell Berry

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 11:39 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: joewass64@everyactioncustom.com <joewass64@everyactioncustom.com>
Sent: Wednesday, October 21, 2020 11:18 AM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Rebecca French,

I thank you for this first step to deal with climate change. I fear that the expansion of natural gas infrastructure is a major step backwards in that it releases methane, a very potent green house gas. I urge the Governor to declare  a moratorium on all natural gas power plants,pipelines and other related infrustucture.

We need to direct all resources toward renewable energy ,energy efficiency and energy conservation.p

Joseph Wasserman

West Hartford

Sincerely,
Mr. Joseph Wasserman
10 Starkel Rd Apt G West Hartford, CT 06117-2454 joewass64@yahoo.com

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 draft report comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 6:21 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: judyanddrew@everyactioncustom.com <judyanddrew@everyactioncustom.com>
Sent: Wednesday, October 21, 2020 5:49 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 draft report comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Climate Change Bureau CT DEEP Climate Change Bureau,

Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals.

I particularly support these recommendations, and urge their inclusion in the final reports:

- Strengthen alignment between the state's decision-making and its greenhouse gas reduction goals. All regulatory decisions should be evaluated for consistency with meeting Global Warming Solutions Act targets.

- Move climate adaptation and resiliency measures—like nature-based solutions, forest and wetland protection, urban green infrastructure and tree planting, and making low/moderate income housing energy efficient and healthy—from demonstration project scale to widespread adoption and protection.

- Support robust, equitable state funding and financing (leveraged and matched by federal and local sources) for emissions reduction and adaptation programs. This is a large ($150-600 million/year) investment. Promising sources include:
  a) adopting the Transportation & Climate Initiative (up to $250 m/yr) and increasing the petroleum gross profits tax (~$100 m/yr). Connecticut can help ensure robust TCI implementation that drives down emissions while reinvesting auction proceeds in other high-impact and equitable programs;
  b) increasing or re-directing state bonding (up to $70 m/yr);
  c) adopting the Maryland "flush tax" model (up to $75 m/yr).

- Reduce stormwater pollution and flooding, and help municipalities afford green infrastructure and resiliency investments, by passing statewide enabling legislation for stormwater authorities.

- Target future building projects to already-developed areas, and prioritize the conservation and preservation of naturally-resilient coastal marsh, dunes, and forests.

- Develop and fund a community engagement strategy to inform the 2021 GC3 process and implementation, including grants for community-based NGOs partners and ensuring environmental justice perspectives are integral to the process.

The reports could be made even stronger. Please consider these additions and modifications to build the ambitious climate mitigation, resilience, and justice plan Connecticut needs:

- Emphasize the importance and urgency of strong climate mitigation action, by:
  a) highlighting the current and projected impacts of climate change in Connecticut, including health and economic impacts;
  b) identifying the greenhouse gas reduction potential of suggested projects;
  c) prioritizing, among the many valuable ideas in the reports, the highest-impact polices that will be most effective in driving down emissions and transitioning to a carbon-free economy.

- Eliminate, not just “phase down,” biomass as an eligible resource in the Renewable Portfolio Standard (RPS). If we are to achieve our climate goals, we can’t keep subsidizing dirty energy sources.

- Add dams to the proposed statewide GIS database of culverts, flood gates, tide gates, and other water control structures, and create a dynamic list that prioritizes structures for replacement, removal, and/or modification—including identifying dams that are vulnerable to our changing climate, and ensuring culverts can handle 100-year floods and allow migratory fish to pass.

- Encourage municipalities to adopt green infrastructure as a first-choice solution to flooding and stormwater pollution.

Together, this suite of policies can reduce Connecticut’s contribution to climate change and help our region adapt to the changes that are already occurring—while protecting public health, generating good jobs, and protecting vulnerable communities from storms, flooding, and air pollution.

Thank you for your consideration.

Sincerely,
Ms. Judith Nugent
68 Clark St  New Haven, CT 06511-3802
judyanddrew@gmail.com

UCONN
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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect our public forests

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 2:27 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Julie Fewster <jfewster55@aol.com>
**Sent:** Wednesday, October 21, 2020 1:57 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect our public forests



Please protect our public forests as nature preserves. Many thanks on behalf of me and future generations, Julie Fewster

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 5:40 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Brand, Karen <kbrand@reidandriege.com>
**Sent:** Wednesday, October 21, 2020 5:34 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change,

I am writing to note my support for the protection of the natural world, based both on what SCIENCE tells up about its importance for resilient communities facing the effects of climate change, and its importance to people choosing where to live and visit.

Nature is essential for the future, for evolution and for everything we need, and serves the public good now and for the long term.

We have many beautiful natural areas, and some need to be protected for nature study, hiking, and places that people can count on. This has never been more important.

We need systems that support good jobs, local resource use, AND natural areas. Our public land is held in the public trust.

We need your leadership.

I ask that you make every effort to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

Sincerely,

**Karen L. Brand**

**22 Woodhaven Drive**

**Simsbury, CT 06070**

---

UCONN
UNIVERSITY OF CONNECTICUT

**Alec Shub <alec.shub@uconn.edu>**

# FW: Governor's Council on Climate Change

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 2:28 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Kate L. Rozen <katerozen@gmail.com>
**Sent:** Wednesday, October 21, 2020 2:17 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Governor's Council on Climate Change

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

I am writing in support of adding e-bikes and other e-micromobility options to the EV rebate program. The price point of electric vehicles have not dropped to a place where they are across the board affordable. Until technology has advanced in a way that makes it an equitable option for all, I would like this group to consider the in between of other electric transportation options.

I own and do most of my transportation via an electric cargo bike (1,700+ miles in 2020). At the end of last year, I had to make a decision about purchasing a new car , which I would have wanted to be an EV or an electric bicycle. An EV was not affordable for my middle class family at this time, but an electric bike very much was.

When you are putting these wonderful ideas into play with the goal of improving our planet, please consider everyone. You can green transportation by expanding the definition of what you include in your rebates. E-bikes are absolutely a game changer.

Thank you.

Kate Rozen

Woodbridge, CT

UCONN
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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 6:23 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: kathleen alsgaard <kathleenalsgaard60@att.net>
Sent: Wednesday, October 21, 2020 6:02 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change,

Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit.

Nature is essential for the future, for evolution and for everything we need, and serves the public good now and for the long term.

We have so many beautiful natural areas, and some need to be protected for nature study, hiking, and places that people can count on. This has never been more important.

Meanwhile - we are burning and exporting our public forests? Who benefits? This is beyond disturbing.

We need systems that support good jobs, local resource use, AND natural areas.

Our public land is held in the public trust.

We need your leadership.

Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

MYSTIC AQUARIUM
RESEARCH

55 Coogan Boulevard
Mystic, CT 06355
P 860 572 5955
F 860 572 5969
W mysticaquarium.org

October 21, 2020

Subject: Governor's Council on Climate Change: Working Group Draft Report Public Review

To Whom It May Concern:

Thank you for the opportunity to comment on the draft reports and recommendations from the Working Groups that are addressing measures to reduce and mitigate the effects of climate change on our State. While our expertise is on marine and freshwater ecosystems, we comment on all the reports focused on natural resources, as upland uses and human dimensions in aggregate affect aquatic ecosystems. Here we assume that these draft reports are starting points in this process and that revisions and a process for subsequent reviews of the details will be forthcoming. In that vein, our comments below are brief and at a relatively coarse level of detail.

Overall, we found there is little integration across reports, with various degrees of overlap in details, approaches, and recommendations. For example, an integrative accounting approach to carbon storage and sequestration across all terrestrial and aquatic habitats will be needed to address the trade-offs in human uses and management interventions for addressing climate change. Further, the Working Groups should look beyond our borders and consider linking and modifying recommendations for Connecticut to national and international goals and objectives focused on climate change. For example, there is an international effort to conserve 30% of land and sea by 2030 (i.e., 30 x 30) to stem the loss of biodiversity and mitigate climate change through natural carbon storage processes (see Dinerstein et al. 2019. A global deal for nature ... Science Advances 5 eaaw 2869). California Governor Newsom recently issued an executive order directing the California Natural Resources Agency to conserve 30% of land and coastal waters by 2030 (after a bill with similar goals failed in the legislature). The "Ocean-Based Climate Solutions Act of 2020" has been introduced in the U.S. House of Representatives to address ocean solutions to climate change and includes Blue Carbon program and a goal of protecting 30% of US waters. These kinds of approaches should be considered by the Working Groups as a whole.

Comments on individual Working Group Reports, in no particular order, are:

1. Wetlands - We encourage improved integration of education and outreach to stakeholder communities such as boaters, municipal harbor commissions, and landowners about conservation of tidal wetland habitats. This should include values of associated seagrass meadows and shellfish reefs as well as the need to minimize introductions of invasive species and the impacts of existing invaders.

2. Forests – The extensive detail in the report on forests lists a set of multiple goals, which we agree with conceptually, but appear to be impossible to meet simultaneously. Presenting these results in the recommended format would have made review, comparison of actions to implement multiple goals, and comparison to other working group reports much easier. Some recommendations have significant ecological risks. While the goal of sustaining forested lands as a carbon sink is critical, we need to

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F 860 572 5969
W mysticaquarium.org

address conservation of forested land as a part of the overall state and regional carbon budget. The challenge will be to balance carbon sequestration in forest growth with storage in old growth communities, by managing for the diversity of age classes and functional roles. Nested within this major objective is the need to assess and manage forest lands for the biodiversity they support. This will require active management in areas that do not necessarily comport with the recommendations based on forest cover and age distribution of trees alone. Most critical is the need to acknowledge the ecological value of young forest and grassland habitat. These habitats cannot simply be sources for reforestation goals as described. The distribution of young forest and grassland habitats will need to match the distributions of species that require such landscape elements, including rare plants, insects, birds and mammals. Every species of concern simply does not require mature canopied forest. In sum, the forest plan needs to integrate the ecological needs of associated species to minimize the risk of listing under State and Federal Endangered Species Acts, with all the regulatory limitations that such listing requires.

3. Agriculture/Soils – We support these important recommendations and applaud the integration of agricultural, urban, and natural soils in a holistic manner. This level of integration should stretch across all the Working Groups, as noted above.

4. Rivers – We support goals of restoring free-flowing waterways for the ecological and social benefits they accrue. Conserving cold-water habitats should be a priority focus and makes an outsized contribution to conserving biodiversity in our state and region.

Notable is the absence of a working group and report focused on Long Island Sound. The natural resources within State waters are a component of our stewardship responsibilities and are clearly impacted by climate change. Management actions to address conservation of ecosystem services, maximize ecological resilience, mitigate extinction risks, and sustain carbon sequestration processes should be a component of this statewide endeavor. Further, the trade-offs and benefits of offshore wind energy for minimizing greenhouse gas production and the attendant impacts on marine life are important elements to consider regarding our accounting for climate change adaptation, mitigation, and resilience.

We look forward to further discussions on this critical issue. That said, time is off the essence and the perfect should not be the enemy of the good. Our comments are given to help us collectively move forward. An initial plan that includes an adaptive framework to allow integration of new knowledge and new ways of considering trade-offs could be the optimal approach. Thank you, in advance, for your consideration of our comments.

Sincerely,

Katie Cubina

Katie Cubina
Senior VP for Mission Programs

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:37 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

---

**From:** Betts, Kayla G. (2021) <kayla.betts@trincoll.edu>
**Sent:** Wednesday, October 21, 2020 9:24 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change,

Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit.

Nature is essential for the future, for evolution and for everything we need, and serves the public good now and for the long term.

We have so many beautiful natural areas, and some need to be protected for nature study, hiking, and places that people can count on. This has never been more important.

Meanwhile - we are burning and exporting our public forests? Who benefits? This is beyond disturbing.

We need systems that support good jobs, local resource use, AND natural areas.

Our public land is held in the public trust.

We need your leadership.

Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

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Alec Shub <alec.shub@uconn.edu>

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:48 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

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---

**From:** Holt, Laura J. <Laura.Holt@trincoll.edu>
**Sent:** Wednesday, October 21, 2020 11:05 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future



To DEEP Climate Change,

Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit.

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Signed,

Laura Holt

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:48 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

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**From:** laura vasselle <lvvasselle@gmail.com>
**Sent:** Wednesday, October 21, 2020 11:06 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

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Alec Shub <alec.shub@uconn.edu>

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1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 7:05 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

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**From:** Bertrand, Laurie <Laurie.Bertrand@coldwellbankermoves.com>
**Sent:** Wednesday, October 21, 2020 6:50 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

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Sent from my Sprint Samsung Galaxy S10.

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 6:50 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

---

**From:** Bertrand, Laurie <Laurie.Bertrand@coldwellbankermoves.com>
**Sent:** Wednesday, October 21, 2020 6:49 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

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Sent from my Sprint Samsung Galaxy S10.

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Comments for Mitigation Strategies Group, Transportation Sub-Group Draft Report

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 2:27 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

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**From:** grannis@nhcleancities.org <grannis@nhcleancities.org>
**Sent:** Wednesday, October 21, 2020 2:06 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Cc:** grannis@nhcleancities.org
**Subject:** Comments for Mitigation Strategies Group, Transportation Sub-Group Draft Report



From: Lee Grannis, Coordinator Greater New Haven Clean Cities Coalition

To: **Comments for Mitigation Strategies Group, Transportation Sub-Group Draft Report**

Date October 21, 2020

**I am providing comments related to the Transportation Sub-Group Recommendation starting on Page 75 of the Mitigation Strategies Group Draft Report. Below are several points that relate to my concerns about the draft report:**

1. The report gives a lot of emphasis to emission reduction through the deployment of medium and heavy-duty electric vehicles that will not be available for mass production, most likely for ten years or more, with the exception of mature electric transit bus technology.
2. There are mature light duty vehicle technologies exemplified by Tesla, GM and some other vehicle original equipment manufacturers (OEMs) available for the general public, but the optimal word is ”Light Duty”.
3. In the case of Class 3 and heavier vehicle classes the technology is still in the research and demonstration phases, with no date for general availability to the public, especially true for Class 8 vehicles.
4. The whole GC3 concept appears to avoid making recommendations to fill the current technology gap with existing clean fossil and other available low carbon technologies in the technology gap years.
5. Until renewable energy is able to fill our energy requirements, low emission fossil fuels are the main fuels available, and the new technologies based on propane, natural gas and high percentage biofuels blend fuel in use now, are nearly as clean as zero emission fuels.

6. Electric vehicles are not zero emission when 50 to 60 percent of the electric power in the northeast comes from natural gas electric generation plants.
7. There are low emission fossil fuels like propane, compressed natural gas and high percentage biofuel vehicles available now, all the way up to Class 8 size, which are as close to zero emission as the current electric vehicles.
8. No business is going to invest in electric vehicles that cannot meet their fleet operational and cost-effective requirements.
9. This report fails to educate the general public about the full array of low carbon transportation vehicle, fuels and infrastructure options, which private and municipal fleet are fully aware of operationally and monetarily.
10. Again, as in past state runs panels, this panel did not have any private fleet owners/operators on it.
11. In line with the greater deployment of electric vehicles as lot more work has to be accomplished related to electric grid efficiency, resilience, cyber security and electric rates.

Lee

Lee Grannis

Coordinator

Greater New Haven Clean Cities Coalition

grannis@nhcleancities.org

203-627-3715

October 21, 2020

# FirstLight Power Comments on the Draft Report of the Progress on Mitigation Strategies Working Group

**Company Overview**

FirstLight Power (FirstLight) is the largest clean energy producer and energy storage company in New England today, with a portfolio that includes nearly 1.4 gigawatts (GW) of pumped-hydro storage, battery storage, hydroelectric generation, and solar generation. These local clean energy resources are a significant part of New England's existing zero-emissions electricity today, and provide a strong foundation for Connecticut's increased climate mitigation efforts. Our assets in Connecticut include more than 70% of the overall hydroelectric generation in the state. Our largest asset, the Northfield Mountain pumped hydroelectric facility located in western Massachusetts, provides nearly 1,200 MW of emissions-free energy and clean energy storage capacity, and it serves as a critical asset to maintaining regional reliability on the New England electric grid.

FirstLight strongly commends the work of the Governor's Council on Climate Change and of the Progress on Mitigation Strategies Working Group in identifying critical climate mitigation strategies to help advance solutions to the climate change crisis, and for its emphasis on equity and environmental justice concerns. FirstLight offers the comments herein in support of the overall recommendations provided in the Draft Report, to request important clarifications regarding the role of hydroelectric generation in meeting zero-emissions targets, and to request clarifications regarding the role of existing and new energy storage in accelerating grid decarbonization while maintaining and enhancing reliability of the electric system.

**Current Proposed Strategy: "Utilize battery storage as a peak demand reduction and load flexibility strategy"**

**Recommended Strategy: "Utilize energy storage as a peak demand reduction and load flexibility strategy"**

This proposal focuses on the use of battery storage technology to shift demand and improve system resiliency. FirstLight supports greater deployment of battery storage technologies, particularly those that can potentially serve to replace existing fossil peaking units. However, there are numerous types of energy storage that have a role to play in providing load flexibility, and FirstLight recommends expanding the scope of this recommendation to include all energy storage technologies, which may provide greater flexibility and resiliency for the system. A key example is pumped hydro storage, which is currently operational in western Connecticut and can provide long-duration storage well suited for grid resiliency purposes.

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firstlightpower.com

**Current Proposed Strategy: "Establish clear targets for off-shore wind procurement – in concert with IRP recommendations and in balance with other renewable energy sources – to foster its significant potential to help meet zero-carbon goals"**

**Recommended Strategy: "Establish clear targets for off-shore wind procurement – in concert with IRP recommendations and in balance with other renewable energy and energy storage sources – to foster its significant potential to help meet zero-carbon goals"**

Offshore wind procurements have quickly become one of the most important policy initiatives in the fight against climate change here in New England. The value that these large-scale renewables can offer the region, particularly to reduce the need for fossil fuel generation resources, is indispensable to meet zero-carbon goals. Achieving these goals will however require a full arsenal of zero-carbon resources to ensure decarbonization does not disrupt reliability and resiliency on the system. Energy storage is uniquely positioned to integrate intermittent renewables such as offshore wind and explicitly including the term "energy storage" will help guide policy makers to find solutions to comprehensively address the state's decarbonization goals.

Currently there are three existing pumped hydro energy storage resources operating in Massachusetts and Connecticut. The combined nameplate capacity of these three resources is over 1,800 MW, and each of these resources is underutilized. In most years the overall throughput capability of New England's pumped hydro storage resources is only captured at a rate of less than 25%, meaning that the merchant energy markets in which these plants operate is not designed to optimize the full value of energy storage. Other technologies, such as lithium-ion batteries, would face similar issues if they are limited to operating under existing energy market structures.

The optimization of existing zero-carbon resources and identification of obstacles to achieving a higher level of production from these resources will be critical to Connecticut's climate strategy moving forward. Energy storage incentivized to integrate renewable generation is key to optimal carbon reduction, by moving clean energy from times of over-generation to times of peak load when dirtier generation would otherwise come on line. Capturing this time-shift value of storage will be particularly important to realizing the full benefits of Connecticut's investment in offshore wind generation, and also achieving other goals such as transportation and heating electrification and addressing environmental justice issues in areas where dirtier fossil generation is often located.

The existing energy markets, which were not designed to capture energy storage's carbon-reducing potential, are insufficient to achieve a substantially higher level of energy storage penetration or optimal usage to integrate renewable resources and decrease regional carbon emissions. Examining this reality is critical to effectively assessing the most economical pathway to a 100% zero-carbon energy future.

**Current Strategy: "Maintain in-state zero-carbon nuclear generation and develop long-term zero-carbon replacement strategy equivalent to 2100 megawatts"**

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**Proposed Strategy: "Maintain in-state zero-carbon generation and develop long-term zero-carbon replacement strategy equivalent to the total capacity of existing nuclear generation"**

Connecticut relies heavily on existing zero-carbon nuclear generation to avoid dispatching an equivalent level of fossil fuel generation; however, nuclear generation is not the only existing zero-carbon resource that the state relies on for this service. Currently there are more than 100 MW of existing hydropower operating throughout Connecticut, much of which is not eligible for renewable incentives under the current renewable portfolio standard. This is a sizeable portion of the zero-emissions resources in the state that must be maintained with public support for their role in advancing to a zero-carbon electric grid. The Draft Report correctly includes hydroelectric generation in its definition of "low and zero carbon resources" and FirstLight recommends that the state emphasize the role of existing hydropower alongside the focus on nuclear zero-carbon generation. In addition, existing hydropower in Connecticut is a vastly important economic driver for local communities. The recreational and economic development benefits from these lakes contribute millions of dollars to the economies of the local communities in which these assets are located.

Like nuclear generation, existing hydropower resources have been detrimentally affected by changing circumstances in the energy markets, which in recent years have hit historical lows. The potential for retirement due to a lack of economic viability does exist with some of these hydropower resources, which will result in a backsliding effect on Connecticut's climate goals and heavily impact the local communities where they operate.

To avoid losing in-state hydropower resources Connecticut should examine methods to maintain all existing zero-carbon resources that currently do not qualify for the renewable portfolio standard or other renewable energy incentive policies.

**Proposed New Strategy: "Over the next 2-5 years, research and identify opportunities to pair battery storage and distributed renewable energy technologies with existing clean energy technologies to displace carbon emissions and improve reliability"**

In addition to supporting efforts to integrate energy storage as noted above, FirstLight recommends that the State of Connecticut also consider programs to pair energy storage and distributed renewable energy technologies with existing clean energy assets like hydroelectric generation to create new, dispatchable renewable resources. Existing run-of-river hydro generates electricity based on river flows, which are not always concordant with peak demand on the system. Pairing these resources with energy storage or other distributed renewables will create additional opportunities for the dispatch of off-peak run-of-river generation during times of peak demand, thereby reducing the need for dirty fossil generation.

Conventional hydro, which is dispatchable, offers substantial opportunity for Connecticut to increase the flexibility of the system through paired arrangements with energy storage and distributed renewables. Conventional hydro can provide even more to the system without altering the current footprint of those

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plants. Paired energy storage and distributed renewables can leverage this dispatchable foundation of clean energy resources to deliver even more benefits to the grid by helping displace carbon emissions, improving flexibility, and increasing reliability while mitigating the need to overbuild the system, which would prove more costly to ratepayers.

Programs designed to leverage existing clean energy will help the state achieve its clean energy goals more cost-effectively than simply focusing on the new development of renewables alone. These programs will also assist the state in addressing other needs such as environmental justice issues by helping displace dirty fossil generation located in communities where disadvantaged residents are disproportionately affected.

**Conclusion**

As the largest generator of clean, hydroelectric energy in Connecticut today, FirstLight strongly supports Connecticut's efforts to fight climate change, address environmental justice, and move to a cleaner energy mix in the years ahead. To reach this level of ambition, the policy and programmatic framework Connecticut is advancing must support the contributions of all existing clean and zero-emissions resources, including hydropower, as the foundation to build upon in advancing the new renewable and storage projects that will be needed to hit the targets outlined in the Draft Report. FirstLight looks forward to working with the state to reach its clean energy goals and deliver a cleaner, more reliable, and more equitable energy system for the people of Connecticut.

Respectfully,

Len Greene
Director, Government Affairs & Communications
FirstLight Power

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Burlington, MA 01803
781-653-4240
firstlightpower.com

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**Alec Shub <alec.shub@uconn.edu>**

# FW: CT GC3 Presentation on Forest Carbon Sequestration

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 7:51 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

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**From:** Tomasso, Linda Powers <tomasso@hsph.harvard.edu>
**Sent:** Wednesday, October 21, 2020 7:10 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** CT GC3 Presentation on Forest Carbon Sequestration



To members of the DEEP GC3 Committee,

I was asked to share the forest carbon research which was the product of my time interning with the DEEP Climate Change Desk.

That work resulted in the attached article published in the Journal of Environmental Protection. I was also invited along with my colleague Atty. Helen Silver to present our research findings and policy recommendations to then-Commissioner Rob Klee addressing opportunities for strategic utilization of Connecticut's forest assets for carbon sequestration gains through protected status and implemented forest management plans. I enclose that presentation as well.

I understand the GC3 continues to weigh these options as policy levers but with diminished enthusiasm for State forest protection, especially as regards Connecticut's remaining old-growth forests. These documents review the fiscal and ecological logic of recommitting to Connecticut's climate goals sensibly through forest carbon storage. Please feel free to contact me at this email with questions.

Kind regards,

Linda Tomasso

L I N D A P O W E R S T O M A S S O

PhD Candidate of Population Health Sciences | Environmental Health
Graduate School of Arts and Sciences & T.H.Chan School of Public Health
Harvard University

tomasso@hsph.harvard.edu

**2 attachments**

**CT GC3 Presentation_Tomasso_Silver.pdf**
4967K

**Tomasso_Leighton_Land Use Change and GHG Inventories in CT.pdf**
3633K

# Optimizing the Climate Mitigation Potential of Connecticut's Forests: Policy Recommendations

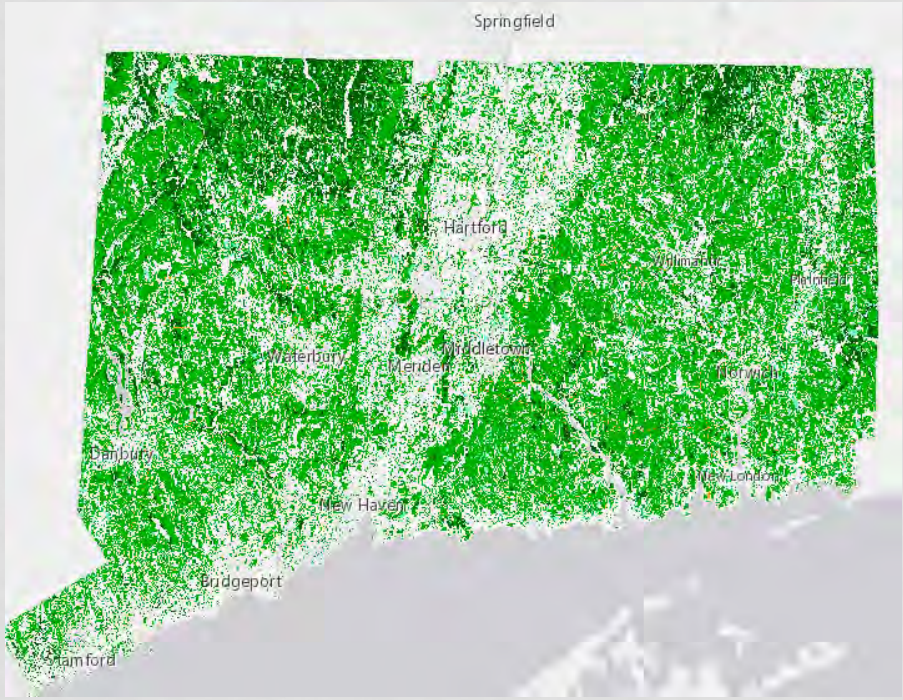
Helen D. Silver, Esq.

Linda Powers Tomasso, ALM, MSFS

October 19, 2015

# OVERVIEW

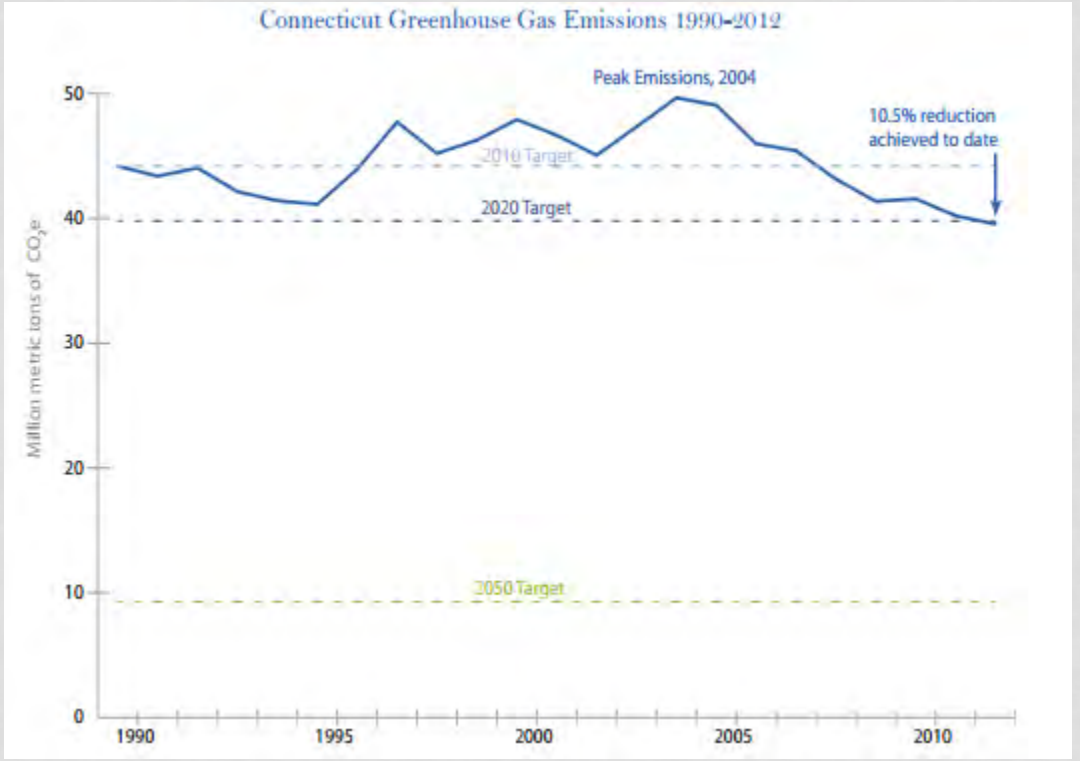
- **Background**
  - Chronology of Work Performed
  - Climate impacts of CT's forests
    - Sequestration and GHG Emissions
  - Forest Ownership Facts
  - Causes /Rates of Land Use Change (LUCF)
- **Presentation highlights the top 5 recommendations for conservation**




State Forest Coverage in 2010. Between 1985 and 2010, Connecticut lost 190 square miles of forest. (CLEAR, 2010)

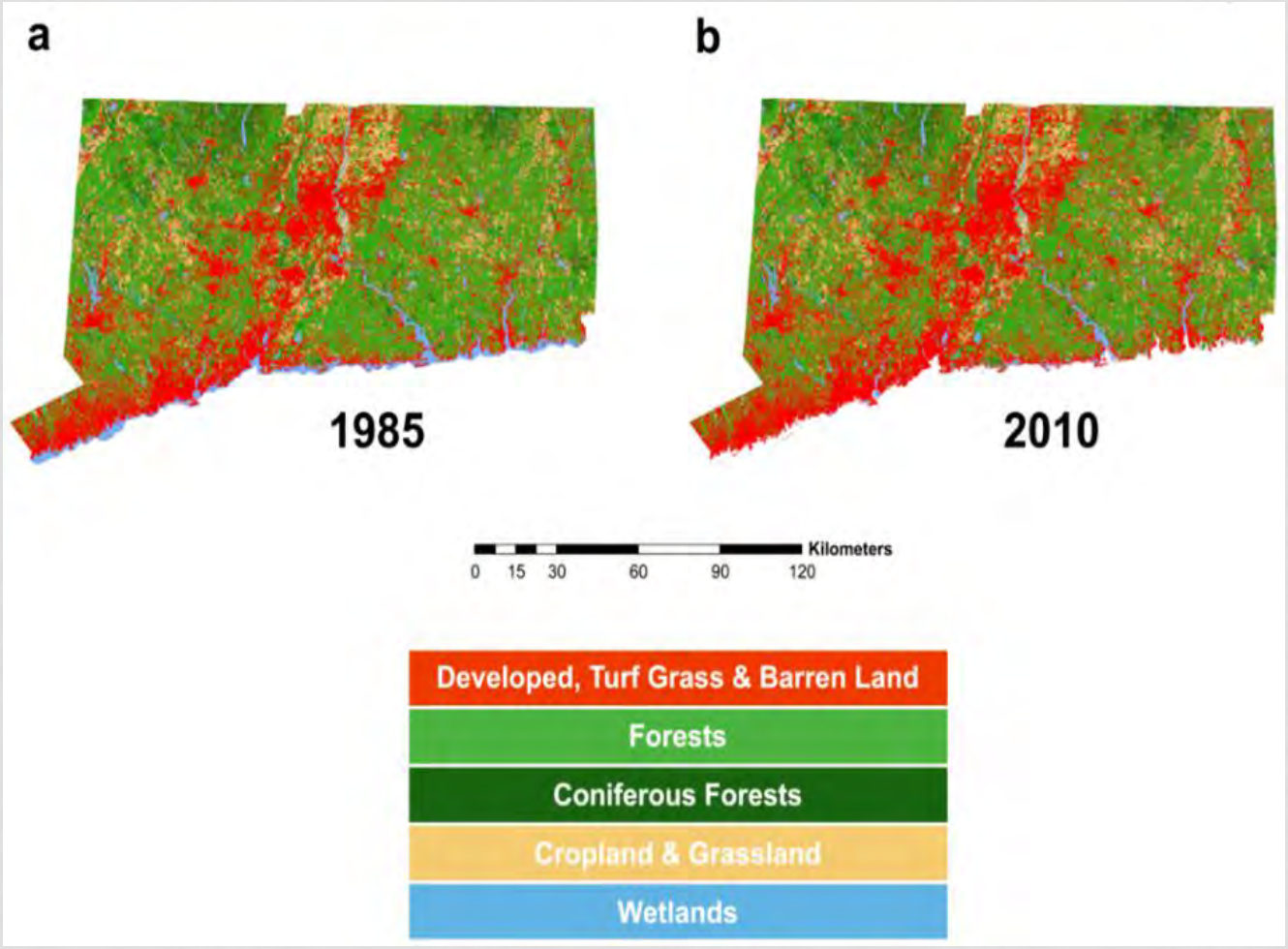
# OVERVIEW:
# MAIN CONCLUSIONS

- Forests are critical to meeting 2050 CC targets
  - Avoiding GHG emissions and sequestering additional carbon
  - Forest sequestration capacity is expected to increase
- Must be accounted for in GHG Inventory
- Conversion is imminent and significant, but conservation is feasible




Forest conservation will help bridge the gap through sequestration *and* avoided significant emissions (graph: CLEAR)

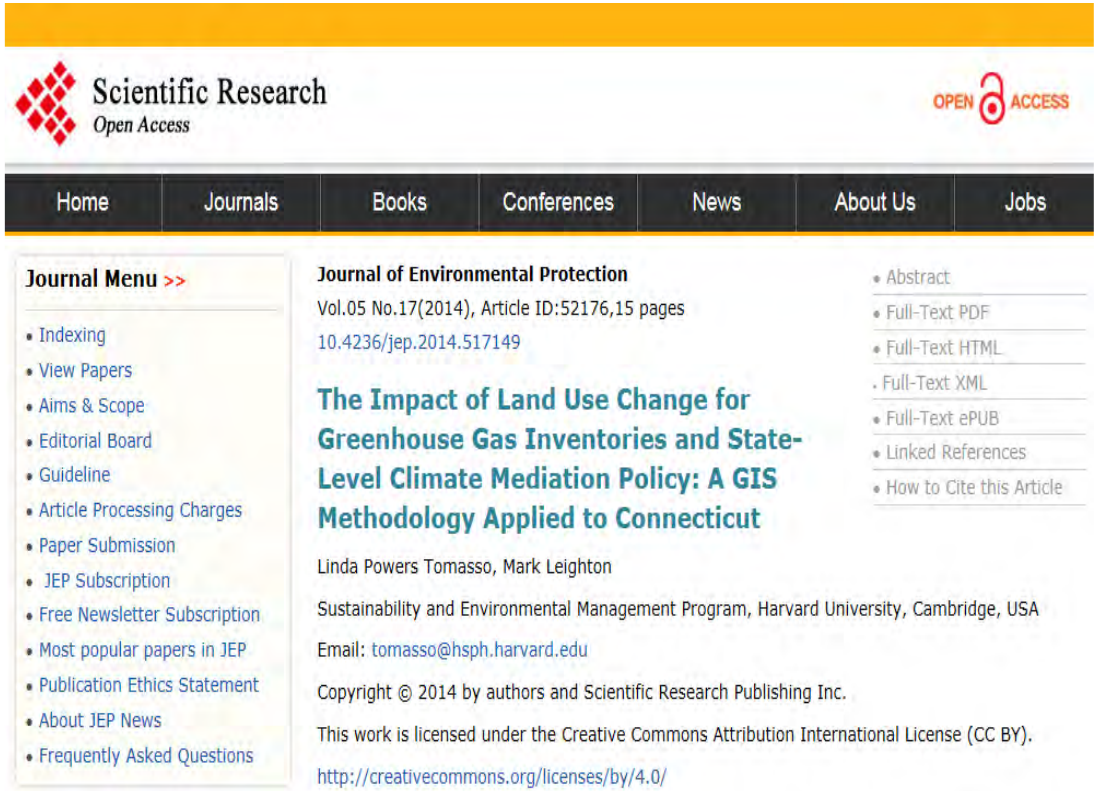
# CT LAND USE CHANGE 1985-2010




Source Data: CLEAR land use change. www.CLEAR/uconn.edu Mapping: Tomasso (2014)

# CHRONOLOGY OF WORK PERFORMED

## Journal of Environmental Protection publication, Oct 2014



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**Journal of Environmental Protection**
Vol.05 No.17(2014), Article ID:52176,15 pages
10.4236/jep.2014.517149

**The Impact of Land Use Change for Greenhouse Gas Inventories and State-Level Climate Mediation Policy: A GIS Methodology Applied to Connecticut**

- Abstract
- Full-Text PDF
- Full-Text HTML
- Full-Text XML
- Full-Text ePUB
- Linked References
- How to Cite this Article

Linda Powers Tomasso, Mark Leighton

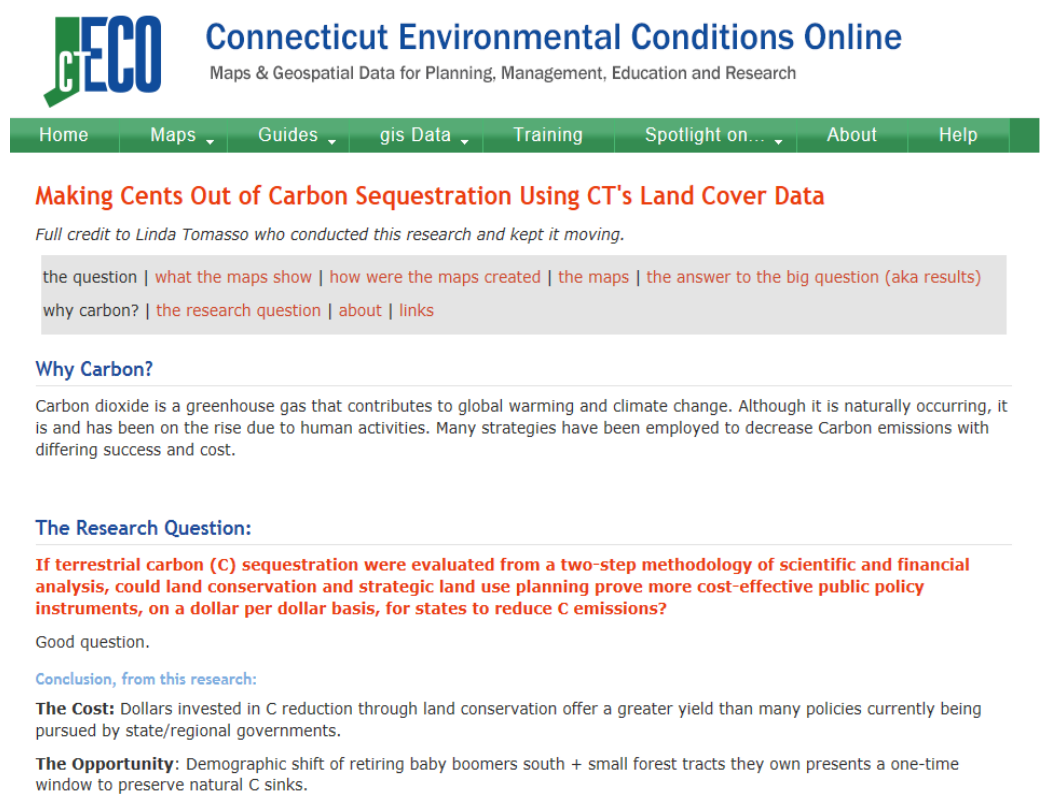
Sustainability and Environmental Management Program, Harvard University, Cambridge, USA

Email: tomasso@hsph.harvard.edu



www.scrip.org/journal/paperInformation.aspx?PaperID=52176

## CT Eco: "Making Cents out of C Seq-uestration using CT's Land Cover Data"



CTECO
Connecticut Environmental Conditions Online
Maps & Geospatial Data for Planning, Management, Education and Research

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**Making Cents Out of Carbon Sequestration Using CT's Land Cover Data**

*Full credit to Linda Tomasso who conducted this research and kept it moving.*

the question | what the maps show | how were the maps created | the maps | the answer to the big question (aka results)
why carbon? | the research question | about | links

**Why Carbon?**

Carbon dioxide is a greenhouse gas that contributes to global warming and climate change. Although it is naturally occurring, it is and has been on the rise due to human activities. Many strategies have been employed to decrease Carbon emissions with differing success and cost.

**The Research Question:**

**If terrestrial carbon (C) sequestration were evaluated from a two-step methodology of scientific and financial analysis, could land conservation and strategic land use planning prove more cost-effective public policy instruments, on a dollar per dollar basis, for states to reduce C emissions?**

Good question.

Conclusion, from this research:

**The Cost:** Dollars invested in C reduction through land conservation offer a greater yield than many policies currently being pursued by state/regional governments.

**The Opportunity**: Demographic shift of retiring baby boomers south + small forest tracts they own presents a one-time window to preserve natural C sinks.

www.cteco.uconn.edu/energy/carbon/index.htm

# CHRONOLOGY OF WORK PERFORMED (CONT'D)

- Summer of 2015: Two research projects completed for CT DEEP
  - **Task 1:** Evaluate GHG Inventory Methodologies to Account for Land Use Change and Forestry & Propose Recommendations
  - **Task 2:** Evaluate Other State Practices & Propose Polices for Forest Conservation and Enhancement of C Sequestration

*Increasing the Climate Mitigation Potential of Connecticut's Forests: Policy Recommendations*

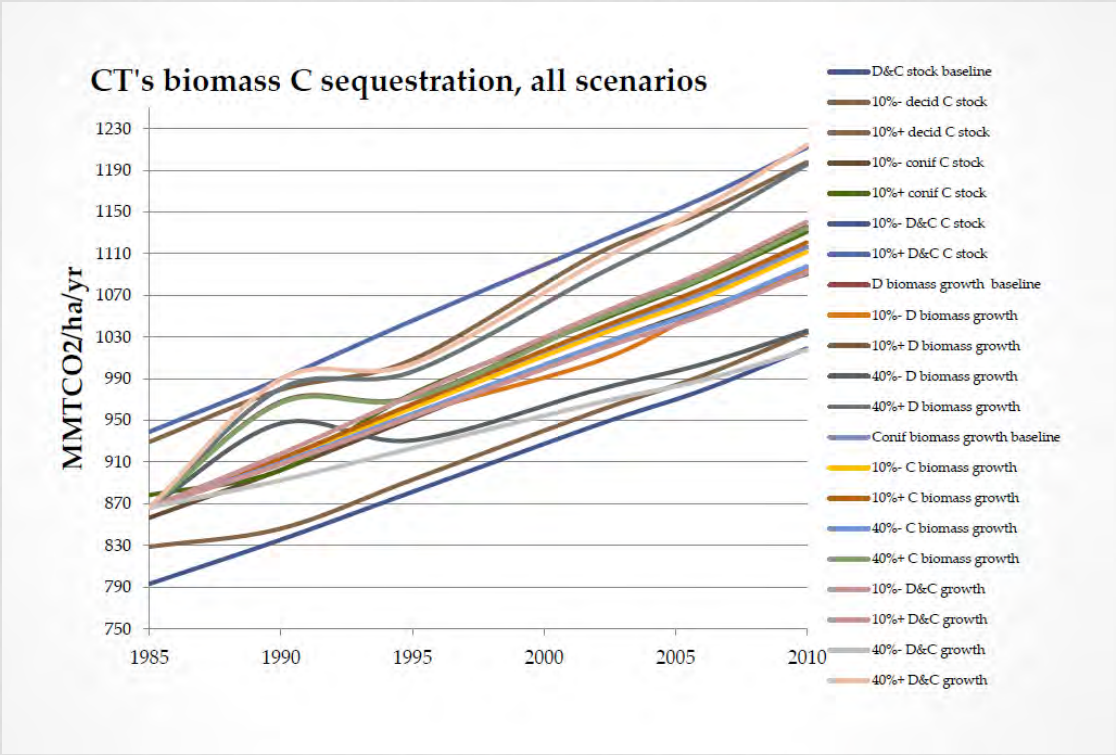
Prepared for Jeff Howard & Keri Enright-Kato

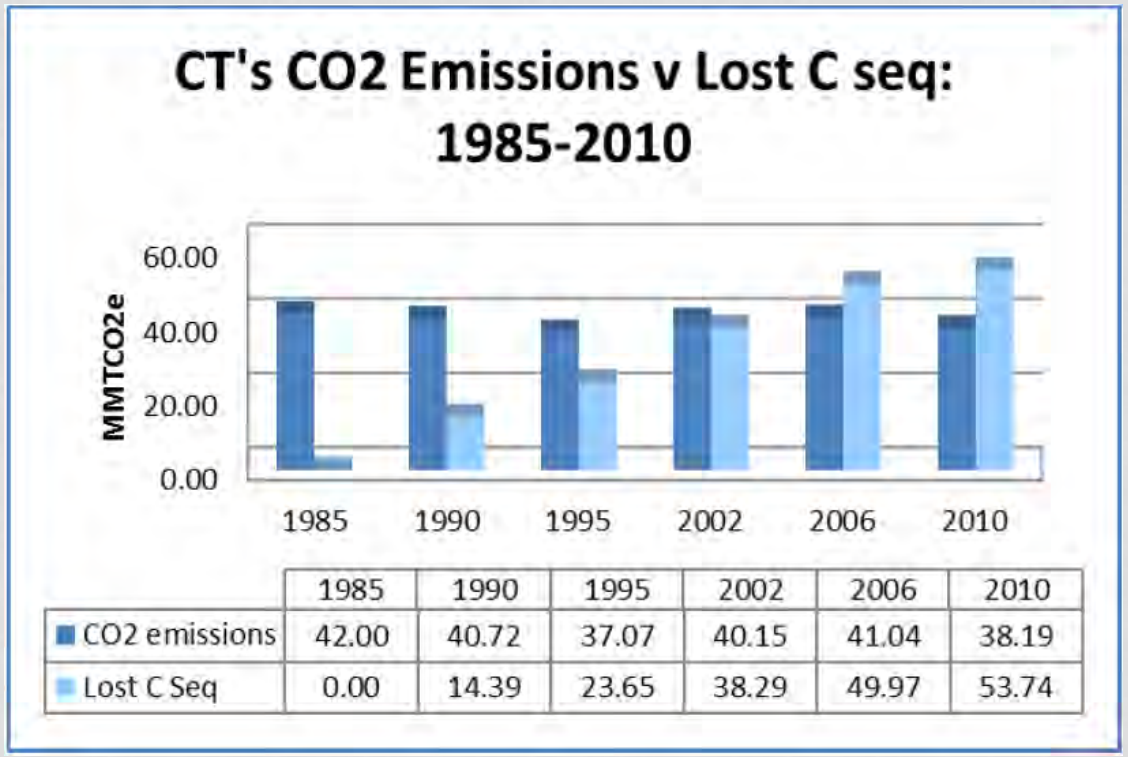
Connecticut Department of Energy & Environmental Protection (Office of Climate Change, Technology, and Research)

*August 2015*

*Helen D. Silver, Esq. (h_d_silver@yahoo.com)*

# FOREST SEQUESTRATION CAPACITY IS LIKELY TO INCREASE IN COMING YEARS

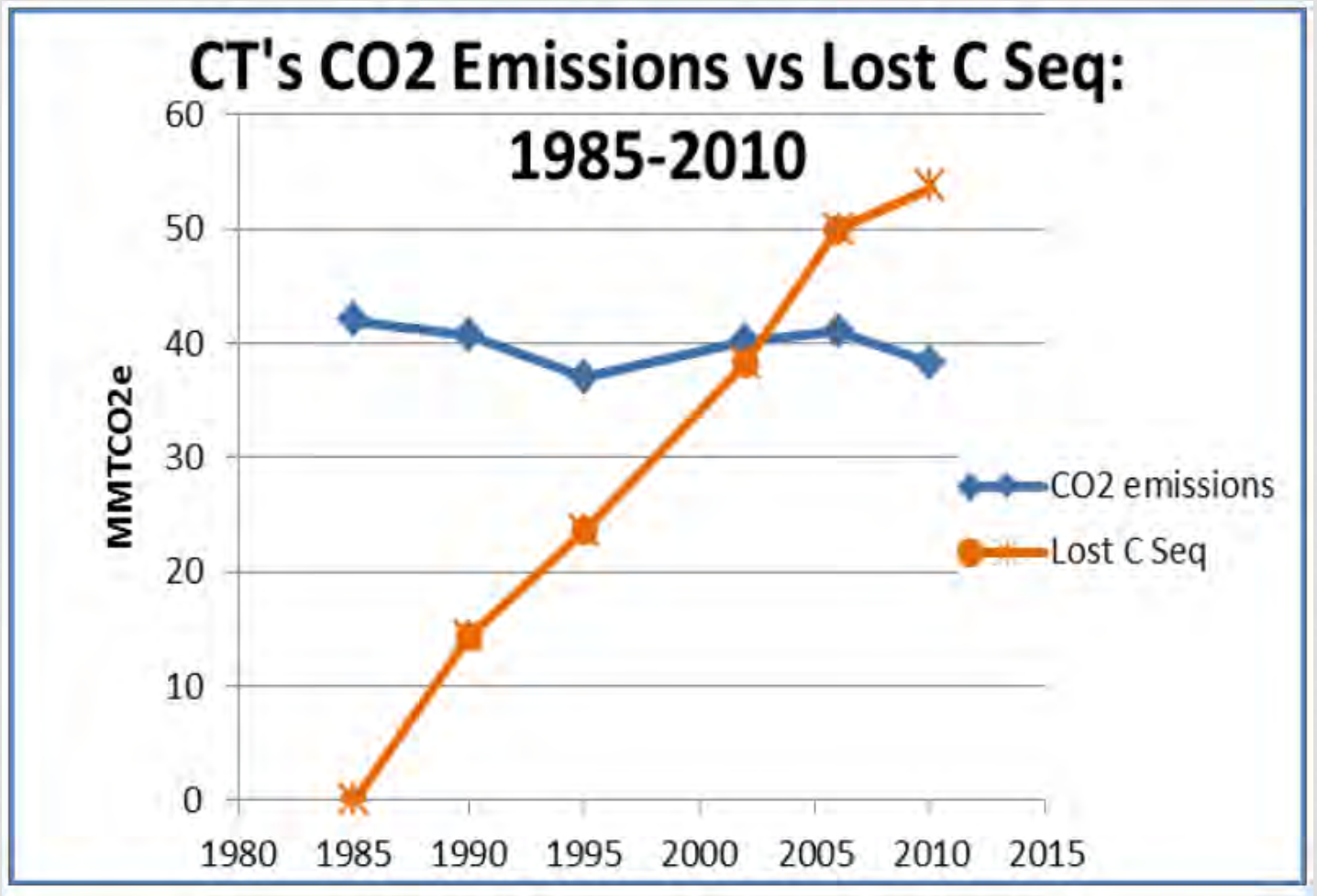


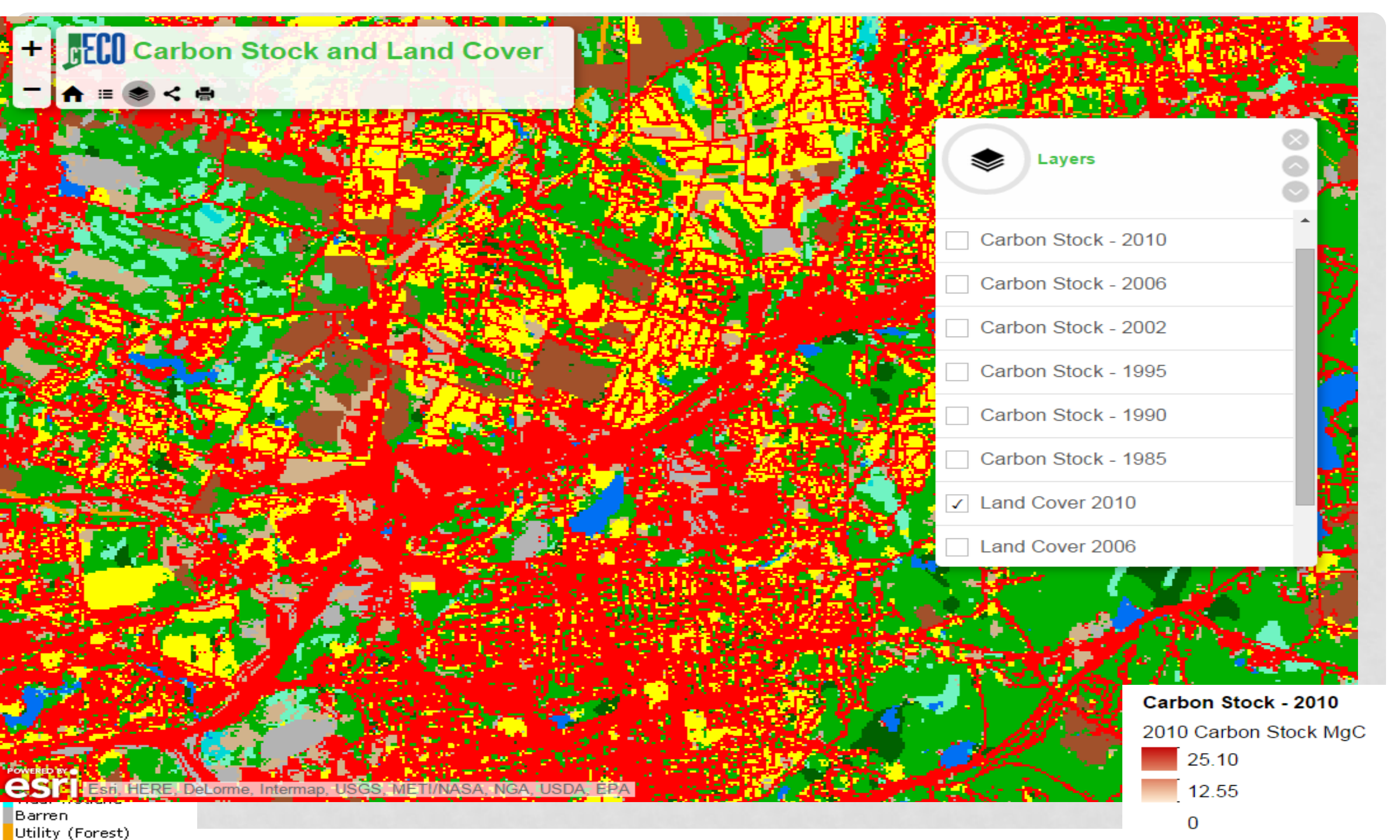

| | 1985 | 1990 | 1995 | 2002 | 2006 | 2010 |
|---|---|---|---|---|---|---|
| CO2 emissions | 42.00 | 40.72 | 37.07 | 40.15 | 41.04 | 38.19 |
| Lost C Seq | 0.00 | 14.39 | 23.65 | 38.29 | 49.97 | 53.74 |

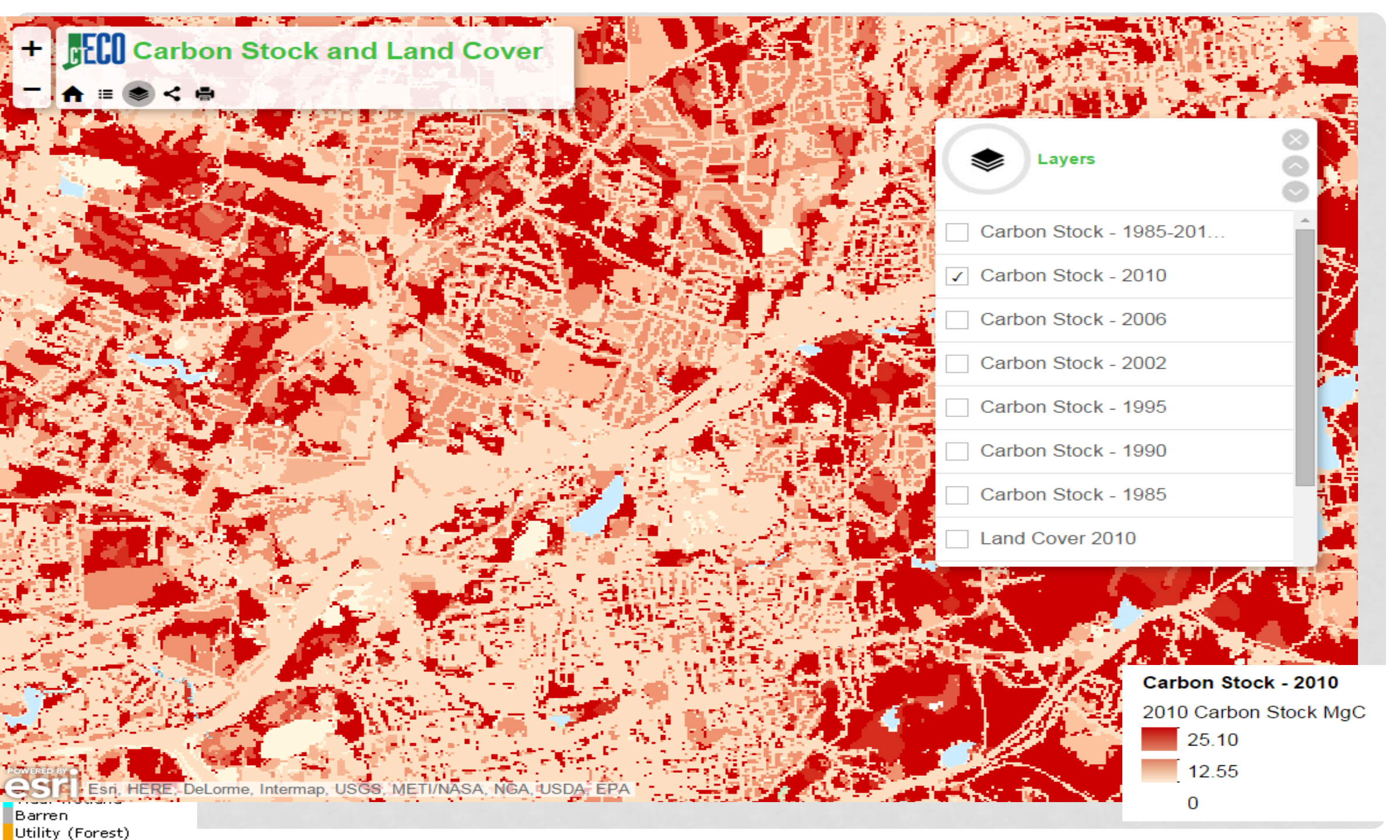
Graphics, Tomasso (2014). www.scrip.org/journal/paperInformation.aspx?PaperID=52176

# GROWTH OF LOST C SEQUESTRATION OPPORTUNITY OVER 25 YEARS OF LUCF




Graphics, Tomasso (2014). www.scrip.org/journal/paperInformation.aspx?PaperID=52176


Carbon Stock and Land Cover
Layers
Carbon Stock - 2010
Carbon Stock - 2006
Carbon Stock - 2002
Carbon Stock - 1995
Carbon Stock - 1990
Carbon Stock - 1985
Land Cover 2010
Land Cover 2006
Carbon Stock - 2010
2010 Carbon Stock MgC
25.10
12.55
0
Esri, HERE, DeLorme, Intermap, USGS, METI/NASA, NGA, USDA, EPA
Barren
Utility (Forest)


Carbon Stock and Land Cover
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Carbon Stock - 1985-201...
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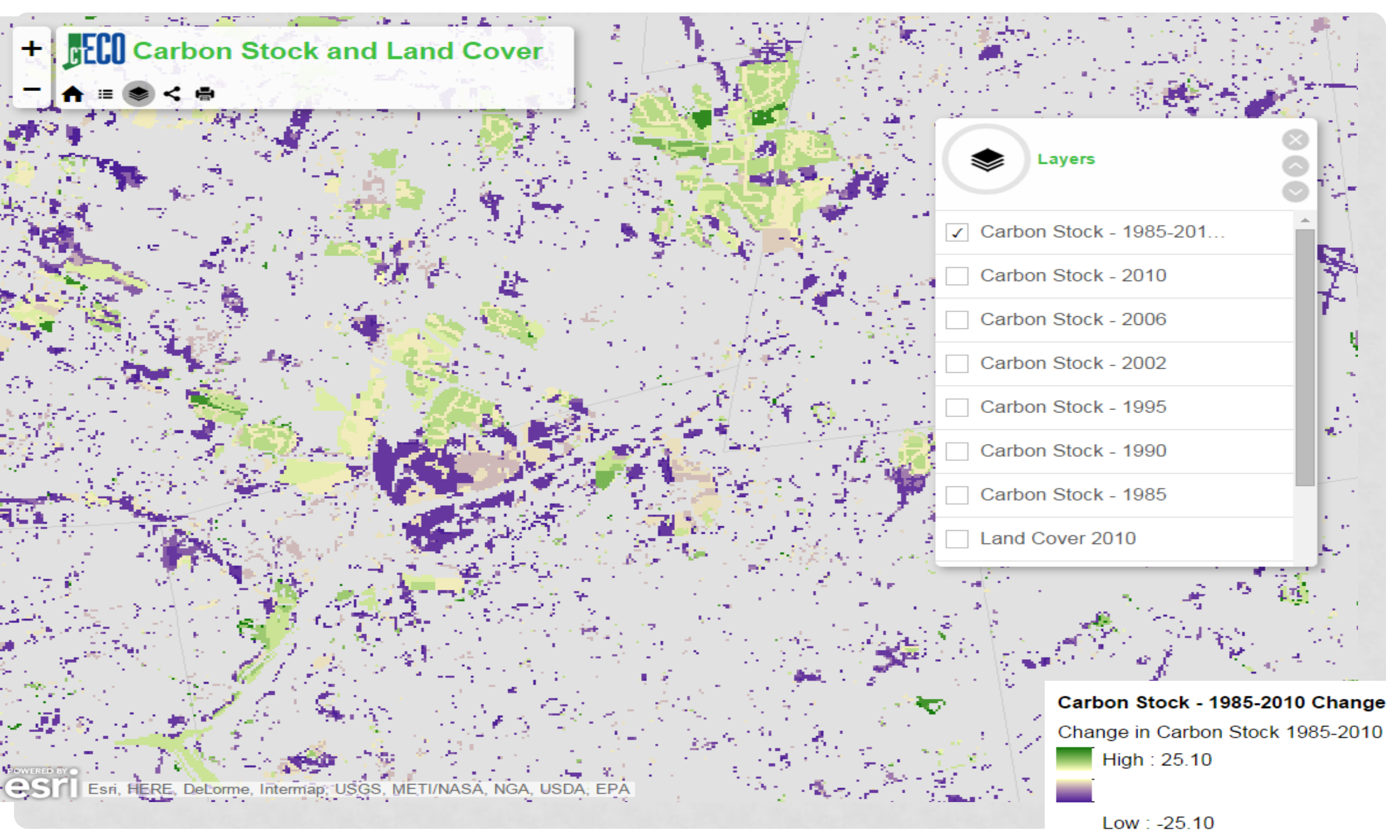
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Carbon Stock - 1995
Carbon Stock - 1990
Carbon Stock - 1985
Land Cover 2010
Carbon Stock - 1985-2010 Change
Change in Carbon Stock 1985-2010
High : 25.10
Low : -25.10
Esri, HERE, DeLorme, Intermap, USGS, METI/NASA, NGA, USDA, EPA

Ag Field or Other Grass to Turf and grass

Lose forest, lose potential

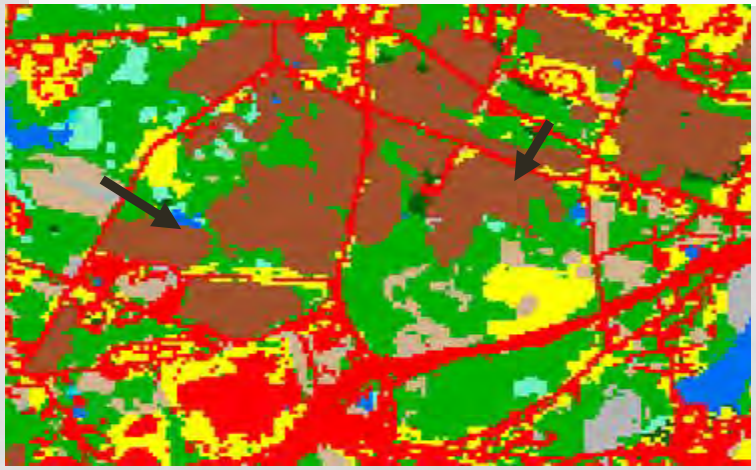
| FROM \ TO | Developed | Turf &Grass | Other Grass | Ag. Field | Deciduous Forest | Coniferous Forest | Water | Non-forested Wetland | Forested Wetland | Tidal Wetland | Barren | Utility (forest) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Developed | | 86.2 | 48.2 | 34.0 | 236.4 | 189.2 | -33.8 | 110.5 | 148.3 | 209.5 | -33.1 | 172.6 |
| Turf &Grass | -86.2 | | -38.1 | -52.2 | 150.2 | 103.0 | -120.0 | 24.3 | 62.1 | 123.3 | -119.4 | 86.4 |
| Other Grass | -48.2 | 38.1 | | -14.2 | 188.3 | 141.1 | -81.9 | 62.4 | 100.1 | 161.4 | -81.3 | 124.5 |
| Ag. Field | -34.0 | 52.2 | 14.2 | | 202.4 | 155.2 | -67.8 | 76.5 | 114.3 | 175.5 | -67.1 | 138.6 |
| Deciduous Forest | -236.4 | -150.2 | -188.3 | -202.4 | | -47.2 | -270.2 | -125.9 | -88.1 | -26.9 | -269.5 | -63.8 |
| Coniferous Forest | -189.2 | -103.0 | -141.1 | -155.2 | 47.2 | | -223.0 | -78.7 | -40.9 | 20.3 | -222.3 | -16.6 |
| Water | 33.8 | 120.0 | 81.9 | 67.8 | 270.2 | 223.0 | | 144.3 | 182.1 | 243.3 | 0.7 | 206.4 |
| Non-forested Wetland | -110.5 | -24.3 | -62.4 | -76.5 | 125.9 | 78.7 | -144.3 | | 37.7 | 99.0 | -143.7 | 62.1 |
| Forested Wetland | -148.3 | -62.1 | -100.1 | -114.3 | 88.1 | 40.9 | -182.1 | -37.7 | | 61.2 | -181.4 | 24.3 |
| Tidal Wetland | -209.5 | -123.3 | -161.4 | -175.5 | 26.9 | -20.3 | -243.3 | -99.0 | -61.2 | | -242.6 | -36.9 |
| Barren | 33.1 | 119.4 | 81.3 | 67.1 | 269.5 | 222.3 | -0.7 | 143.7 | 181.4 | 242.6 | | 205.7 |
| Utility (forest) | -172.6 | -86.4 | -124.5 | -138.6 | 63.8 | 16.6 | -206.4 | -62.1 | -24.3 | 36.9 | -205.7 | |

More developed, lose sequestration

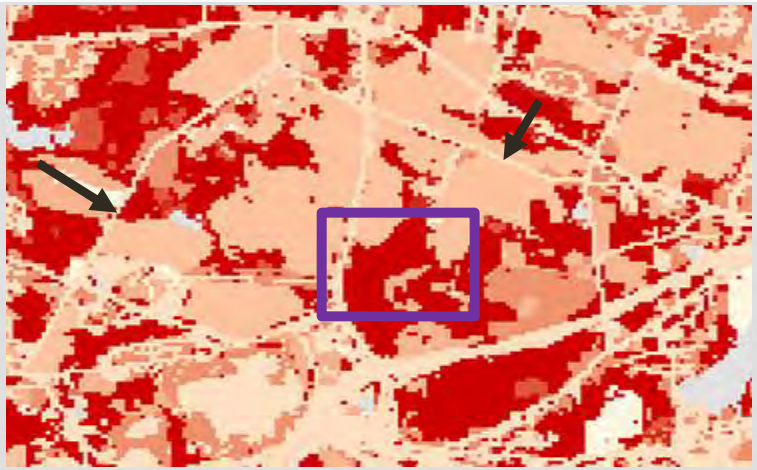
Gain forest, gain sequestration (light green)

# Sample Carbon Mapping: Manchester/ South Windsor line Buckland Mall and Evergreen Walk area

1985 Land Cover

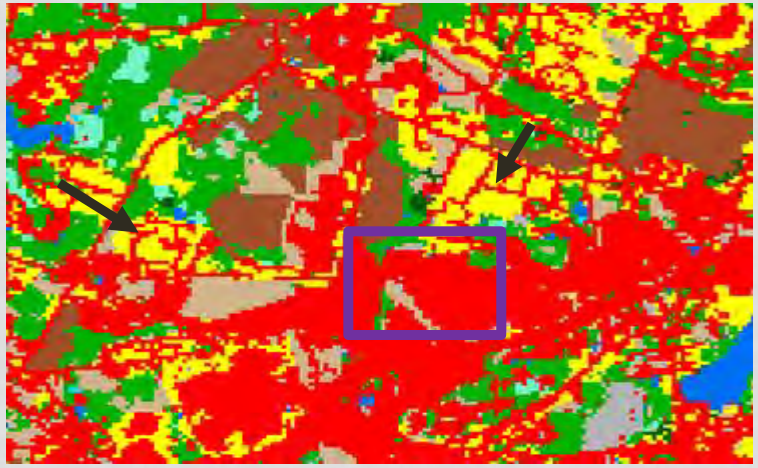


1985 Carbon Stock



1985-2010 Change in Carbon Stock

2010 Land Cover



2010 Carbon Stock

**Carbon Stock - 1985-2010 Change**

Change in Carbon Stock 1985-2010

High : 25.10

Low : -25.10

# CONNECTICUT LEADS IN:

- **Forested area:** Though one of the most densely populated states, ~59% is forested
- **Longevity of land use mapping data** (1985-2010)
- **Leading academic institutions**
- **Private forest land-holding** (73%; 54% owned by families in parcels of 10 acres or more)
- **Conservation and legacy values of forest landowners**
- **Awareness of "legacy tools," e.g., conservation easements**
- **Demographic data on forest landholders**

# CONNECTICUT LAGS IN:

- Positioning of forests as essential mitigation tools in key policy documents
- Policies and programs dis-incentivizing land use change
- Adequate Funding for DEEP Division of Forestry
- High average age of forest landholders
- Low percentage of younger residents in state

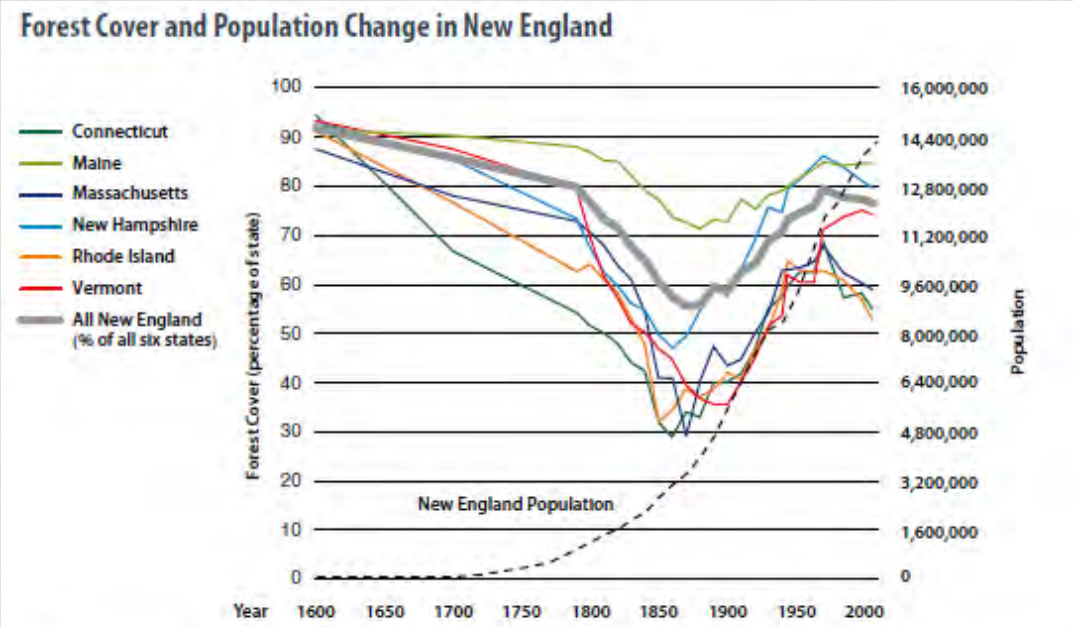



FIGURE 1: *Long-term trends in forest cover and human population in the six New England states shows that even as the population grew, forest cover increased between 1850 and the early 2000s. In recent years, forest cover has again declined due to conversion of forests to developed land.*

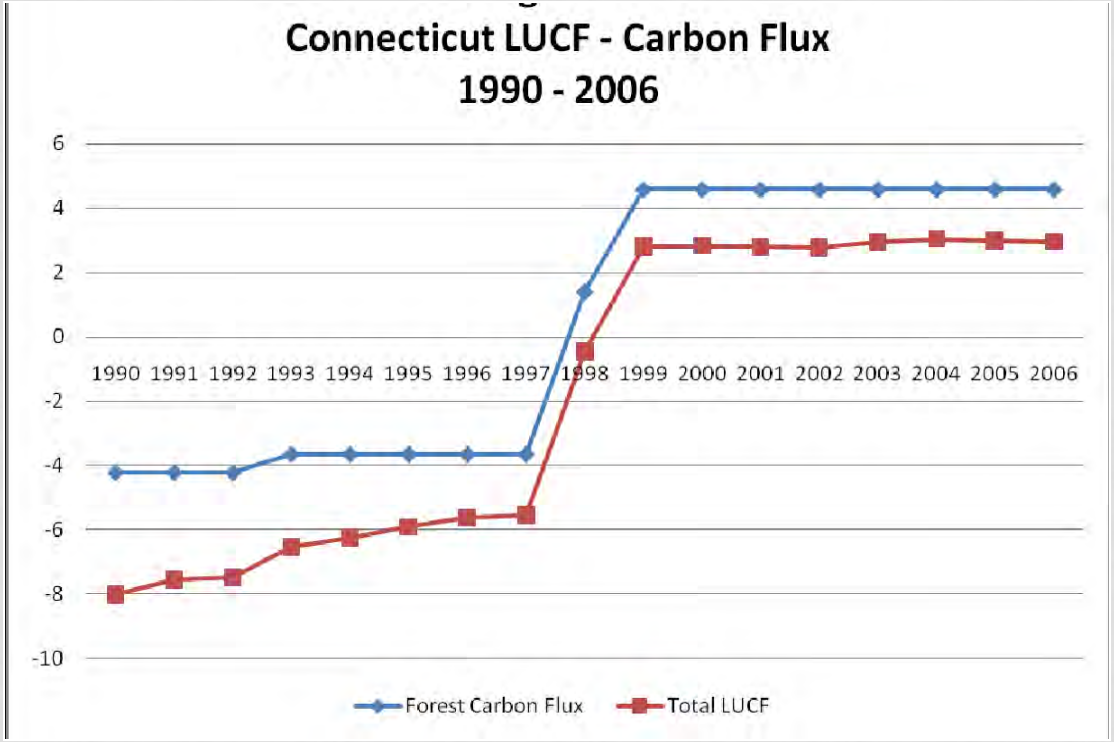
Source: Metropatterns CT, 2003

# UNIQUE OPPORTUNITY TO CATCH UP

- Current situation is a once in lifetime chance to permanently capture forest conversion due to demographics
- Meaningful C sequestration impact relative to GHG goal:
  - 2.6MMT/yr average (recent yr vs total graph): 9.25 MMT 2050 target
- Meaningful risk of increased GHG emissions from conversion relative to 2050 target
- Because C quantified thru bottom-up methodology, chance to use knowledge to incorporate into long-term GHG profile
- Recommendations and strategies applicable to other High-C lands of value (agricultural lands and wetlands)

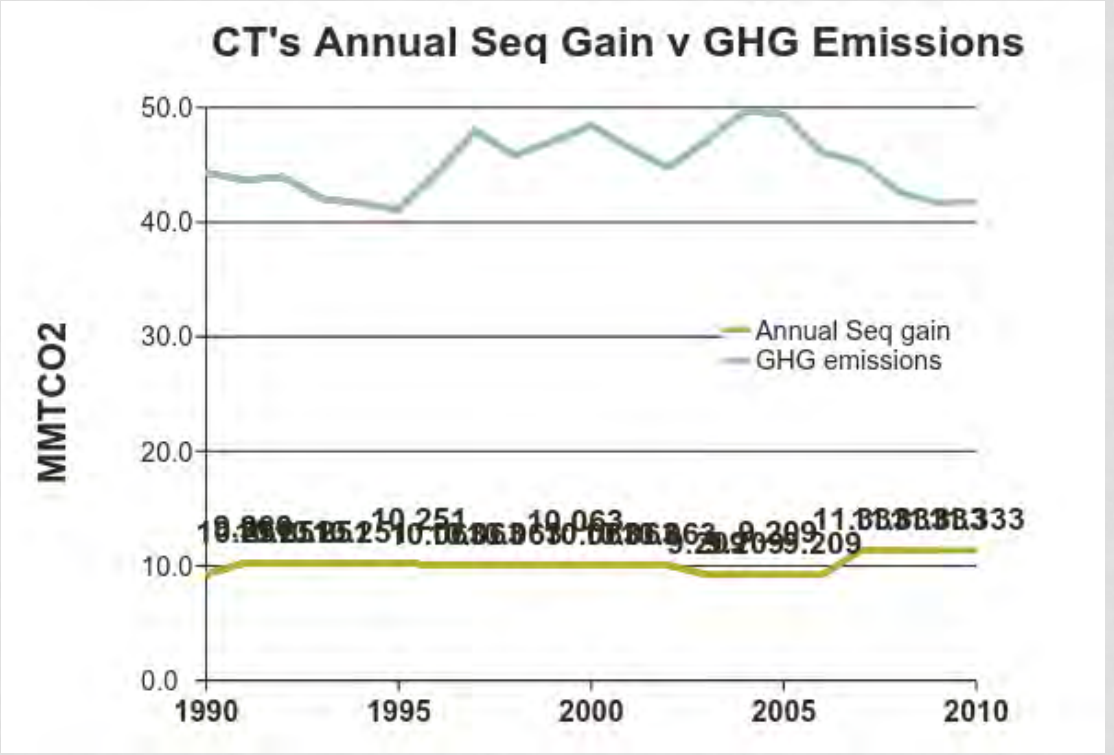
# NEED FOR ACCURATE LAND USE ACCOUNTING

## EPA State Inventory C Accounting




CT Climate Change Progress Report, 2009

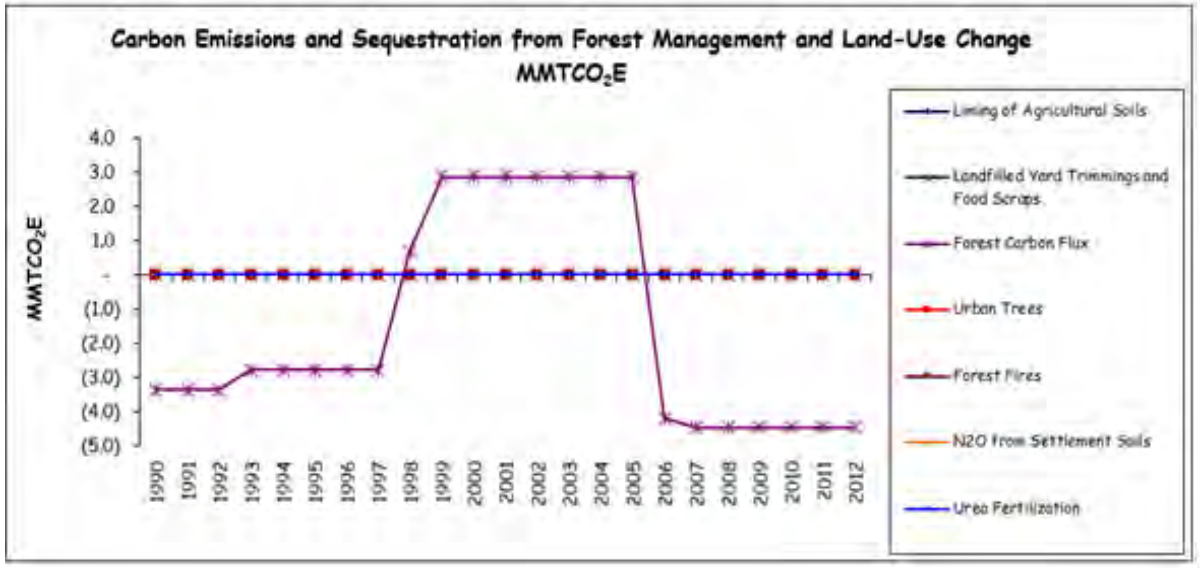
## Tomasso InVEST C Accounting



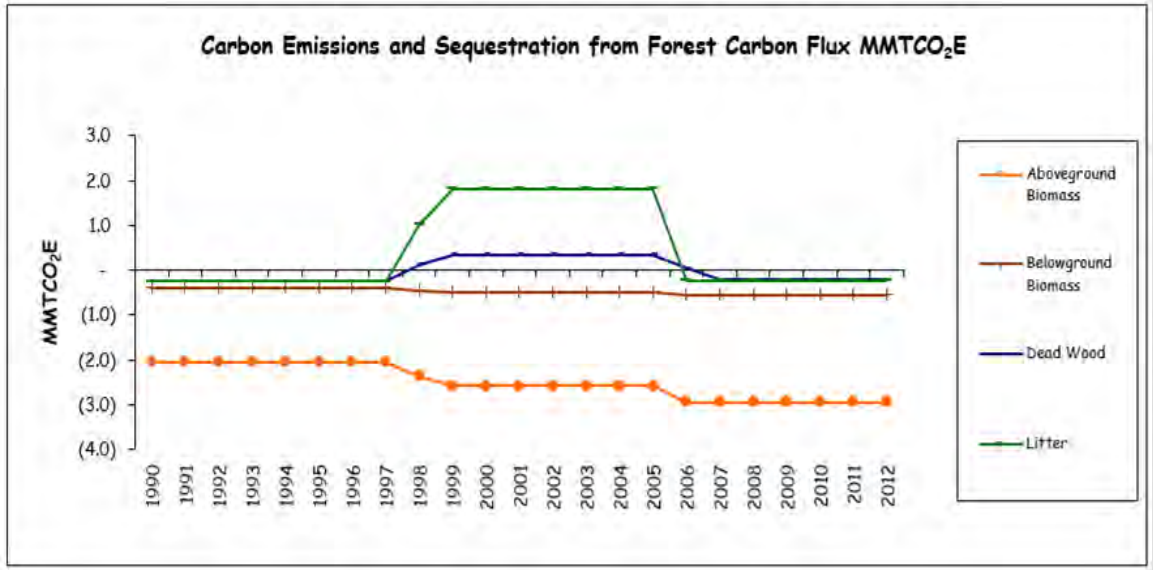

Tomasso modeling of CLEAR data, 2015

# EXISTING TOP-DOWN METHODOLOGIES FOR LUCF ACCOUNTING

## SIT Module Results, June 2015

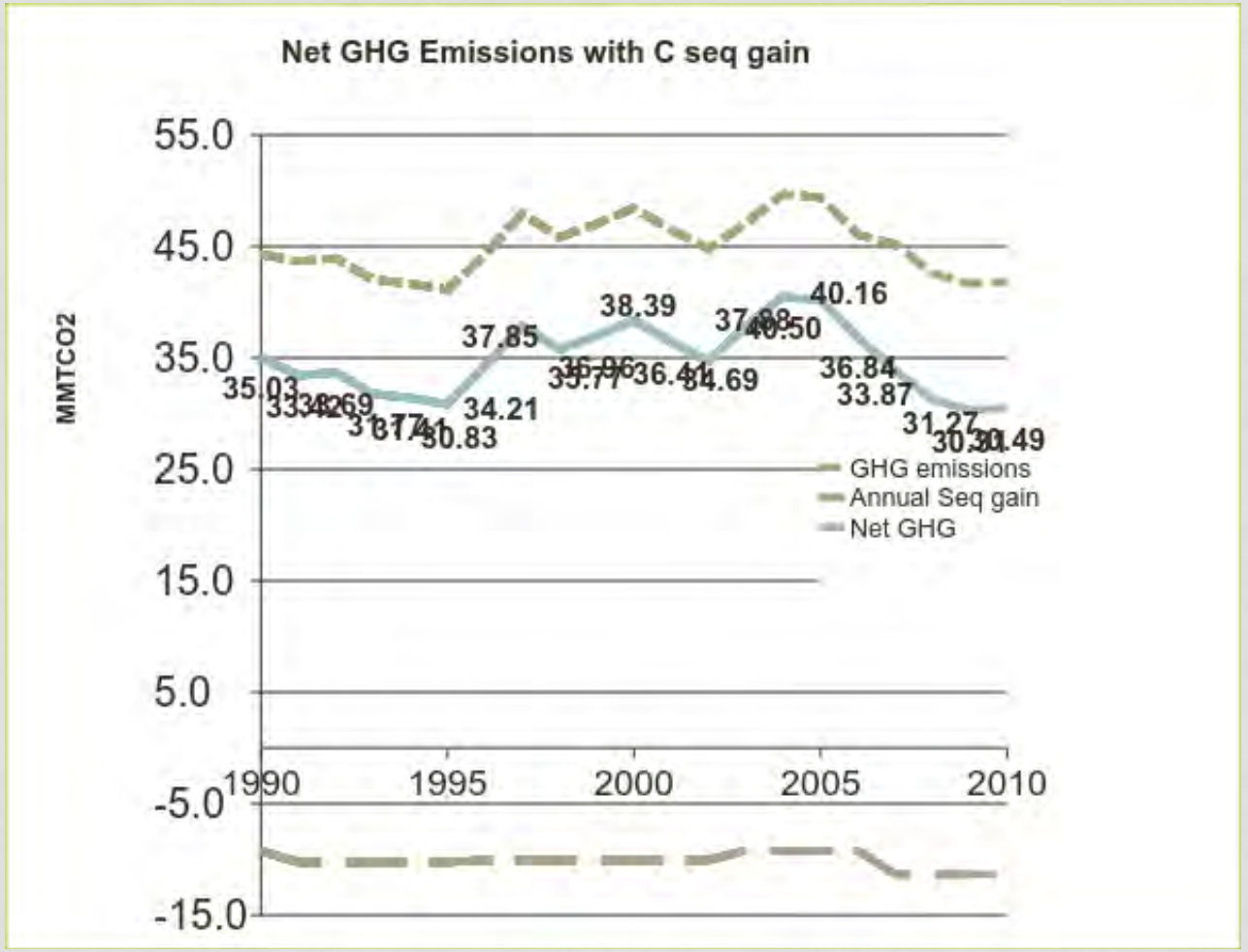



## SIT Module Results, C Differentiated




Helen Silver modeling, June 26, 2015.

# IMPACT OF C FOREST ACCOUNTING ON GHG TOTALS



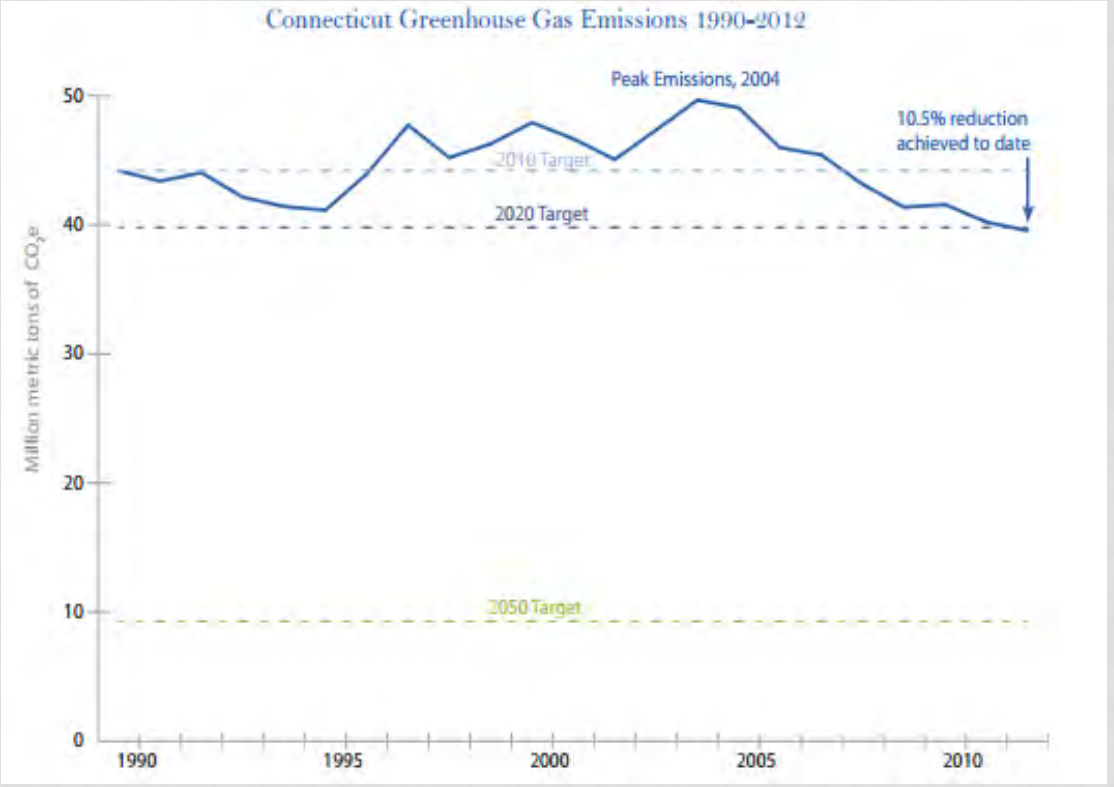

Tomasso modeling of CLEAR data, 2015

# FOREST CONSERVATION IS A COST-EFFECTIVE MITIGATION ALTERNATIVE

## Estimated costs of implementation per ton of CO2 reduced

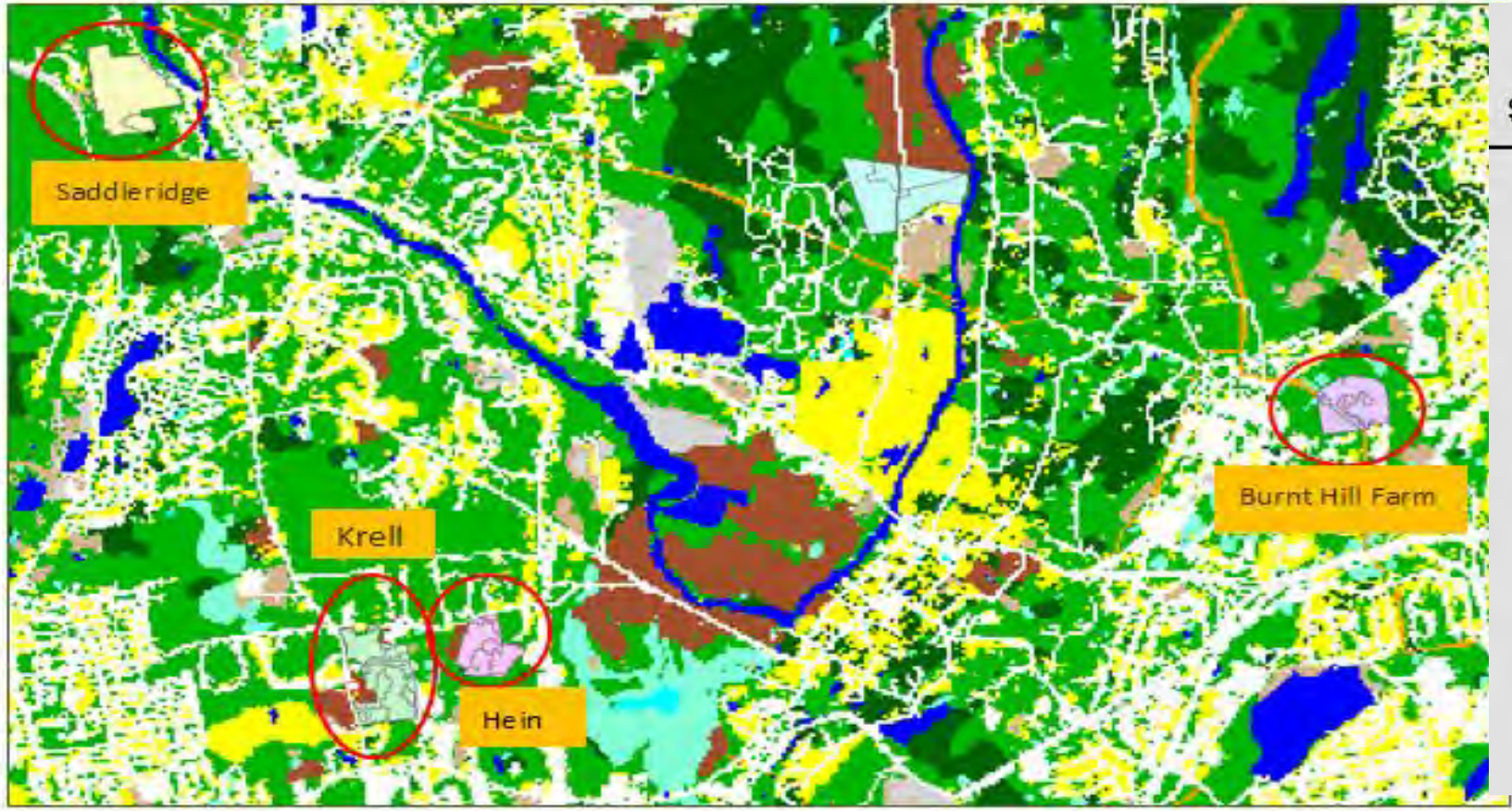
| | |
|---|---|
| • Transit modification strategies (Reason Foundation) | • $ 4,257/tCO$_2$ |
| ○ (Moore, Staley & Poole) | • $ 833/tCO$_2$ |
| ○ (Victoria Policy Institute) | • $ 1,000/tCO$_2$ |
| • Bus rapid transit systems | |
| ○ Los Angeles | • $ 117/tCO$_2$ |
| ○ Vancouver (Millard-Ball) | • $ 3,238/tCO$_2$ |
| • Major road improvements | |
| ○ (Reason Foundation) | • $ 3,995/tCO$_2$ |
| • Concentrated solar in select sun-rich locations | • $ 52/tCO$_2$ |
| ○ (CT State DEEP) | |
| • Current nuclear competitive with coal/NG (MIT) | • $ 27/tCO$_2$ |
| • RGGI auction 23 clearing price | • $ 4/tCO$_2$ |
| • Forest preservation | • $47-137/tCO$_2$ |

Tomasso Harvard thesis, 2014.




CT Climate Change Progress Report, 2014

# RESEARCH APPLIED TO PRESERVED PARCELS IN FARMINGTON, CT




| $/MgC | $/MTonsC | $/MTCO2 | $/MMTCO2 |
|---|---|---|---|
| 244.90 | 244.90 | 66.84 | 66,840,652 |
| 182.24 | 182.24 | 49.74 | 49,737,286 |
| 501.13 | 501.13 | 136.77 | 136,772,110 |
| 379.79 | 379.79 | 103.65 | 103,654,695 |
| 326.56 | 326.56 | 89.13 | 89,125,898 |
| 233.33 | 233.33 | 63.68 | 63,682,880 |
| 240.84 | 240.84 | 65.73 | 65,732,428 |
| 172.45 | 172.45 | 47.07 | 47,066,579 |

Map Source: Esri 10.1 ArcGIS; Data Source: Farmington, CT Office of Town Planning

# AT ANY LEVEL, FOREST C SEQUESTRATION COULD BE CLOSING THE GAP BTW 2020 & 2050 GHG REDUCTION TARGETS

**Table 1: Connecticut Gross Annual Emissions of Select Years and GHG Reduction Targets**

| | 1990 | 2001 | 2007 | 2010 | 2020 | 2050 |
|---|---|---|---|---|---|---|
| Total Emissions (MMT $CO_2$) | 43.75 | 46.25 | 45.06 | 41.38 | | |
| 2010 Target (Attain 1990 Level) | | | | ✓ | | |
| 2020 Target (10% Below 1990 Level) | | | | | 39.38 | |
| 2050 Target (80% Below 2001 Level) | | | | | | 9.25 |

*Source: DEEP analysis using EPA's SIT.*

# BACKGROUND TO CT PRIVATE FOREST OWNERSHIP

| Parcel Size (acres) | Owners | % of all 10+ acre Owners | Acres | % of land in 10+ acre class | % of CT Forest | Average parcel size | # Survey Respondents |
|---|---|---|---|---|---|---|---|
| 10-24 | 9,700 | 58% | 140,500 | 24% | 8% | 14 acres | 53 |
| 25-99 | 6,000 | 36% | 267,800 | 47% | 15% | 45 acres | 101 |
| 100+ | 1,000 | 6% | 167,100 | 29% | 10% | 162 acres | 63 |

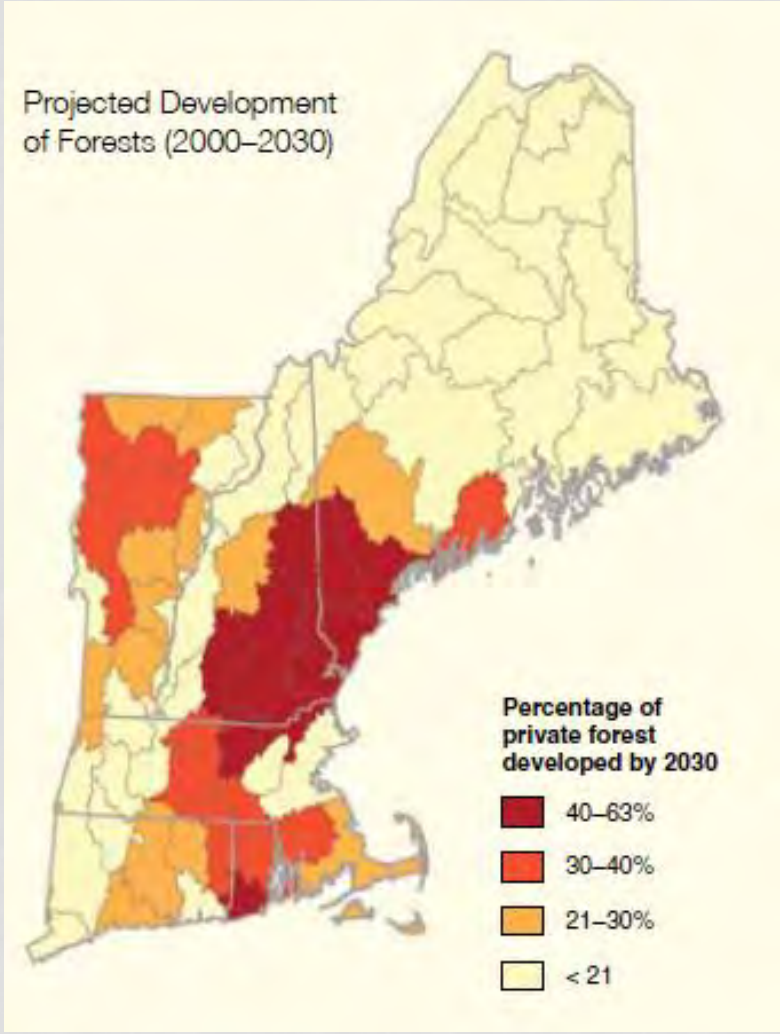
Table 8. Connecticut 10+ acre family woodland owners by size class.

- 85% of Connecticut Forest Owners are above the age of 50
- 40% are retired
- Aging is a major concern for property maintenance and transfer

# OPPORTUNITY COSTS ASSOCIATED WITH CONSERVATION ARE HIGH

**Connecticut's forests are at risk of imminent conversion**

- 1/3 of landowners would sell if offered a "reasonable price" (300,000 acres)
- 17% say that land transfer is likely **within the next five years** (200,000 acres)
- CT property **taxes** are **6th highest** in nation
- **High property taxes** are the most often cited concern for landowners (80%)




Illustration, Harvard Forest.

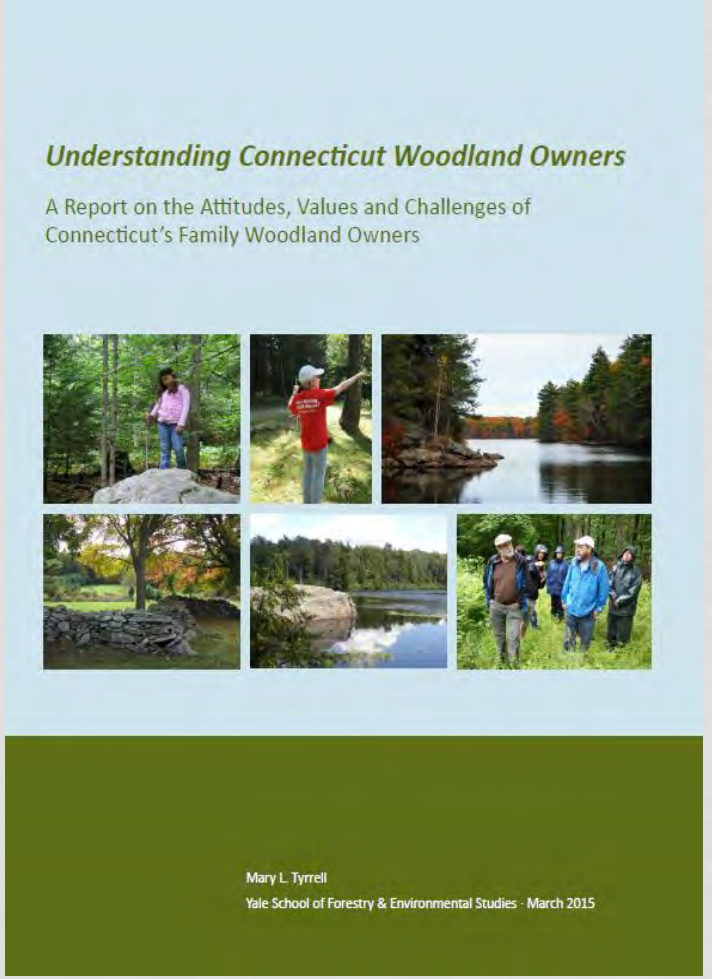
# OPPORTUNITIES ASSOCIATED WITH CONSERVATION ARE ALSO HIGH

**Connecticut's Forests: Ownership Facts**

- Private ownership accounts for 73% of total forested land
- Family/individual owned forestland is 34% of total (600,000 acres) (10/+ acre parcels)
- 85% of forest owners > 50 age: Concern of future ownership and ability to care for land

**Conservation awareness primed for protection**

- 80% want their land to remain forested
- Owner awareness of easements is 46% v 15% nationally, but only 6% (v 3%) under easements
- Awareness of other protective mechanisms low



# POLICIES THAT WOULD BE SUPPORTED BY CONNECTICUT FOREST OWNERS

| | |
|---|---|
| More favorable tax policies | 68% |
| Advice on caring for your property | 52% |
| Advice on invasive plants | 51% |
| Advice on insects and diseases | 49% |
| Advice on woodland management | 47% |
| Advice on how to transfer land to the next generation | 42% |
| Advice on wildlife management | 42% |
| Cost sharing for woodland management | 33% |
| Payments for ecosystem services | 32% |
| Stronger timber markets | 19% |
| Advice on selling or giving away development rights | 19% |

Source: Yale Forest Report (2015)

# 10 RECOMMENDATIONS FOR FOREST C SEQUESTRATION

- ***Recommendation #1.*** *Adopt Overarching Land Use Priorities and Forest Sector Goals.*
- ***Recommendation #2****. Strengthen Tax Incentives & Cost Sharing Programs for Privately Owned Lands.*
- ***Recommendation #3****. Manage and Acquire State Forestlands (including easements) for Mitigation and Adaptation Purposes.*
- ***Recommendation #4****. Increase Educational & Technical Assistance for Privately Owned and Municipal Forestlands.*
- ***Recommendation #5****. Guarantee annual funding for on-going land mapping by UCONN's Center for Land Use Education and Research (CLEAR).*

# 10 RECOMMENDATIONS CONT'D

- ***Recommendation #6***. *Include GHG Impacts and Land Conversion Status in State Environmental Review.*
- ***Recommendation #7***. *Align Connecticut's Transportation Planning with Climate Change and Smart Growth Goals.*
- ***Recommendation #8***. *Increase Land Use Planning at the Regional & Municipal Levels.*
- ***Recommendation #9.*** *Facilitate Additional Revenue Streams for Privately Owned Lands.*
- ***Recommendation #10***. *Increase Stringency of Eligible Biomass Standards under the Renewable Portfolio Standard (RPS).*

# RECOMMENDATIONS FOR FOREST CONSERVATION OVERVIEW & RESEARCH METHODOLOGY

**Ten Overarching Recommendations**

- Overlapping and mutually reinforcing
- Target various sectors
- Roughly weighted according to impact, feasibility, and urgency
- Consideration of budgetary constraints/legislative approval

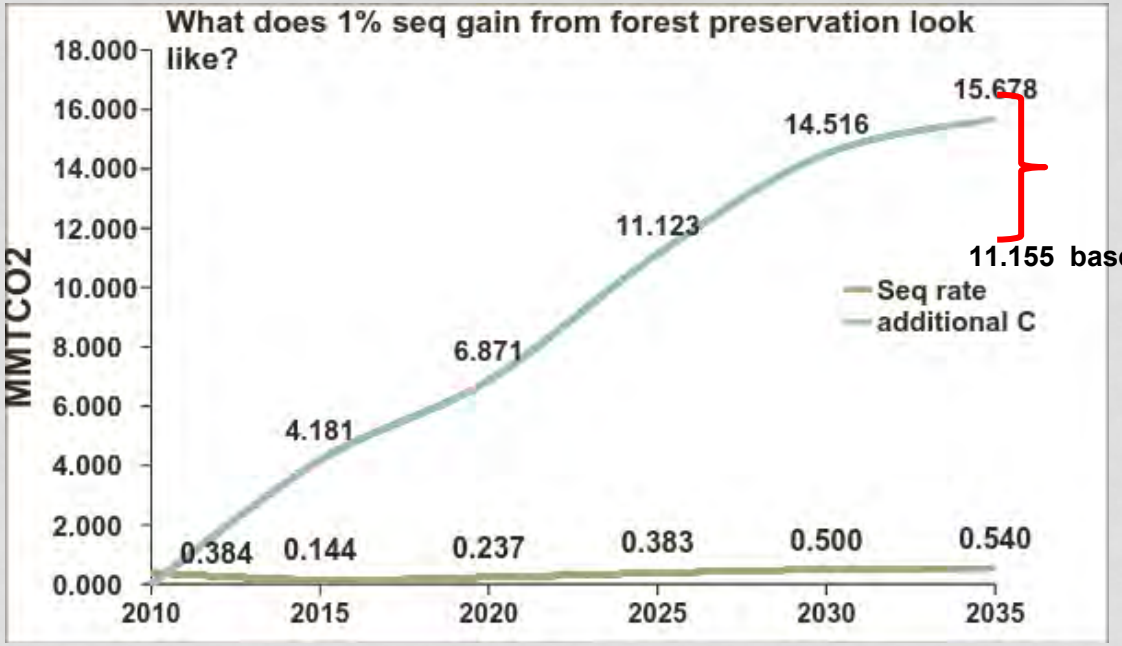
**Research Prioritized State Policies Based on:**

- Leadership in Climate Change Policies
- Results of GHG Inventory Research
- RGGI membership
- Forest/Natural Resource Conservation Ethic

**States of Focus**: MA, VT, NY, CA, WA; Federal programs largely excluded

# RECOMMENDATION #1:
# ADOPT LAND USE PRIORITIES AND FOREST SECTOR GOALS

- **Recommendation 1A: Legislative Revision of 21% Conservation Goal to a no-net loss or net forest gain**



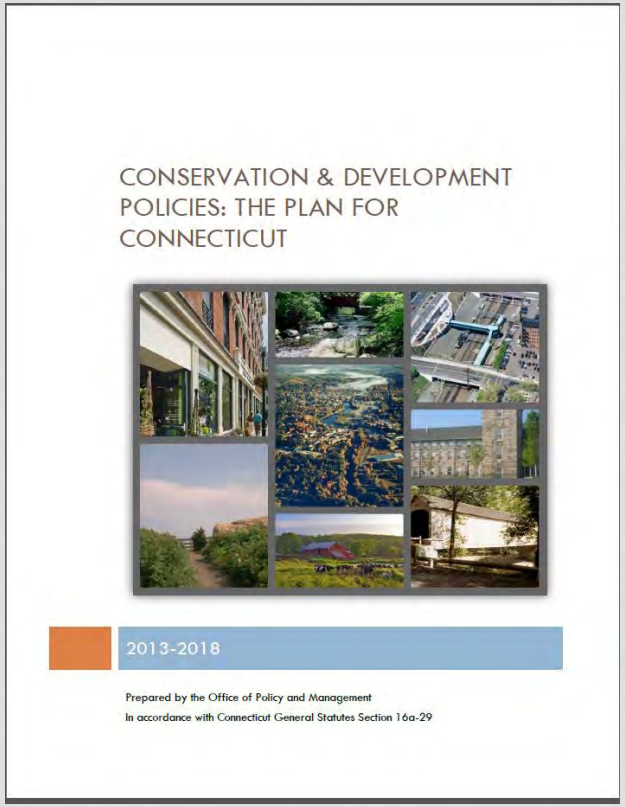

  - If the remaining 175,111 acres of CT's total open space mandate were devoted to forest, **8%** of preserved forests would yield an added **36.2 MMTCO2** over 25 yrs.

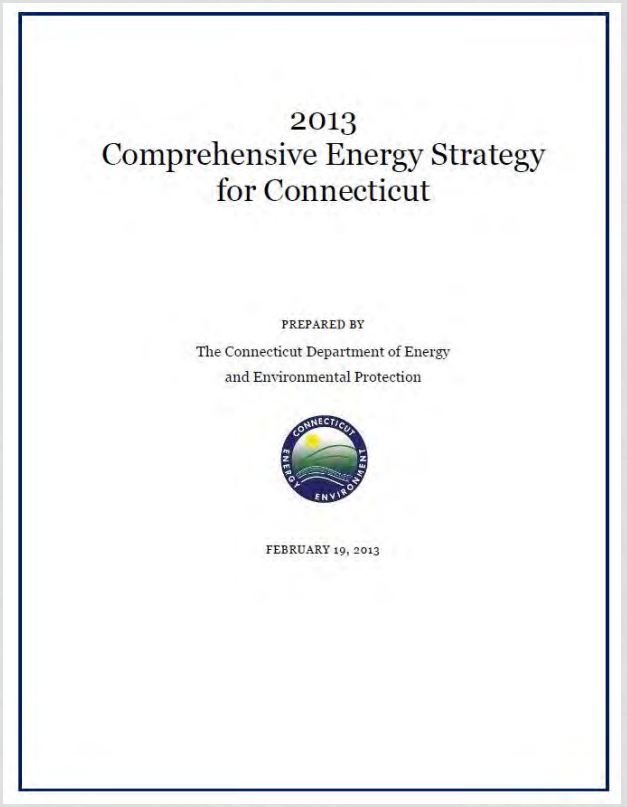
# RECOMMENDATION #1:
# ADOPT LAND USE PRIORITIES AND FOREST SECTOR GOALS

- **Recommendation 1B: Amend State Conservation and Development Plan and other key documents to include:**
  - Quantified targets (e.g., net sequestration and conservation goals)
  - Targets should address private, municipal, and state-owned lands
  - Use existing authority to set internal agency policies (e.g, state-owned lands)
  - Seek Legislative Action where necessary

# RECOMMENDATION #1 (CONT'D)

- Current Plan C&D mentions Carbon 1x and Forests 0x
- C&D Plan needs:
  - Explicit recognition of forests as C sinks and mitigation tools
  - Strengthened Growth Management Principles (particularly GMP #4 & 5)
- Amendment would require legislative approval



# RECOMMENDATION #2:
# STRENGTHEN TAX INCENTIVES & COST SHARING PROGRAMS FOR PRIVATELY OWNED LANDS

- **Recommendation 2A: Lower eligibility acreage of PA490 from 25 to 9 acres**
  - High likelihood of efficacy
  - 68% support more favorable tax policies
  - Would capture at least 140,000 acres or ~ 8-10% more of privately owned forestland
  - Leverages conservation and legacy ethic
  - Reduces risks of otherwise imminent sale due to opportunity costs/aging
  - Creative ways to counteract budgetary constraints

# RECOMMENDATION #2 (CONT'D)
# COMPARISON OF OTHER STATE POLICIES

- **Massachusetts:**
  - Over ¼ of total land area legally protected
  - Current Use Laws: capture 10≥ acres
- **Vermont:**
  - 1/3 of total land area enrolled in Current Use Programs
  - No maximum tax credit value
  - Innovative response to budgetary cap: Increased early withdrawal penalties
- **Washington State:**
  - No minimum acreage for Open Space Tax Credit
  - Minimum acreage for timberland = 5 acres

# RECOMMENDATION #2 (CONT'D)

- Recommendation 2B: Establish a Permanent Tax Deduction for Donations
- Used in Several Other States
- Massachusetts Conservation Incentives Act:
  - Heralded as a landmark success for conservation
  - Provides 50% tax credit for permanent donations of easements and fee interests ($75,000 maximum)
  - Funded up to $2 million per year

Connecticut Forest & Park Association

Middlesex Land Trust
Conservation in the heart of Connecticut

Audubon Connecticut

# RECOMMENDATION #2 (CONT'D): COST-SHARING & GRANT PROGRAMS

- **Recommendation 2B: Increase Cost-Sharing & Grant Programs**
- Wide variety of options available
- To increase area of protected forests, cement programs for Land Acquisition by non-profits, municipalities for conservation
- To increase existing C sequestration capacity, provide financial assistance to:
  - Develop & implement sustainable management plans
  - Ease burden of most costly property maintenance expenses

# RECOMMENDATION # 3:
# ACQUIRE AND MANAGE STATE LAND FOR CARBON SEQUESTRATION PURPOSES

## Incorporate C sequestration into land acquisition and management criteria

### Land Acquisition:

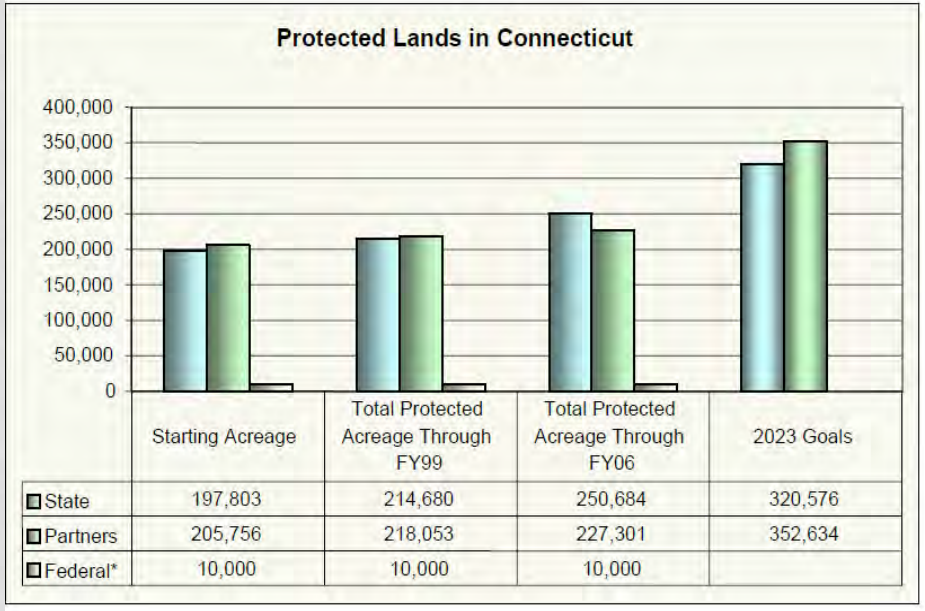
- Through Recreational and Natural Heritage Program, Open Space Program, and The Green Plan
- Expand current focus on traditional public use value to C capture services
- Legislative reform likely necessary

### Forest Management:

- Timber harvesting plans should consider enhanced C sequestration as a criteria
- Consider Expansion of Forest Reserves (areas w/out harvesting)

**The Green Plan: Guiding Land Acquisition and Protection in CT: 2007-2012**

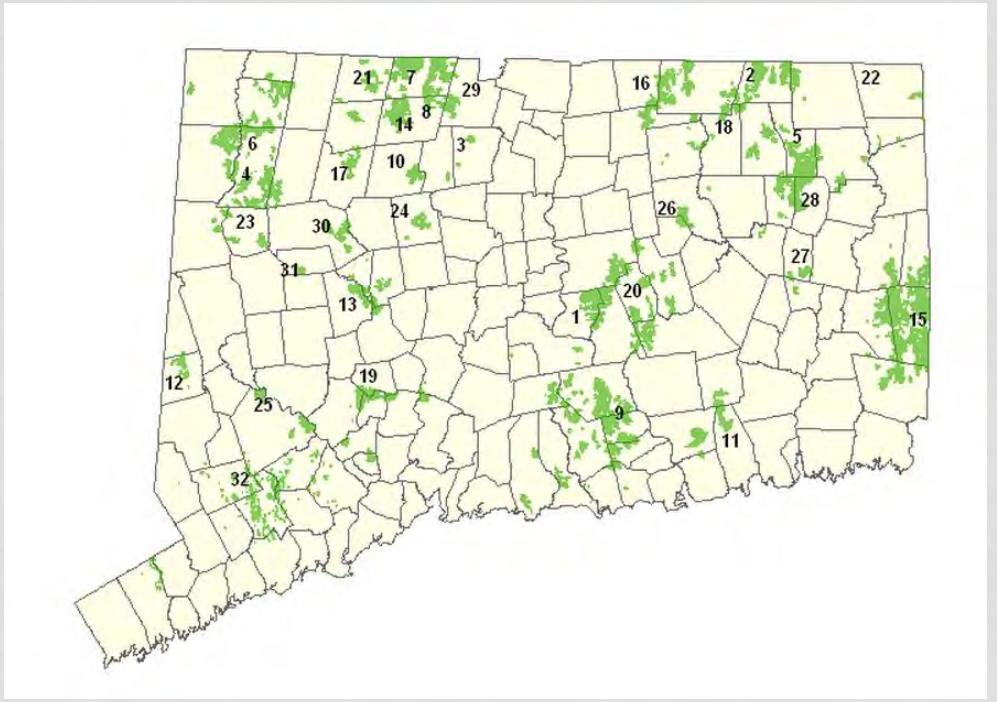
**Carbon mentioned 1x in body of report, 2x overall**




| | Starting Acreage | Total Protected Acreage Through FY99 | Total Protected Acreage Through FY06 | 2023 Goals |
|---|---|---|---|---|
| State | 197,803 | 214,680 | 250,684 | 320,576 |
| Partners | 205,756 | 218,053 | 227,301 | 352,634 |
| Federal* | 10,000 | 10,000 | 10,000 | |

# RECOMMENDATION #3 (CONT'D)

- **Recommendation 3B: Ensure that all State-owned lands have sustainable forest management plans *and* adequate implementation**
  - Significant, but surmountable management deficits
  - As of 2010, only 23 of 32 State Forests managed by a DOF Forester
  - About ½ of all state owned forest land is unmanaged due to personnel deficits
  - **Budgetary assistance from legislature**




Sustainable management of Connecticut's State Forests is essential for ecosystem services, recreational opportunities, and provide timber revenues

# RECOMMENDATION #4:
## INCREASE EDUCATIONAL & TECHNICAL ASSISTANCE FOR LANDOWNERS

- **Recommendation 4a: Redesign DEEP website to contain user-friendly repository of resources**

College of Agriculture and Natural Resources
Center for Land Use Education and Research
CLEAR

- **Recommendation 4b: Partner with academic and nonprofit institutions to provide learning opportunities and increase awareness of resources**
  - Eg., written materials, webinars, presentations, open-source website
  - Only 2 state foresters devoted to private landowners
  - Evidence suggests that opportunity would be welcomed by both landowners and institutions

Yale School of Forestry & Environmental Studies

# RECOMMENDATION #4
# RESPONDING TO LANDOWNERS' CONCERNS

Landowners voicing requests for forestry "stewardship" assistance:
What are my options for management and transfer?

| | |
|---|---|
| More favorable tax policies | 68% |
| Advice on caring for your property | 52% |
| Advice on invasive plants | 51% |
| Advice on insects and diseases | 49% |
| Advice on woodland management | 47% |
| Advice on how to transfer land to the next generation | 42% |
| Advice on wildlife management | 42% |
| Cost sharing for woodland management | 33% |
| Payments for ecosystem services | 32% |
| Stronger timber markets | 19% |
| Advice on selling or giving away development rights | 19% |

# RECOMMENDATION #4
# LANDOWNER AWARENESS OF AVAILABLE ASSISTANCE

- Significant gains can be made in Landowner Assistance programs
- Only ~60% are aware of significant tax deductions available through PA490
- ~20% or below are aware of other state and federal programs

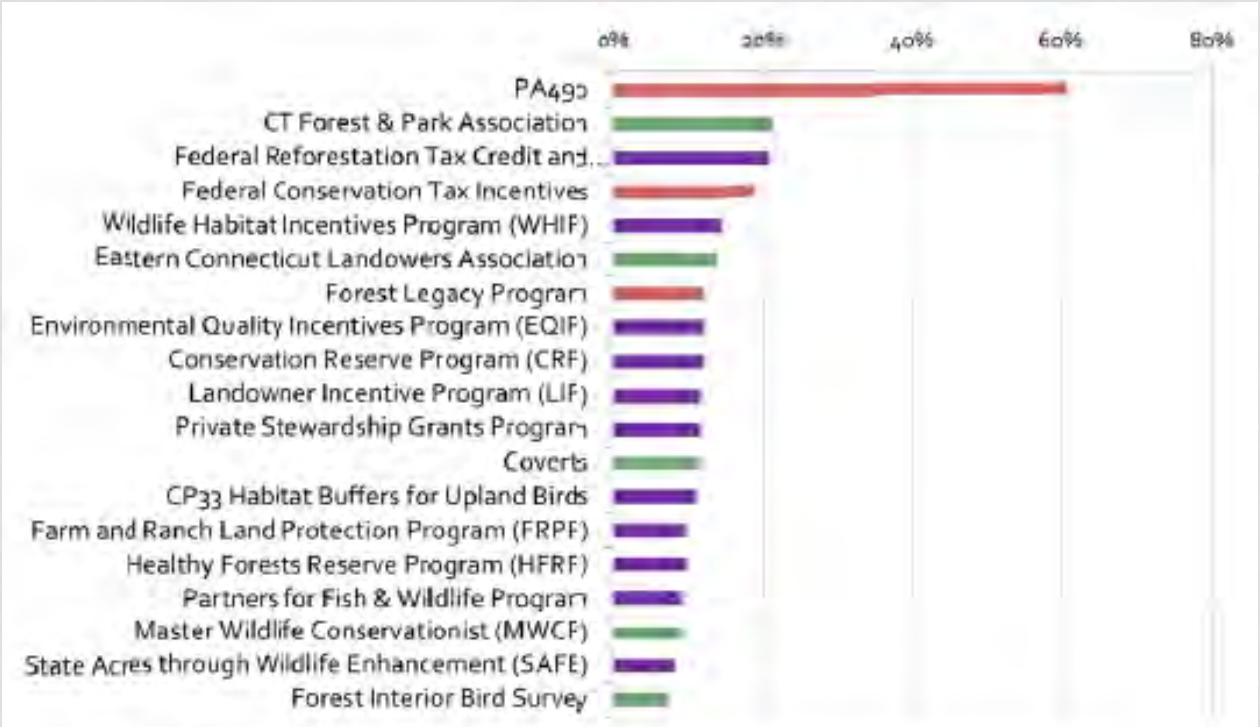



Figure 5. Landowner assistance programs, support organizations, and volunteer programs for Connecticut woodland owners. Percent of woodland owners who have heard of each program. Red are financial programs that effectively reduce taxes; green are organizations or programs that increase landowner involvement; purple are government financial assistance programs for land management.

# RECOMMENDATION #5:

# PROVIDE **CLEAR** WITH CONSISTENT FUNDING FOR LUCF DATA GATHERING AND ANALYSIS

College of Agriculture and Natural Resources
Center for Land Use Education and Research

CLEAR

- CLEAR generates longest-running data set on land use change in US
- Yale forest analysis utilized CLEAR data
- NOAA partners with CLEAR, currently on Blue Carbon
- Without funding (190K/yr), Connecticut will lose a consistent baseline data set on land cover

# CONCLUSION

- Without improved policies, deforestation is likely *and* imminent
- Seizing this opportunity is imperative: *Predicted deforestation would serious compromise CT's ability to meet the 2050 GHG target*
- Compared to other mitigation alternatives, forest conservation is cost effective

# CONCLUSION (CONT'D)

- Policies could expanded to protect other carbon intensive lands
  - Between 1985 and 2010, Connecticut lost 22% of its good agricultural soils to other uses
- Conservation of forests and other lands is essential to protecting other values for Connecticut's citizens

# SUPPLEMENTARY MATERIALS

10 overarching recommendations

Table 1 From August 2015 Memorandum:
with Specific Action Items, Comments, and Examples of Other State Programs

# 10 RECOMMENDATIONS FOR FOREST C SEQUESTRATION

- *Recommendation #1. Adopt Overarching Land Use Priorities and Forest Sector Goals:* Connecticut should establish an overarching goals for its forest sector, such as a no-net-loss goal, as well as near-, mid-, and long-term sequestration goals (e.g., percentage capture of parcels most ripe for land conversion due to owner demographics, parcel size and location). While Connecticut's Conservation & Development Plan (C&D Plan) provides a robust foundation for land preservation, the State must explicitly prioritize forest conservation for carbon sequestration in the C&D Plan and other key documents.

- *Recommendation #2. Strengthen Tax Incentives & Cost Sharing Programs for Privately Owned Lands:* One of the primary causes of deforested land conversion is that opportunity costs associated with conservation are high, and land sale for development is ultimately more profitable. Thus, making conservation more financially attractive by increasing available tax deductions will counteract an underlying root cause of deforestation.

- *Recommendation #3. Manage and Acquire State Forestlands (including easements) for Mitigation and Adaptation Purposes:* Both forest management plans and state acquisition criteria should include a goal of enhancing carbon sequestration through forest acquisition. Moreover, Connecticut DEEP should seek additional funding to ensure that all state and town-owned forests are managed appropriately.

- *Recommendation #4. Increase Educational & Technical Assistance for Privately Owned and Municipal Forestlands:* Managing lands for C sequestration and other values is technically complex, and Connecticut can facilitate assistance to private and municipal forest owners through strategic partnerships and knowledge dissemination, beginning with DEEP website redesign to access "boots-on-the-ground" outreach and e-outreach.

- *Recommendation #5. Guarantee annual funding for on-going land mapping by UCONN's Center for Land Use Education and Research (CLEAR),* the fundamental data base on Connecticut's forestlands.

# 10 RECOMMENDATIONS (CONT'D)

- *Recommendation #6. Include GHG Impacts and Land Conversion Status in State Environmental Review:* Connecticut should revise either its statutes or regulation so that GHG emissions from both land conversion and bioenergy and effects on forest C sequestration potential are considered under the Connecticut Environmental Policy Act.

- *Recommendation #7. Align Connecticut's Transportation Planning with Climate Change and Smart Growth goals:* Reducing sub/urban sprawl through Connecticut DOT programs will reduce not only VMT but forest incursion by development as well as habitat fragmentation.

- *Recommendation #8. Increase Land Use Planning at the Regional & Municipal Levels:* Several opportunities exist to facilitate regional land use planning, co-housing opportunities and clustered development, including through the State Conservation & Development Plan, coordinating with the state's regional planning organizations, and providing financial incentives to municipalities.

- *Recommendation #9. Facilitate Additional Revenue Streams for Privately Owned Lands:* Increasing landowner income by expanding eligible C offset projects, recreational leases, and payments for ecosystem services will discourage property sales.

- *Recommendation #10. Increase Stringency of Eligible Biomass Standards under the Renewable Portfolio Standard (RPS):* To ensure that the RPS does not increase near-term GHG emissions, Connecticut should amend its definition of "sustainable biomass" to include more stringent sourcing requirements and, possibly, a GHG reduction requirement.

| *Recommendations* | *Action Item* | *Pros/Cons & Comments* | *Other State Programs* |
|---|---|---|---|
| | | | |
| **#1. Adopt Overarching Land Use Priorities and Forest Sector Goals** | | Though direct GHG emissions reduction attributable to these types of programs may be difficult to determine, they are essential for coordinating and prioritizing state action | |
| Strengthen existing Growth Management Principles to incorporate forest conservation and climate mitigation potential | Legislative revision and/or Revision to the 2013 State Conservation & Development Plan | | |
| Adopt guiding principles to organize state and municipal policies | Either agency level (informal policies/regulation ) or legislative action | Time and costs depends up on process | Massachusetts Sustainable Development Principles (http://www.mass.gov/envir/smart_growth_toolkit/pdf/patrick-principles.pdf) |
| Establish a goal of C negative (net C sequestration) for the land use sector | Either agency level (informal policies/regulation ) or legislative action | | |
| Amend the current conservation goal of 21% forest by:<br>- Increasing percentage<br>- Including a no net loss goal | Legislative action | | Recommendations by MA Secretary of Energy and Environmental Affairs (http://www.mass.gov/eea/docs/eea/energy/cca/eea-climate-adaptation-report.pdf)<br><br>Recommendations by California Air Resources Board for Forest Planning and Actions |

| *Recommendations* | *Action Item* | *Pros/Cons & Comments* | *Other State Programs* |
|---|---|---|---|
| - Establishing a C sequestration goal with quantified near-, mid-, and long-term targets | | | (http://www.arb.ca.gov/cc/scopingplan/document/updatedscopingplan2013.htm (overview)) |
| Fully engage the private sector in both policy development and implementation | | | The New York Climate Action Council has adopted such a vision as a primary guide in policy development (Full report available here: http://www.dec.ny.gov/energy/80930.html; *see Overview and Chapter 9)* |
| Fully engage the Transportation and Land Use Sector at all governmental levels with a vision that Connecticut will live in smart growth communities by 2050 | | | The New York Climate Action Council has adopted such a vision as a primary guide in policy development (Full report available here: http://www.dec.ny.gov/energy/80930.html; *see Overview and Chapter 7)* |
| Consider the establishment of an interagency Forest Carbon Working Group to further develop and explore cross-sector climate mitigation strategies and available funding | Legislative or Executive action | High administrative costs, but benefits could be enormous through the identification of administrative, regulatory, and funding opportunities and streamlining | California Planned Forest Carbon Work Group (http://www.arb.ca.gov/cc/scopingplan/document/updatedscopingplan2013.htm (Overview)) |
| Include in economic analysis of policies all environmental, social, and health benefits | | | |
| Consider an appropriate discount rate for net present value of future benefits | | | |
| | | | |
| **#2. Strengthen Tax Incentives, Cost Sharing, and Grant** | | | |

| *Recommendations* | *Action Item* | *Pros/Cons & Comments* | *Other State Programs* |
|---|---|---|---|
| **Programs for Privately Owned Forests** | | | |
| *Tax Incentives*[1] | | | |
| Lower the required acreage under PA 490 from 25 to 9 acres<br><br>Defines tax on open space as current use vs highest/best use | Legislative action | Tax negative | Massachusetts Current Use Tax (http://www.mass.gov/eea/agencies/dcr/conservation/forestry-and-fire-control/ma-current-use-forest-tax-program.html)<br><br>Washington State Current Use/Open Space Tax Law (http://dor.wa.gov/docs/pubs/prop_tax/openspace.pdf) |
| Revise PA490 to include existing C sequestration and increased sequestration | Legislative action | Tax negative | |
| Identify tax exempt purposes for other types of ecosystem services/environmental values | | Tax negative | Vermont Dep't of Forest, Parks & Recreation climate policy recommendation (May 2015) (http://fpr.vermont.gov/sites/fpr/files/Forest_and_Forestry/The_Forest_Ecosystem/Library/Climate%20change%20report_final_v6-18-15a.pdf) |
| Establish "Keep forests as forests taxes" by providing tax deductions for most costly landowner expenses (e.g., roads, trails, fences, insurance, etc.) | Research<br><br>Legislative action or amendment to implementing regulations | Time and cost depend upon procedure; much work has been done | |
| Provide a permanent tax deduction for the gift of either a fee interest or easement for conservation purposes | Legislative action | Tax negative | Massachusetts Conservation Land Tax Credit (http://www.mass.gov/eea/state-parks-beaches/land-use-and-management/land-conservation/massachusetts-conservation-tax-credit-program.html ) |
| Increase tax incentives or provide cost-sharing programs for the adoption of sustainable forestry practices | Promulgate regulations pursuant to the | Tax negative<br><br>C sequestration not currently included | Massachusetts Forest Stewardship & Green Certification Program (http://www.mass.gov/eea/agencies/dcr/conservation/forestry-and-fire-control/forest-stewardship-program.html) |

[1] Several of the proposed tax incentives/deductions could be formulated under cost-sharing or grant programs. The main difference would be in the economic impact (e.g., direct expenditure by the state vs. loss of tax revenue)

| *Recommendations* | *Action Item* | *Pros/Cons & Comments* | *Other State Programs* |
|---|---|---|---|
| | Forestry Practices Act | | |
| *Cost Sharing & Grants* | | | |
| Provide financial assistance in the form of cost-share programs to nonprofits, municipalities, and individuals for acquiring conservation land | Funding requirement | Tax negative or direct expense | Massachusetts Conservation Partnership Grant http://www.mass.gov/eea/grants-and-tech-assistance/grants-and-loans/dcs/grant-programs/conservation-partnership-grant.html )<br><br>Washington State (various Habitat Conservation and Restoration Grants; http://www.rco.wa.gov/grants/habitat_grants.shtml) |
| | | | |
| **#3. Manage & Acquire State Forest Lands (including easements) for Climate Mitigation purposes** | | | |
| Expand Forest Legacy Program pursuant to comprehensive state-wide plan accounting for climate change values | Work with USFS, potentially budgetary approvals, plan design | | |
| Ensure that lands have management plans & appropriate personnel | Seek budget assistance | | |
| Harvesting: Consider enhancing C sequestration as a requirement in CT forest harvesting plans | Amend state forest management plans | May result in an increase in harvesting costs or reduction in timber revenues<br><br>Amendment of plans may require stakeholder engagement | |

| *Recommendations* | *Action Item* | *Pros/Cons & Comments* | *Other State Programs* |
|---|---|---|---|
| Consider establishment and expansion of Forest Reserves where no harvesting can occur | Amend state forest management plans | Low cost as management is generally for natural baseline<br><br>But may result in a decrease in timber revenues<br><br>Amendment of plans may require stakeholder engagement | Massachusetts Forest Reserve Program expansion enjoys broad public support (http://www.mass.gov/eea/state-parks-beaches/sustainable-forest-management/forestry-reserves/what-are-forest-reserves.html) |
| Consider C sequestration & stored C in land acquisition programs, focusing on large unfragmented blocks | Likely regulatory/policy reform | Low cost if no legislative amendments | Massachusetts' Clean Energy and Climate Action Plan for 2020 adopted this as a specific recommendation (http://www.mass.gov/eea/docs/eea/energy/2020-clean-energy-plan.pdf) |
| Amend Open Space Plan and other programs to specifically include climate change mitigation (C sequestration in acquisition criteria) | Legislative action | | Connecticut plan currently under revision (draft makes no meaningful mention of C sequestration or climate change) (http://www.ct.gov/deep/cwp/view.asp?a=2706&q=511558&deepNav_GID=1641) |
| | | | |
| **#4. Increase Educational & Technical Assistance for Privately Owned and Municipal Forest Lands** | | | |
| Redesign DEEP website to contain user-friendly repository of landowner financial assistance resources (nonprofit, federal, and municipal) | Website redesign | Low cost | Nonprofit and university websites provide the best models (UMass Amherst: http://masswoods.net/landowner-programs; Landscope (Washington): http://www.landscope.org/washington/programs/wa_programs/) |
| Partner with institutions (CLEAR, academic & nonprofit) | | Website would contain scientific | |

| *Recommendations* | *Action Item* | *Pros/Cons & Comments* | *Other State Programs* |
|---|---|---|---|
| to provide peer-to-peer learning opportunities via webinars, land trust presentations, and an open-source website | | and technical information and contacts regarding sustainable harvesting techniques, environmental management plans, etc. | |
| Increase technical assistance and educational programs for municipalities and landowners | Funding requirement | | Massachusetts Forest Stewardship Program (http://www.mass.gov/eea/agencies/dcr/conservation/forestry-and-fire-control/forest-stewardship-program.html) |
| Consider the establishment of Conservation Districts within Connecticut's Regional Planning Organizations | Potential funding requirement | Potentially high initial costs for establishment | Washington State Conservation Commission (http://scc.wa.gov/ ) |
| | | | |
| **#5. Guarantee annual funding for on-going land mapping by Center for Land Use Education and Research (CLEAR).** | Annual line-item funding of $190K | Essential to maintain this fundamental longitudinal data base on CT's forestlands and changing land use | Center for Land Use Education and Research (http://clear.uconn.edu/)<br><br>Symbiotic state-state partner for disseminating technical and financial assistance to land owners and non-profits. |
| | | | |
| **#6. Include GHG Impacts and Land Conversion in State Environmental Review** | | | |
| Prioritize GHG and climate impacts in CEPA review | Adoption of regulations or policy by CEQ to incorporate quantification and consideration of | Alternatives analysis and mitigation measures should include smart growth principles | Massachusetts Environmental Policy Act (http://www.mass.gov/eea/agencies/mepa/greenhouse-gas-emissions-policy-and-protocol-generic.html)<br><br>Washington State Environmental Policy Act (http://www.ecy.wa.gov/programs/sea/sepa/climatechange/index.ht |

| *Recommendations* | *Action Item* | *Pros/Cons & Comments* | *Other State Programs* |
|---|---|---|---|
| | GHG impacts from projects, including emissions from land conversion | Land conversion mitigation could include purchase of conservation land | m; http://www.ecy.wa.gov/climatechange/docs/sepa/20110603_SEPA_GHGinternalguidance.pdf)<br><br>California Environmental Quality Act (http://resources.ca.gov/ceqa/docs/Adopted_and_Transmitted_Text_of_SB97_CEQA_Guidelines_Amendments.pdf) |
| | | | |
| **#7. Align Connecticut's Transportation Planning with Climate Change and Smart Growth goals:** | | Reducing sub/urban sprawl through Connecticut DOT programs will reduce not only VMT but forest incursion by development as well as habitat fragmentation. | |
| | | | |
| Incorporate sustainability into DOT's programs, including a self-certification program | | | New York GreenLITES program (https://www.dot.ny.gov/programs/greenlites) |
| Enter into an interagency agreement between DEEP and DOT to coordinate review of transportation decisions to avoid habitat fragmentation & conversion | Facility with GIS map overlays of development, transportation, ecological state priorities | | Massachusetts DOT & DEP agreement (agreement not publicly available; MA SWAP June 2015 draft (Chap. 2, p. 17): http://www.mass.gov/eea/docs/dfg/dfw/habitat/ma-swap-public-draft-26june2015-chapter2.pdf)<br><br>Maine's Sustainability Solutions Initiative: http://www.unh.edu/nressphd/docs/HartDavidUNHseminar5.pdf |
| Add climate change tools to existing CT Rides Website | | | Create a toolkit that contains a personalized GHG calculator where commuters can track GHG reductions, in addition to $/mileage saved |
| | | | |

| *Recommendations* | *Action Item* | *Pros/Cons & Comments* | *Other State Programs* |
|---|---|---|---|
| **#8. Increase Land Use Planning at the Regional & Municipal Levels** | Several opportunities exist to facilitate regional land use planning, co-housing opportunities and clustered development, including through the State Conservation & Development Plan, coordinating with the state's regional planning organizations, and providing financial incentives to municipalities. | In general, land use planning and smart growth policies can be more expensive than direct conservation efforts (Tomasso, 2014), but long-term impacts from reduced vehicle miles traveled can be substantial. | |
| Activate/Revive the Interagency Transit-Oriented Development Panel | | | Established in 2012, by Governor Malloy it does not appear that this panel is active. |
| Amend CT General Statutes Title 8, Ch. 126, §§ 8-23 & 8-35a. to require mandatory smart growth plans | Legislative revision | Political opposition from municipalities and private landowners | Washington State Growth Management Act (Rev'd WA Code, Title 36, Ch. 36.70A: http://apps.leg.wa.gov/rcw/default.aspx?cite=36.70A)<br><br>Massachusetts Proposed Land Use Partnership Act (http://www.mass.gov/hed/economic/eohed/pro/zoning-reform/land-use-partnership-act.html) |
| Increase Coordination with Connecticut's 9 Regional Planning Organizations | | | |

| *Recommendations* | *Action Item* | *Pros/Cons & Comments* | *Other State Programs* |
|---|---|---|---|
| Develop an educational tool for municipalities regarding smart growth including model bylaws and case studies | Stakeholder engagement with municipalities and nonprofits to develop model bylaws; other research to develop educational materials including case studies | Much would be low cost, with the exception of developing model bylaws | Massachusetts Green DOT: Smart Growth/Smart Energy Toolkit http://www.mass.gov/envir/smart_growth_toolkit/; http://www.mass.gov/envir/smart_growth_toolkit/pages/SG-bylaws.html) |
| Encourage the adoption of market-based mechanisms such as transfer of development rights on a regional and local basis | Several ways to accomplish (e.g., increased funding, enactment of a Growth Management Act, technical assistance, and state spending) | Allows development of policies based on local needs; market-based mechanism | King County, Washington (http://www.kingcounty.gov/environment/stewardship/sustainable-building/transfer-development-rights.aspx) Falmouth, Massachusetts (http://www.mass.gov/envir/smart_growth_toolkit/pages/CS-tdr-falmouth.html) Other case studies (http://www.njfuture.org/wp-content/uploads/2011/07/Case-Studies-in-Transfer-of-Development-Rights-8-10-Intern-report.pdf) |
| Encourage adoption of a Green DOT program with focus on developing long-term transportation and land use planning | Announce as an initiative DOT or joint initiative with DEEP | Depends on amenability of DOT, but long-term action and impacts | Massachusetts Green DOT Policy Directive (http://www.massdot.state.ma.us/portals/0/docs/P-10-002.pdf) Massachusetts Green DOT Implementation Plan (https://www.massdot.state.ma.us/GreenDOT/GreenDOTReport/GreenDOTImplementationPlan.aspx) |
| Provide direct financial incentives to municipalities for the adoption of smart growth policies | Funding requirement | Direct expense | Massachusetts Smart Growth Zoning Overlay District Act (http://www.mass.gov/hed/community/planning/chapter-40-r.html) |
| | | | |

| *Recommendations* | *Action Item* | *Pros/Cons & Comments* | *Other State Programs* |
|---|---|---|---|
| **#9. Facilitate Additional Revenue Streams for Privately Landowners** | | | |
| Expand projects eligible for offsets to include projects for improved forest management and avoided conversion | Adopt RGGI Offset Forest Protocol (U.S. Forest Projects)<br><br>Amend RGGI implementing regulations to include additional offset projects | Tax positive | RGGI Offset Protocol: U.S. Forest Projects (http://www.rggi.org/docs/ProgramReview/_FinalProgramReviewMaterials/Forest_Protocol_FINAL.pdf); *See* especially Sec 3.1.2.3: Avoided Conversion Programs<br><br>California Compliance Offset Protocol: US Forest Projects (http://www.arb.ca.gov/regact/2014/capandtrade14/ctusforestprojectsprotocol.pdf) |
| Aggregate current forested lands to reach threshold eligibility criteria for GHG offset projects | Requires coordinating office for offset application | Tax Positive | RGGI Offset Protocol: U.S. Forest Projects (http://www.rggi.org/docs/ProgramReview/_FinalProgramReviewMaterials/Forest_Protocol_FINAL.pdf) |
| Encourage private landowners to participate in other offset markets (e.g., other RGGI states, California) | | Tax Positive | California is actively purchasing offset projects in other states (Ex. http://bangordailynews.com/2013/11/24/news/down-east/washington-county-land-trust-gets-1-million-in-california-C-offset-funds/) |
| Develop private and public programs for ecosystem service payments including C sequestration | Funding requirement; potential legislative action | Tax Positive | Vermont Dep't of Forest, Parks & Recreation Climate policy recommendation (May 2015) (http://fpr.vermont.gov/sites/fpr/files/Forest_and_Forestry/The_Forest_Ecosystem/Library/Climate%20change%20report_final_v6-18-15a.pdf) |
| Explore the facilitation of leases on private land for hunting and other sport | Review legal requirements for liability insurance; explore legislative exemptions | Tax positive | California SHARE (Shared Habitat Alliance for Recreational Enhancement; https://www.wildlife.ca.gov/hunting/share) |
| | | | |
| **#10. Increase Stringency of RPS Biomass Requirements** | | | |

| *Recommendations* | *Action Item* | *Pros/Cons & Comments* | *Other State Programs* |
|---|---|---|---|
| Incorporate Sourcing and GHG reduction standards | Legislative action | Politically sensitive issue; large potential for opposition at local and national level: | Massachusetts is the national leader (http://www.mass.gov/eea/docs/doer/renewables/biomass/225-cmr-14-00-final-reg-doer-081712-clean-copy.pdf)<br><br>Massachusetts regulations contain a lifecycle GHG reduction requirement, sourcing requirements, and prohibitions on land conversion, but adoption may face significant political opposition.<br><br>Rhode Island provides a protective model, but no GHG reduction requirement: http://www.ripuc.org/utilityinfo/res.html<br>Adopting similar policies may be more politically feasible in Connecticut.<br>New York contains *the least* restrictive standards that should be adopted (NY Biomass Power Guide, available at http://www.ripuc.org/utilityinfo/res.html) |

# REFERENCES


- Holchholzer, H. Connecticut Forest Planner, (2010). *Connecticut's Forest Resource Assessment and Strategy.* Retrieved from website: http://www.ct.gov/deep/lib/deep/forestry/assessment_and_strategy/assessment__strategy.pdf

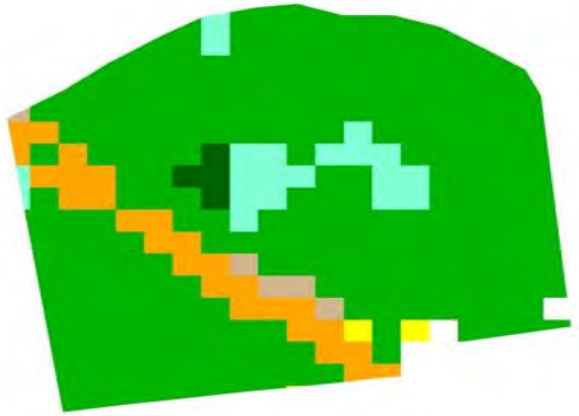
- Tomasso, L. P. (2014). The Impact of Land Use Change for Greenhouse Gas Inventories and State-Level Mediation Policy: A GIS Methodology Applied to Connecticut. *Journal of Environmental Protection*, *5*, 1572-1587. doi: 10.4236/jep.2014.517149; http://www.scirp.org/journal/PaperInformation.aspx?PaperID=52176

- Tyrell, M. (2015). *Understanding Connecticut Woodland Owners*. Retrieved from Yale School of Forestry & Environmental Studies website: http://environment.yale.edu/gisf/files/CT%20Woodland%20Owners%20Report%20March%202015-2.pdf

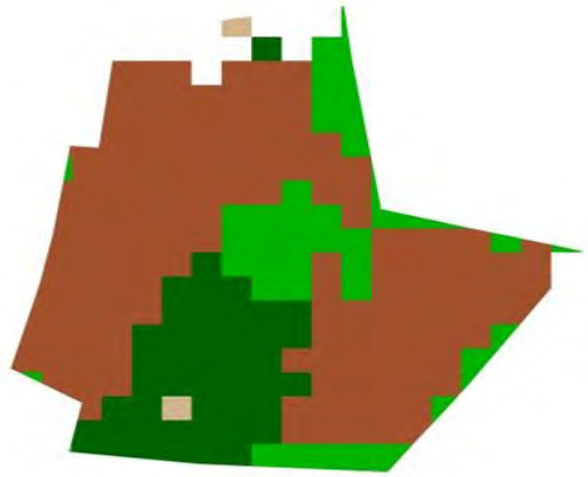
- UCONN CLEAR. http://clear.uconn.edu/ (source of various data points)

# ARCGIS LAND COVER MAPS OF OPEN SPACE PARCELS

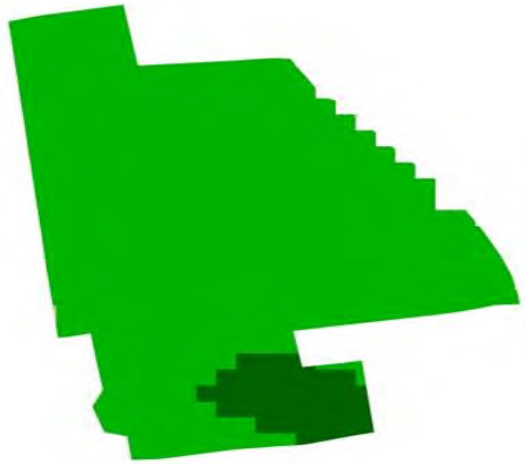
Burnt Hill Farm



Hein Farm



Krell Farm



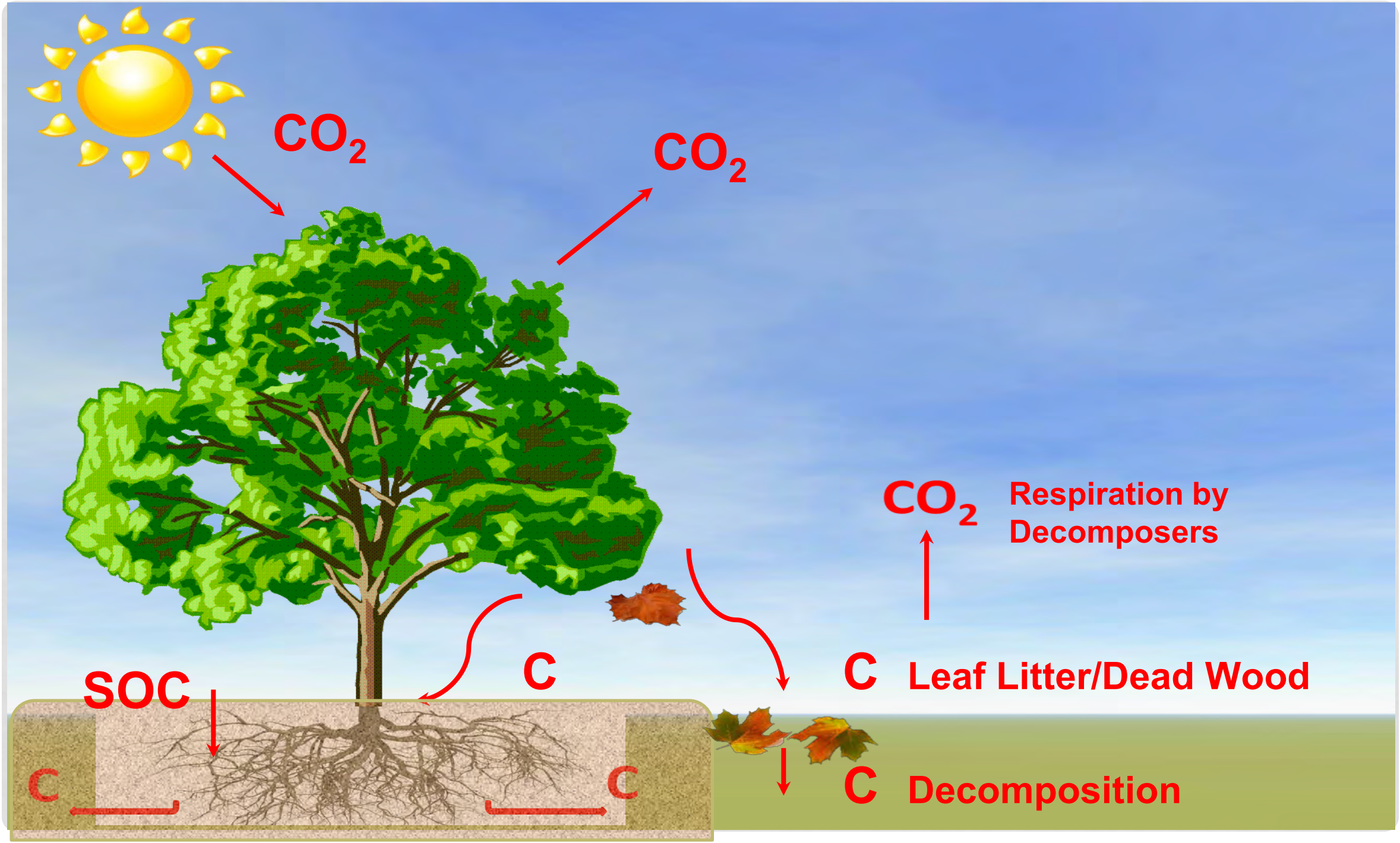
Saddleridge Farm

# RESULTS: PRICE DIFFERENTIALS IN $/TCO$_2$ ARE A FUNCTION OF C DENSITIES

| Farm | | acres | ha | Total MgC | MgC/ha sequestered | MgC>MgCO2 sequestered | MgCO2> MtCO2 | $/acre | $/ha | $/MgC | $/MTonsC | $/MTCO2 | $/MMTCO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Burnt Hill** | | | | | | | | | | | | | |
| | 1985 | 64.9 | 26.264 | 6,625.02 | 252.25 | 924.23 | 924.23 | 25,000.00 | 61,776.35 | 244.90 | 244.90 | 66.84 | 66,840,652 |
| | 2010 | 64.9 | 26.264 | 8,903.19 | 338.99 | 1,242.05 | 1,242.05 | 25,000.00 | 61,776.35 | 182.24 | 182.24 | 49.74 | 49,737,286 |
| **Hein** | | | | | | | | | | | | | |
| | 1985 | 53.5 | 21.651 | 2,668.99 | 123.27 | 451.67 | 451.67 | 25,000.00 | 61,776.35 | 501.13 | 501.13 | 136.77 | 136,772,110 |
| | 2010 | 53.5 | 21.651 | 3,521.73 | 162.66 | 595.98 | 595.98 | 25,000.00 | 61,776.35 | 379.79 | 379.79 | 103.65 | 103,654,695 |
| **Krell** | | | | | | | | | | | | | |
| | 1985 | 90 | 36.422 | 6,890.12 | 189.17 | 693.14 | 693.14 | 25,000.00 | 61,776.35 | 326.56 | 326.56 | 89.13 | 89,125,898 |
| | 2010 | 90 | 36.422 | 9,642.90 | 264.75 | 970.06 | 970.06 | 25,000.00 | 61,776.35 | 233.33 | 233.33 | 63.68 | 63,682,880 |
| **Saddleridge** | | | | | | | | | | | | | |
| | 1985 | 103.5 | 41.885 | 10,743.50 | 256.50 | 939.82 | 939.82 | 25,000.00 | 61,776.35 | 240.84 | 240.84 | 65.73 | 65,732,428 |
| | 2010 | 103.5 | 41.885 | 15,004.19 | 358.22 | 1,312.53 | 1,312.53 | 25,000.00 | 61,776.35 | 172.45 | 172.45 | 47.07 | 47,066,579 |

1 acre = 0.404685642 ha

1 ha = 2.471054 acre


$CO_2$
$CO_2$
$CO_2$
Respiration by Decomposers
C
Leaf Litter/Dead Wood
C
Decomposition
C
SOC
C
C

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# The Impact of Land Use Change for Greenhouse Gas Inventories and State-Level Climate Mediation Policy: A GIS Methodology Applied to Connecticut

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## Abstract

**Greenhouse gas (GHG) inventories conducted at state and regional levels serve to quantify long-term emissions trends and set benchmarks against which to evaluate the effectiveness of state government-mandated emissions reductions. GHG inventories which incompletely account for land use, land change, and forestry (LUCF) due to insufficient measurement tools discount the value of terrestrial carbon (C) sinks. In consequence, sink preservation is often omitted from regional land use planning. This paper proposes an accounting methodology which estimates foregone C sequestration derived LUCF change in the southern New England State of Connecticut (CT). The Natural Capital Project's InVEST program provided a template for modeling C storage and sequestration for CT's land class categories. LandSat mapping of long-term land cover patterns in CT conducted by CLEAR at the University of CT served as input data for InVEST computer modeling of C sequestration, both realized and foregone due to LUCF. The results showed that: 1) Land converted from high C density forestland to low density C land cover classes reduced the rate of C sequestration loss at 4.62 times the rate of forest reduction. Forest loss of 3.83% over twenty-five years was responsible for foregone C sequestration equivalent to 17.68% of total 2010 sequestration. 2) Accumulating C stocks pushed total annual sequestration from a 1985 baseline level of 866 $MMTCO_2$ to 1116 $MMTCO_2$ by 2010—a 250 $MMTCO_2$ increment. 3) C sequestration from forest loss since 1985 would have yielded additional sequestration of 53.74 $MMTCO_2$ by 2010. By 2002, foregone yield surpassed CT's annual fossil fuel emissions, currently at 40 $MMTCO_2$. 4) Preservation of forest C stocks over time becomes the determining factor for influencing biomass C sequestration levels. Deciduous forests have a preponderant influence on $CO_2$ budgets. The ground-up methodology to quantify land-based C sequestration presented here demonstrates the influence of forest biomass in state-level C mitigation efforts useful to climate-oriented policy makers.**

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## Keywords

**Carbon Sequestration, Forest Carbon Density, Climate Change, GIS Land Mapping, Land Use Change**

## 1. Introduction

In the absence of a national policy to lower net GHG emissions, deliberate policies in the US have instead been enacted at the state level. State energy policy makers and their constituents can better understand the range and scope of local emissions sources which feed climate warming trends through periodic greenhouse gas (GHG) accounting. Measuring emissions levels also establishes the baseline by which states can benchmark mandatory reduction targets. Eighteen US states have passed global warming reporting requirements to track state-based contributions to climate change, with three more state reporting mandates in progress [1]. As example, the Connecticut General Assembly's 2008 passage of Public Act 08-98, an Act Concerning Connecticut Global Warming Solutions (GWSA), introduced a triennial GHG inventory reporting requirement for that state [2]. The complexity of information behind emissions data collection, as well as the need for standardization of collection protocols among states for comparison at the federal level, has given rise to default data aggregators such as the US Environmental Protection Agency's (EPA) State Inventory Tool (SIT) [3]. The EPA SIT is the principal data collection tool for assembling state-level GHG inventories using data collected by US federal agencies and default estimates of C content and combustion efficiencies. EPA bases the land use, change and forest (LUCF) module of the SIT on GHG guidelines developed for country-wide assessment of land-based C sinks [4]. This approach requires a consistent, comprehensive division of land-based biomass according to the six main IPCC land use categories—forest land, cropland, grassland, settlements, wetlands and other lands—but does not provide single states the measurement tool to assess ground-level changes in biomass that alter C accounting results over time.

Many public agencies and research institutions have developed proprietary methodologies for assessing the impacts of GHG emissions on the atmosphere, some of which include methods to account for LUCF C sinks [5]-[7]. Assessment tools have varied, as have the scopes of application, results and conclusions. CT utilizes the EPA SIT, with its "top-down" approach to GHG accounting, except in the LUCF sector since the SIT LUCF module has not yielded consistent land use accounting results [8]. Assumed changes in LUCF accounting methodology reported forest C flux divergent in the extreme and which converted the sector from C sink to source between 1997 and 1999[1]. Reporting uncertainty has resulted in the LUCF sector's omission from subsequent state inventory protocols until better methodologies could be identified.

Sohl *et al*. [9] call for a national, consistent land use methodology to measure C flux, offering a prototype which demonstrates LUCF change based on biogeochemical modeling. The US Geological Survey in turn establishes emissions profiles for four specific US eco-regions using the FORE-SCE model to spatially map downscaled scenarios which would contribute to a national assessment of C stocks [10]. However, neither of these novel approaches to land-use emissions accounting is user-friendly at the level of state GHG inventory assembly.

The availability of cumulative land use data in CT over a twenty-five year span elucidates how long-term loss of biomass through sprawling land conversion compromises urgent policy goals of slowing global warming. Mapping data gathered at five-year periodic intervals provides consistent opportunity to analyze transitional land change dynamics. The land cover classes most heavily impacted by land conversion are the state's terrestrial carbon (C) sinks—most prominently forests, but also green fields, soils, and above- and below-ground biomass. While the environmental role of these C sinks to climate regulation is well understood, methods to quantify their contribution to regional C budgets to date have largely been ignored due to the absence of reliable C accounting. This study seeks to address the weakness surrounding C sink accounting by proposing a ground-up methodology to quantify land-based C sequestration which can used by climate-oriented policy makers.

Research on emissions increases from development-related land cover change supports the proposition that LUCF should play a greater role in GHG reduction strategies [11]-[14]. From an ecological perspective, land converted from both forests and farmland implies loss of wildlife habitat, habitat fragmentation, deterioration of

[1]Under the SIT reporting completed since 2009, CT's LUCF sector has returned to being a C sink.

air and water quality, groundwater run-off from fertilizers and pesticide, impeded groundwater recharge with the expansion of impervious surfaces, and disappearance of farmland. From a global warming perspective, land use characterized by low development density impacts the region's GHG profile, raising emissions from lengthened car travel, deterring public transit use, and increasing the minimum zoning requirements for property and, often in consequence, the C footprint of individual households. From a social equity standpoint, the continued trend toward outlier development diverts state and federal monies away from existing infrastructure improvement in older, inner-core communities in need of reinvestment and toward peripheral development, fueling the cycle of sprawl through newly-lain access to low-density areas [15]-[17]. Satellite land mapping supplies grounds to conclude that indiscriminate land use both drives GHG increases from mobile sources and exacerbates these dynamics by reducing the capacity for terrestrial C storage within the same landscape [18].

## 2. Study Site

New England states have seen a downturn in secondary forest recovery since 1970 [19]. CT has witnessed an increasing amount of undeveloped forest land being converted to development from 1985 to 2010 [20]. Land development encompasses not just residential and commercial building as well as roads, subdivisions and other incursive forms of urban and suburban land use. Land conversion in CT has been piecemeal, incremental and often decentralized at the level of township or property owner, masking the long-term regional impact of development and deforestation. Forest conversion to low-density housing (6 - 25 homes/km$^2$) was considered the fastest growing driver of New England's land cover change over this period [21]. In-state population growth is a key indicator value when gauging the efficiency of Connecticut's residential land development. US Census data reveals a highly skewed growth ratio of population growth in CT to developed land use, using a low-threshold housing development density of at least one housing unit per four acres to plot land development by census tract. In percentage terms, rates of land development grew at roughly eight times the population increase over the period 1970-2000 [21] (**Figure 1**). As a point of contrast, the Pacific Coastal Region forecasts forest cover reduction of four percent for the fifty-year period of 1997 to 2050 [22]. Over the next decades, CT's ratio of forest lost to population growth is expected to exceed Washington's by six-to-one, without accounting for future demographic shifts west.

CT lies in the wet, temperate climate zone of southern New England at 40˚58'N to 42˚3'N and 71˚47'W to 73˚44'W. Elevation varies from sea level along the southern coast of Long Island Sound to 2316' (706 m) in the northwest corner adjoining New York and Massachusetts. CT is known for its attractive landscapes of densely forested hills. Forestlands cover 1.76 million acres (2742 miles$^2$) [20], 80% of which are deciduous forests. Deciduous forests represent the largest C stock in CT, hovering just below one-half of the combined total for all land use classes in 2010. Twenty percent of CT's forest land is classified as urban forests located near or within urban zones; half (49%) of these forests lie within 100 yards of hard development or agriculture [23]. New London

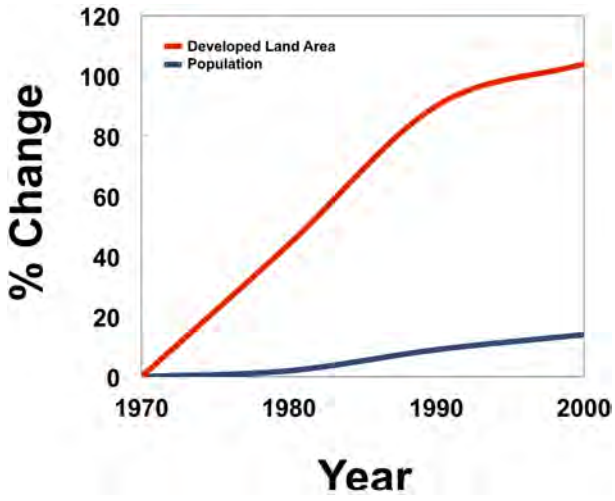


**Figure 1.** Percentage land change v population growth in CT, 1970-2000.

County abutting CT's southern border is forecast to lose between 40% - 63% of private forestlands to land conversion and development by 2031, a prediction similar for New England's mid-coastal region [19]. Heavy development, rapid forest conversion and increasing sprawl extending from aging commercial arteries will continue to endanger Southern New England's coastal forests. Changing land cover in CT over the period 1985-2010 shows clear growth in developed areas (red) concentrated along the CT River valley dividing the state as well as its southern coastline (**Figure 2**).

## 3. Research Methods

The land use component of a state GHG inventory ideally reflects localized data gathered through satellite mapping similar to the type used under the REDD mechanism (Reducing Emissions from Deforestation in Developing Countries) to document avoided deforestation. To employ the REDD approach locally, satellite mapping data of state-wide land cover would be necessary to facilitate a "bottom-up" alternative to the SIT LUCF module. The Center for Land Use Change and Research (CLEAR) at the University of Connecticut (UConn) had designed a geospatial mapping methodology for NASA through the use of satellite data to monitor land change over time dating from the early 1980s [20]. The results of this long-term mapping project provided the landscape-scale data set to model changes to the state's terrestrial C sinks. CLEAR's satellite mapping model demonstrates the effects of development on CT's wooded landscape. The diagnostic value of CLEAR's satellite mapping project is widely accredited in documenting the imprint of urban sprawl [24]-[27] but had not previously been applied to estimate changes to terrestrial C sinks in CT.

The InVEST Carbon Storage and Sequestration computer model, developed at Stanford University's Wood Institute for the Environment and the Natural Capital Project [28] provided the simulation software to quantify and track terrestrial C storage in CT. The InVEST Version 2.5.3 model uses a raster data set drawn from land cover maps of the type produced by Project CLEAR in an ARC-MAP format [29]. A second required data set for modeling changes to sequestered C is an estimate of C pool valuations for each of the LUCF classes, assembled from the scientific literature on C density and terrestrial C capture specific to Southern New England forest eco-systems.

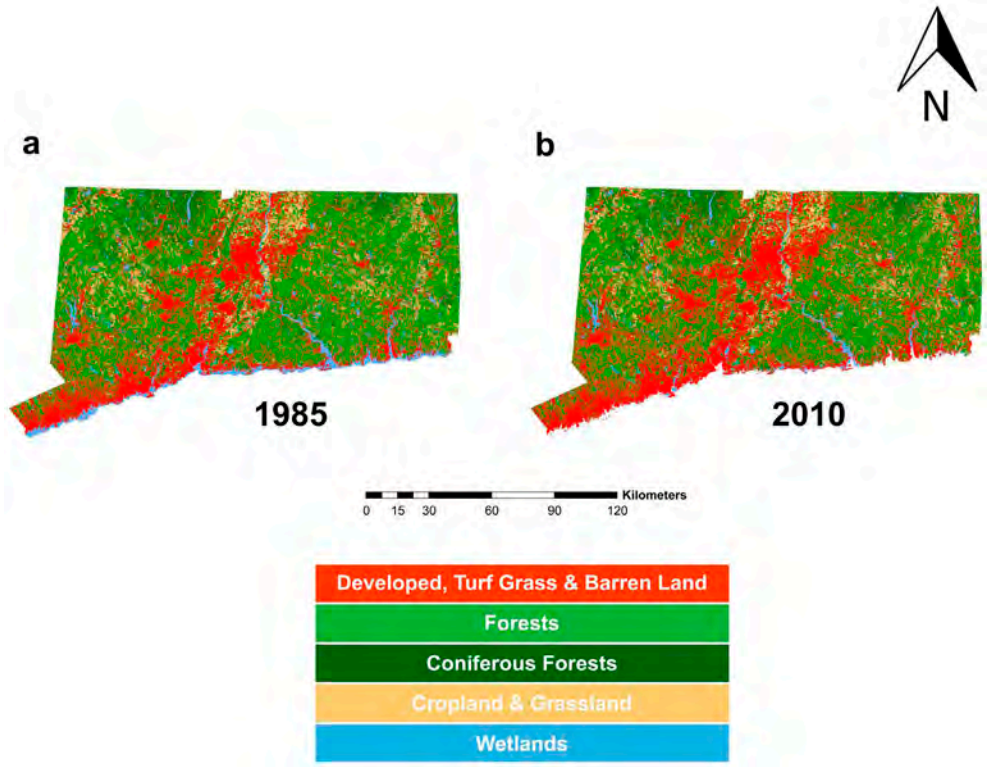


**Figure 2.** ArcGIS modeling of changes in LUCF land cover classes in CT, 1985 (left) v 2010 (right).

### 3.1. Estimating Land Cover Changes and Carbon Stocks by Vegetation Type

CLEAR's GIS raster dataset of land cover use captured six measurement intervals across the period 1985-2010, with a LUCF code for each cell. Twelve land cover classes applied to CT: Developed, Turf & Grass, Other Grasses, Agricultural Field, Deciduous Forest, Coniferous Forest, Water, Non-forested Wetland, Forested Wetland, Tidal Wetland, Barren, and Utility (Forest) [20]. We elaborated a matrix of LUCF classes to evaluate C stored in each of the four fundamental pools for each class: above-ground biomass, below-ground biomass, soil, and dead organic matter (**Table 1**). C stock values were prepared for the four C pools in accordance with the methodology given by the InVEST users' manual [28] and the IPCC [7]. Measured acreage of the twelve land cover classes plotted by Project CLEAR provided estimates for terrestrial C pool sizes in CT.

CLEAR's method of producing remotely sensed land cover maps is unique in its use of "cross-correlation analysis" to solve for the temporal and technical inconsistencies which occur in recurrent long-term satellite data collection [18]. This analytical approach increases the accuracy of measuring LandSat imagery captured in a given time interval against comparable data sets. The 30-meter resolution suitable for regional analysis has been maintained across the twenty-five years of the study to allow for spatially and spectrally consistent data comparison. The scale of CLEAR's Landsat image is set at about 185 kilometers per side in order to capture almost the entire state in a single image [20]. Data were made available as Connecticut State Plane Coordinates, NAD 83, in units of feet. Data reclassification to double band file format allowed overlay of the LandSat raster files onto a vector-based ArcGIS program (ESRI 2012) to create an ArcMap 10.1 of land cover changes in CT.

The table of C pools was compiled from evaluation of published scientific literature on C storage and sequestration particular to the various land use classes. Data on C pools were obtained through field estimates from local plot studies, meta-analyses on specific habitat types or regions, commissioned by government agencies, or from research conducted by Harvard-associated foresters. C storage was set equal to published C storage values, or the mean of published storage values for each LUCF class. A US Forest Service 2007 report was the sole source found which documented all four C stock quadrants by species for Southern New England forests, and so, with some accounting for species density, became the basis of our forest C values [23]. Most if not all of C stock estimates drew from research conducted within 50 - 100 miles north of CT (e.g., Harvard Forest), the one exception being C stock values for mid-Atlantic wetlands due to the absence of New England-specific references.

A baseline level of annual C increase of 2.5 $MgC \cdot ha^{-1} \cdot y^{-1}$ [30] was used to model C sequestration from deciduous forest growth; 3.0 $MgC \cdot ha^{-1} \cdot y^{-1}$ served as the coniferous baseline for old-growth eastern hemlock forests in central New England. Both values fell on the lower end of the range of estimated annual C storage in New England [31]-[34].

The Office of Soil Sampling at the CT Agricultural Experiment Station supplied C soil values for all land cover categories based on measurements of organic matter obtained by the loss-on-ignition method from plot studies of hundreds of forest sites in CT in 2012 [35]. The conversion rate of organic matter to C within the 15% - 30% range was found typical for soil with CT's higher levels found in litter. Soil organic matter (SOM) approximations were confirmed by the State of CT Office of Soil Sampling as within acceptable range for modeling terrestrial C sequestration [35].

To capture the uncertainty apparent from the range of estimates for statewide forest growth rates, sensitivity analyses were conducted in which the parameters of biomass growth varied by both ten and forty percent above and below baseline value. The effects of variation from baseline biomass growth rates were applied to the forest C capture component of the model. A separate sensitivity analysis was run to estimate a ten percent lower and upper limit scenario on the underlying C stocks in land class types altered by annual biomass growth (grasses; deciduous, coniferous, and utility forests; forested wetland) as well as soil sedimentation and accretion (deciduous, coniferous, and utility forests; non-forested and forested wetlands). These biodynamic sensitivity values were plotted as a series of nineteen individual arrays (baseline, plus A-R) for each of the CLEAR land data sets (1985-2010) and inputted into the InVEST model of C sequestration. The resulting complete C stock valuations were then layered onto a GIS ArcMap.

### 3.2. Dynamics of Carbon Sequestration

Using the same computing methodology, levels of C sequestration foregone due to land cover change were modeled and compared with the results of total C sequestered, in $CO_2$ equivalents, for each of the CLEAR inventory intervals. For this comparison, the 2010 C stock values and the 1985 CLEAR land use raster were

**Table 1.** Matrix of carbon stock values for CT's twelve land cover classes, with published references for selected values, used as input data for InVEST carbon storage and sequestration modeling of LUCF. All values measured in megagrams of carbon per hectare per year.

| | Carbon (above) | | Carbon (below) | | Carbon (soil) | | Carbon (dead) | |
|---|---|---|---|---|---|---|---|---|
| **Category** | **Value** | **Reference** | **Value** | **Reference** | **Value** | **Reference** | **Value** | **Reference** |
| **Developed** | 0.2 | Pouyat *et al.* (2006) [36] | 0.59 | Pouyat *et al.* (2006) [36] | 33 | Pouyat *et al.* (2002) [37] | 0 | - |
| **Turf & grass** | 0.9 | Qian & Follett (2012) [38]<br>Rossi (2010) [39] | 9.11 | Qian & Follett (2012) [38]<br>Rossi (2010) [39] | 110 | Pouyat *et al.* (2002) [36]<br>Post & Kwon (2005) [40]<br>Qian, Follett & Kimble (2010) [41] | 0 | - |
| **Other grasses** | 0.33 | Post & Kwon (2005) [40] | 0.89 | Pouyat *et al.* (2006) [36]<br>Birdseye & Heath (1992) [44] | 80.52 | Compton & Boone (2002) [42]<br>Post & Kwon (2005) [40]<br>Lal *et al.* (1999) [45] | 0.2 | Conant *et al.* (2001) [43] |
| **Agricultural field** | 5.2 | Raciti (2012) [46]<br>Davidson *et al.* (2002) [48] | 0.89 | Pouyat *et al.* (2006) [36]<br>Birdseye & Heath (1992) [44] | 60 | Compton & Boone (2002) [42]<br>Post & Kwon (2000) [40]<br>Lal (2008) [49] | 1.7 | West & Post (2002) [47] |
| **Deciduous forest** | 109.8 | Butler *et al.* (2011) [23]<br>Bradford *et al.* (2009) [31]<br>Bradford (2010) [32]<br>McGuire *et al.* (1999) [33]<br>Smith & Heath (2002) [50]<br>Wofsy (1993) [34] | 50.5 | Butler *et al.* (2011) [23]<br>Bradford *et al.* (2009) [31]<br>Bradford (2010) [32]<br>Luyssaert *et al* (2007) [51] | 78.5 | Bradford *et al.* (2009) [31]<br>Bradford (2010) [32]<br>McGuire *et al.* (1999) [33]<br>Lal (2005) [52] | 31.4 | Smith & Heath (2002) [50]<br>Compton & Boone (2007) [42] |
| **Coniferous forest** | 95.4 | McGuire *et al.* (1995) [33]<br>Butler *et al.* (2011) [23]<br>Compton & Boone (2007) [43]<br>Smith & Heath (2002) [50] | 43.9 | Luyssaert *et al* (2007) [51] | 52.6 | McGuire *et al* (1995) [33]<br>Bradford *et al.* (2009) [31] | 31.1 | Smith & Heath (2002) [50]<br>Compton & Boone (2007) [42] |
| **Water** | 0 | IPCC (2006) [7]<br>Fang (1996) [53] | 0 | - | 0 | - | 0 | - |
| **Non-forested wetland** | 35.24 | Bridgham *et al.* (2006) [54]<br>Pouyat *et al.* (2006) [36]<br>Haeseker & Wills (2008) [55]<br>Wojick (1999) [56] | 9.18 | Bridgham *et al.* (2006) [54]<br>InVest User Guide (2012) [29] | 99.91 | Pouyat *et al.* (2006) [36] | 0 | - |

**Continued**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Forested wetland** | 49.28 | Patton *et al.* (2012) [57]<br>Bridgham *et al.* (2006) [54] | 12.83 | Haeseker & Wills (2008) [55]<br>Wojick (1999) [56] | 99.91 | Patton *et al.* (2012) [57] | 20.05 | Patton *et al.* (2012) [57]<br>Scheller *et al.* (2011) [58] |
| **Tidal wetland** | 1.3 | Patton *et al.* (2012) [57]<br>Bridgham *et al.* (2006) [54] | 1.3 | Scheller *et al.* (2011) [58] | 240 | Patton *et al.* (2012) [57]<br>Scheller *et al.* (2011) [58] | 0.7 | Patton *et al.* (2012) [57]<br>Scheller *et al.* (2011) [58] |
| **Barren** | 0 | IPCC (2006) [7] | 0.33 | Pouyat *et al.* (2006) [36] | 0.33 | Pouyat *et al.* (2006) [36] | 0 | - |
| **Utility (forests)** | 71.8 | Bradford *et al.* (2010) [32]<br>McGuire *et al.* (1995) [33] | 47.2 | Bradford *et al.* (2010) [32] | 65.5 | McGuire *et al.* (1995) [33] | 21.9 | Ghosh (2013) [59] |

paired as input data for InVEST to simulate an amount biomass growth would have contributed to sequestration levels in the absence of land change.

The LUCF C sequestration values were then plotted against total state-wide $CO_2$ emissions for CT tallied by the EPA's State Inventory Tool since 1990. This step determined the relative contribution of sequestered C from each land use category toward reducing emissions as part of CT's overall C budget. Specifically, reductions in forested land use classes changes were plotted against the aggregate loss of bio-sequestration in CT from 1990 to 2010. Differentiating C sequestration values by first, land cover class, and second, by type of forest cover, elucidated their impact of offsetting emissions in the context of a state C budget and mounting C offset shortfalls as forested C sinks were converted to non-forested use over time.

Reductions in forested land use classes were measured against the aggregate loss of bio-sequestration in CT for the period 1985-2010. Sequestered C was found by inputting the inventoried land interval raster data sets of actual LUCF changes with simulated annual C biomass growth values. Biomass growth values for the inventoried years applied to the baseline 1985 raster data map generated an estimate of foregone biomass sequestration. Percent calculations of foregone C sequestration for the entire twenty-five year period followed Equation (1).

$$\frac{\sum \text{foregone sequestration} - \sum \text{C sequestration gain}}{\sum \text{foregone sequestration}} \quad (1)$$

The InVEST program recognizes several limitations implicit to the C sequestration model. a) The use of a simplified C cycle to model sequestration fails to capture the full dynamics of the natural world; b) C valuations assume a linear sequestration path, neither gaining or losing C over time, when in reality they change parabolically, since C sequestration occurs at a higher rate initially and decreases over time; and c) The accuracy of model outputs depends on the reliability and detail of input data on land use classes and C pools. C storage estimates within each LUCF class are given as fixed values, though they may differ significantly within a LUCF type according to variables such as elevation, temperature, natural succession or disturbance. Sensitivity analyses were run to simulate uncertainty in the range of biodynamic growth rates as well as on the underlying C stock of the various land classes in order to account for these limitations. Values for forest biomass growth rates derived from scientific literature were projected at ten percent below and above baseline; a range of forty percent below and above baseline for deciduous and coniferous forests accounted for wider uncertainty in biomass growth rates which determine C sequestration across time. The underlying C stock for CT's forested, grass, and sedimentary land categories was modeled explore a range of ten percent below and above baseline estimates.

An additional limitation of the InVEST model is that it prescribes grid cells for a wood-harvest steady-state be assigned a zero sequestration value. The model also fails to capture movements from one pool to another within land class. Projecting age-classes onto the LUCF grid would allow InVEST to more accurately model changes in land attributes as shifts between cells within LUCF categories (principally forested) rather than shifts between LUCF categories alone, since both change C storage values in the process.

The CLEAR series distinguishes "land cover" as detected by the sensors from actual land use, a term which better describes intention or practice occurring at the ground level. Each LandSat cover contains millions of pix-

els, giving inevitable rise to error. For example, in some cases residential development is camouflaged by forest canopy, causing low-density development to register as a forested pixel at satellite level. It is therefore likely that suburban development is greater than that measured by satellite. CLEAR adjusts for some of these errors; still, uncorrected pixels which misrepresent development will tend to overestimate the amount of forest cover in the state, leading if anything to an underestimation of the amount of C sequestration lost to development.

As noted in the InVEST methodology guide, the outcome of this research depends strongly on the accuracy of published C stock valuations for terrestrial C pools applicable to CT. However, these values vary from site to site, depending on the actual mix of forest tree species as well as appropriate land use history, soil, climate, and elevation conditions. The rates of biomass accumulation during growth likewise vary significantly. Ecological factors such as local soil moisture, soil chemistry, forest typology, and climatic zone further refine standardized measurements of land-based C flux and are taken into consideration in the selection of C stock values from the literature. Scientific research into some land use categories, however, is scarce (e.g., New England wetlands) and may not reflect state-level specificity in their influence of ecosystem conditions. Data which maps forest species within the deciduous forests of CT were unavailable, consigning the use of a single general value for both baseline C storage and C accumulated through forest growth.

All C stock values for modeling land use change were derived from scientific literature published in the last two decades (1992-2012). C stock values published in more recent studies were favored over older sources whenever available. Publication dates for C stock values also mattered in assessing points of inflection in the bio-chemical dynamics of terrestrial ecosystems being brought on by climate change. Date-specific C stock values thus aided in quantifying the amounts of C sequestration lost or gained as land use categories shift. The occasionally contrasting impacts of climate change on bio-geochemical processes can affect photosynthetic rates of C capture, for instance, as increased levels of plant respiration which accompany higher atmospheric temperatures, soil warming, and inundation of wetlands due to sea level rise. However, such climatic impacts on terrestrial C stocks were not incorporated in the assessment of data over the last twenty-five years.

We assumed forest data gathered in Southern New England is relatively homogenous, given the region's shared history of logging, agriculture, and age of regenerated forest stands. Conservative values were selected over more robust sequestration levels where researchers diverged in their findings. Some estimates of terrestrial C pools relied on scarcer research assigning C densities to particular land use categories; inland wetlands exemplified this data shortage, as did C storage systems containing below-ground living biomass. Dead organic matter stocks found in Tier 1, non-forest land-use categories were assigned a zero sequestration value as per IPCC guidance [7]. Therefore, C stock values used in this study were the best estimates available for these values based on measured biomass per hectare per year for the twelve classes of land use present in CT. Annual changes in C stocks were built into the five-year intervals inventoried by the CLEAR raster data set.

## 4. Results

Nearly five percent of undeveloped land in Connecticut (CT), the subject of this study, and close to four percent of its forests, was converted to development from 1985 to 2010. The conversion of undeveloped land categories to development, turf, other grasses, and barren land totaled 5.12% at the end of the twenty-five year study period. However, the percentage reduction in C sequestration significantly exceeded the 5.12% rate of land cover change due to the shift from high-density C biomass to low- or no-density C land class cover. Land converted from classes of higher C density (deciduous forests: −3.30%, coniferous forests: −0.32%; forested wetlands: −0.19, and agricultural fields: −1.27) to categories of lower C density (developed: +3.00%; turf grass, including residential lawns: +1.51%; other grasses, e.g., highway borders: +0.61%; and barren land: +0.19%) lowered the state's aggregate C stock responsible for sequestration.

A static modeling of C sequestration, assuming no biomass growth within each vegetation type, yielded a net loss of C sequestration of 38.23 $MMTCO_2$, an amount equal to a 3.7% sequestered C reduction from 1985 to 2010. Loss of sequestering capacity was led by a 3.3% reduction in deciduous forest cover. Reduced C closely approximated the 3.83% forestland converted over the same timeframe. In 1985, forested land classes contributed 84% of total sequestered C, with deciduous forests providing fully 73% of total sequestration. By 2010, C sequestered by deciduous hardwoods had declined by 2% relative to total C sequestered by all land cover classes; however, total C sequestration shrank 22.4% from 1985 to 2010, reflecting the impact on C capture of reduced forest cover.

However, New England's forests are successional and increasing in biomass. For these dynamic biomass growth scenarios, we assumed forest biomass increased by an annual mean growth rate of 2.5 $MgC/ha^{-1}/y^{-1}$ for deciduous forests and 3.0 $MgC/ha^{-1}/y^{-1}$ for coniferous forests, and thus the rate of potential C sequestration was compounded across time for existing forests. Growth rate scenarios of ±10% and ±40% of baseline value captured any significant over- or under-estimation of C stock values for the two principal forest classes—deciduous and coniferous—which essentially determined the outcomes of the InVEST C sequestration simulations. Running scenarios at values for the isolated forest classes conveyed the degree of influence of cumulative biomass stock growth values on overall sequestration goals. **Figures 3(a)-(d)** depict the results of these various sensitivity analyses run with the land conversion data provided by CLEAR.

Sequestration scenarios held constant all baseline values of C density per non-forested land cover type while adding a growth model for either or both forest types. The undulation in the early curves showed a decline in C capture owing to an atypically larger loss of forest cover from 1990 to 1995. This dip indicated that the degree of C sequestration from natural biomass growth was not sufficiently robust to overcome the loss of C density due to the higher rate of deforestation during the period. Deforestation in the final C inventory years was slightly slower and, combined with a more robust volume of vegetative growth in this latter period, yielded stronger levels of C sequestration in the final phase of the confidence interval scenarios.

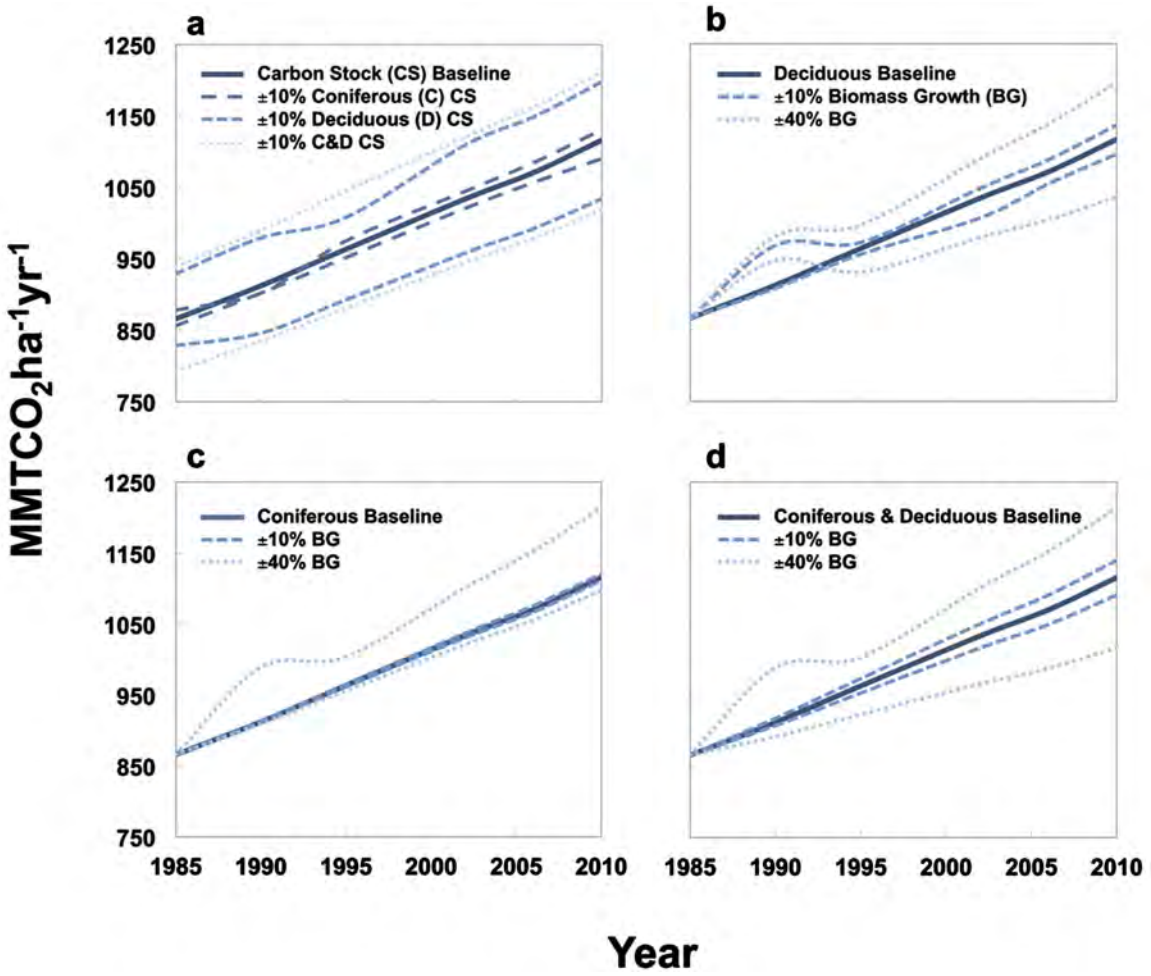


**Figure 3.** (a)-(d) Sensitivity analyses graphs. (a) C sequestration by CT's forests, estimated at ±10% of baseline of C stocks; (b) C sequestration by CT's deciduous forests with values used in sensitivity analysis of ±10% and ±40% of baseline value for annual biomass growth; (c) C sequestration by CT's coniferous forests with values used in sensitivity analysis of ±10% and ±40% of baseline value for annual biomass growth; (d) C sequestration by CT's deciduous and coniferous forests with values used in sensitivity analysis of ±10% and ±40% of baseline values for annual biomass growth.

Modeling of all scenarios revealed the ±10% variation from baseline of combined deciduous and coniferous C stock to be the prime determinant of long-term C sequestration in Southern New England forests. The slopes of these four sequestration trajectories and their confluence at the 2010 data interval suggested that C stock values were only overtaken by the most extreme variations from baseline values of ±40% deciduous and coniferous biomass growth to decide levels of sequestration. The highest overall level of C sequestered occurred in the scenario describing 40% above baseline biomass growth by both deciduous and coniferous forests (+40% D & C biomass growth) to yield 1214.5 $MMTCO_2$. The +10% upper limit C stock for deciduous and coniferous forests (+10% D & C C stock) came in nearly at par at 1212 $MMTCO_2$—only 2.5 $MMTCO_2 \cdot ha^{-1} \cdot y^{-1}$ short of the total sequestration for the +40% D & C biomass growth scenario. The +10% deciduous biomass growth scenario at 1198 $MMTCO_2$ ranked third in terms of total sequestration, trailed closely by +40% deciduous only biomass growth scenario at 1196 $MMTCO_2$.

Based on our sensitivity analyses of variations from baseline values across both C stock and biomass growth rates, total C sequestered in CT, in $CO_2$ equivalents fluctuated most widely in response to increases or decreases in underlying C biomass stock. A ±10% variation from baseline value of combined D & C forest stock yields a 47.8 $MMTCO_2$ increase or decrease in total C sequestration [(1212 − 1019)/2), whereas a ±10% variation in baseline value of deciduous and coniferous annual biomass growth produced a 24.5 $MMTCO_2$ difference from baseline C capture [(1214.5 − 1017.7)/2]. C stocks proved nearly twice as influential in determining total C sequestration across the twenty-five years.

Assumptions of accumulating C stocks quantitatively pushed total C sequestration from a 1985 baseline level of 866 $MMTCO_2 \cdot ha^{-1} \cdot y^{-1}$ to a 2010 baseline value which reached 1116 $MMTCO_2 \cdot ha^{-1} \cdot y^{-1}$, or an increment of 250 $MMTCO_2 \cdot ha^{-1} \cdot y^{-1}$. The upper and lower limits of ±10% of baseline value of forest C stock show fairly predictable levels of C sequestration for the period 1985-2010. Deciduous C stock is the most variable. Sequestered C for the lower limit of -10% baseline C stock for deciduous and coniferous forests grew by 226 $MMTCO_2$ over the 25-year study period, as compared to 252.8 $MMTCO_2$ for the +10% upper limit of baseline C stock for deciduous and coniferous forests. A 10% over- or under-estimation of C stocks produced a difference of 13.5 $MMTCO_2$ from the 2010 baseline, which equates to 35% of CT's 2010 $CO_2$ emissions level (38.12 $MMTCO_2$). This result emphasizes the responsiveness of sequestration processes to the underlying change in forest C stocks.

Modeling results showed that the percentage of foregone sequestration estimated for the baseline model was 17.68%, with modeling extremes ranging from 14.59% to 23.82%, corresponding to ±40% deciduous and coniferous biomass growth scenarios, respectively. The highest level of foregone C sequestration was estimated at over 60 $MMTCO_2$ for a +10% over baseline of forest C stocks. Even the most modest measure of foregone C sequestration (47.34 $MMCTO_2$ from −10% variation to baseline C stock value) in excess of baseline sequestered C values surpasses accounting of CT's 2010 total fossil fuel emissions (38.12 $MMTCO_2$), expressed as $CO_2$ equivalents.

2010 foregone sequestration expresses the difference in $MMTCO_2$ between realized C sequestered over 1985-2010 and the amount of foregone sequestered C due to deforestation by the end of the study period. While the total twenty-five year gain in sequestered C for the baseline scenario was 250 $MMTCO_2$, the baseline scenario for foregone C sequestration in CT during 1985-2010, given 1985 land use patterns, is the C equivalent of 303.9 $MMTCO_2$. This baseline scenario values indicate a loss of 53.74 $MMTCO_2$, the equivalent of 17.68% of potential C sequester for the full twenty-five years as determined by subtracting 1985 estimate of total sequestered C from the 2010 estimate.

Comparing the modeling results of C sequestration summarized in **Figure 4** steers attention to the significant difference between the percentage of forest cover loss (3.83%) and the percentage of foregone C sequestration (17.68%) occurring over this period. The divergence between these percentages owed to the higher C density of deforested biomass relative to the land cover classes which replaced it. The 3.83% forest cover reduction represented 190.1 square miles and comprised most of the 5.12% land use conversion in the categories of developed land, turfgrass and other grasses. The 17.68% baseline C sequestration reduction rate over the 1985 baseline scenario was 4.62 times greater than the 3.83% baseline forest conversion rate. Sensitivity analyses of the upper and lower limits to these baseline values reinforce these comparative results to only slightly greater and lesser degrees.

## 5. Discussion

The contrast of twenty-five year history of CT fossil fuel emissions derived from the CT Emissions Summary,

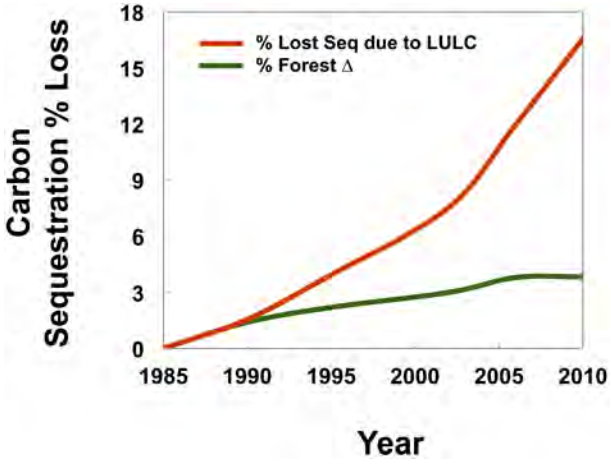


**Figure 4.** Comparison of percentage loss of forestlands in CT v percentage loss of C sequestration in CT, 1985-2010.

1990-2010 of the EPA State Inventory Tool [3], with foregone opportunities for C sequestration which vegetative land converted to lower C density failed to capture, is striking. The 2010 fossil fuel emissions total was calculated from data available at the Energy Information Agency [60]. CT's level of annual $CO_2$ emissions has remained fairly stable slightly above or below the 40 $MMTCO_2$ mark, with some vicissitudes reflecting state economic conditions and recent policy mandates to curb emissions in light of growing awareness of climate change. The use of 1985 as baseline year for measuring foregone C sequestration corresponds to the start date of CLEAR's land use change inventorying and was thus recorded as zero. Data comparisons showed that the additive loss of sequestered C, significant in its own right, rose over time due to the continued trend in biomass growth, with a surging gap between emissions and foregone sequestration expected in future years.

Comparing sequestered C against loss of sequestered C due to recent deforestation revealed the degree of impact CT's land use classes have on state's efforts to mitigate global warming. Modeling of sequestered C from existing biomass growth without land use change rose from 0 in 1985 to 53.74 $MMTCO_2$ in 2010. Under this scenario, the annual level of foregone sequestered C would have surpassed $CO_2$ emissions around the year 2002 and by 2010 would have equated to approximately 140% of emissions measured in 2010 by CT's most recent GHG inventory [61] (**Figure 5**).

The expanse of deciduous forests in Southern New England states like CT, amplified by the high level of C they sequester relative to other land uses in the state, positions them as the most impactful land class for our modeling of sequestered C. The high sequestration level of above-ground deciduous biomass (AGB) of baseline value, estimated at 109.8 $MgC \cdot ha^{-1} \cdot yr^{-1}$ for 1985 [23] but reaching 172.3 $MgC \cdot ha^{-1} \cdot yr^{-1}$ by 2010 according to the dynamic growth modeling, speaks to the influence of these stands as a stabilizer for local C budgets.

The natural processes of forest succession will continue to spur increases in rates of C captured by older forest stands due to changing forest species composition with time. With the exception of natural disturbances, longer-lived, shade-tolerant mid- to late-successional species will replace earlier successional species, resulting in increased C sequestration. This owes to the fact that late successional species absorb more C due to the higher biomass density in their woody parts. Research on New England forests shows that mid- to late-successional tree species have higher levels of C uptake than their predecessor species [62]. The amount of stored C could more than double in protected forests as they reach maturity [63].

Land conversion and climate change hold the potentially greatest impact to forest landscapes globally [30]. Successional forest growth and regional recovery following a relatively recent history of agricultural abandonment should prevail in driving forest dynamics over the next half century [64]. C sequestration by forest biomass is identified as one of a few climate-related gains to function as a negative feedback loop by buffering continued warming trends [30]. The percentage of modeled sequestration loss in CT over the twenty-five year study period was 4.62 times the percentage loss of high C-density forestland for the same time span. **Figure 6(a)** and **Figure 6(b)** express normalized rates of changes for related land cover categories, indicating the high sensitivity of forest biomass contraction to C sink value. Continued relative land pattern changes as shown here will slow the negative feedback loop C sinks provide and, in contradiction, hasten the impacts of climate change.

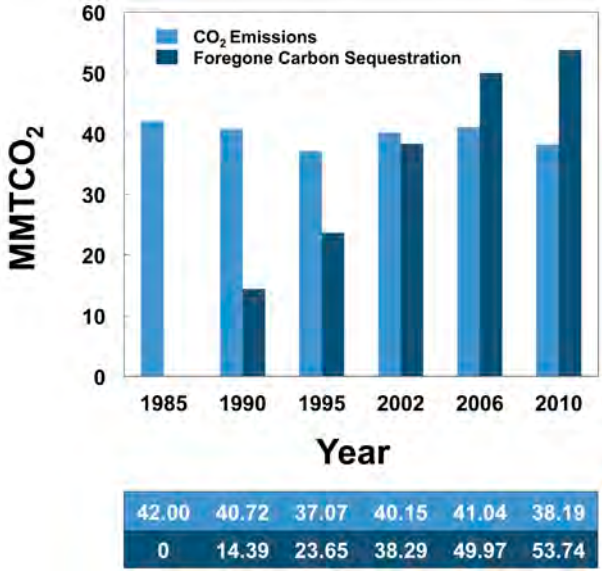


**Figure 5.** Levels of foregone C sequestration v levels of annual fossil fuel emissions in CT, 1985-2010.

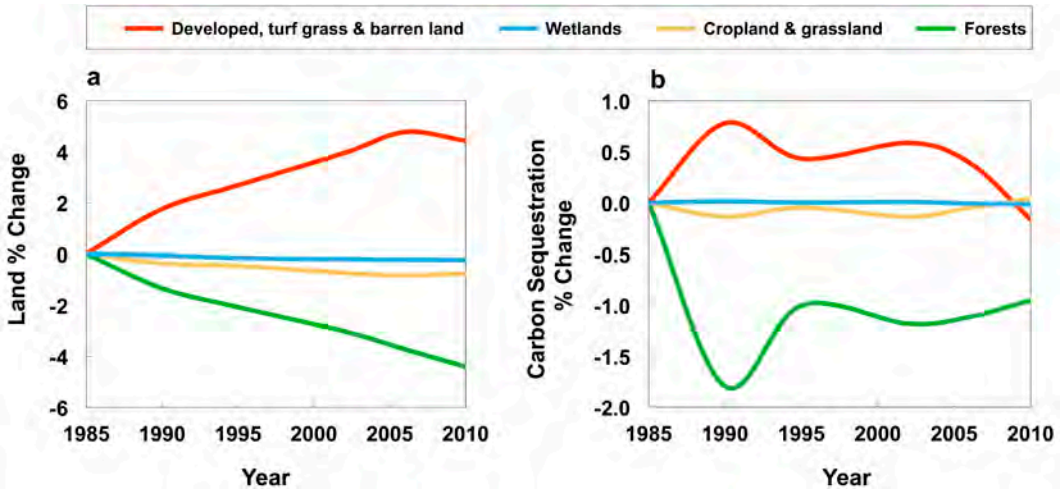


**Figure 6.** (a) and (b) Percentage of land cover change by grouped LUCF categories relative to all land cover change in CT for the period 1985-2010 (left). Percentage of C sequestration change by grouped LUCF categories relative to total C sequestration change in CT for the period 1985-2010 (right).

Periods of active C sequestration by New England's forest stands have been shown to extend decades beyond previous research assumptions [64]. Despite a century-old legacy of natural forest recovery, Southern New England will continue to see forest C sequestration for decades into the future. Land conservators, whether public or private agents, must take into account that the equilibrium point for C storage has not yet been reached. Forest growth and succession will potentially have the largest impact on the aboveground C stock, and this study has shown that deciduous forests in particular have a disproportionate influence on CT's emissions future. Preventative forest conservation ought therefore to play a key role in any global warming solution policy.

Research which identifies land use mismanagement as the enabler of suburban sprawl also proposes the use of satellite land use mapping for better natural resource management [65]. The ecological relevance of mapping for public policy-making is value-additive, embracing habitat conservation, climate adaptation, and water quality management into the process of urban development and regional transportation planning for whole-design land use planning.

Comparing sequestered C against loss of sequestered C due to recent deforestation revealed the degree of im-

pact CT's land use classes have on state's efforts to mitigate global warming. In order to capture GHG remediation through C sink preservation, low-density development in areas of mature, second-growth forests should be discouraged, with development diverted toward renewing the original suburban tracts ringing the urban cores, first built in the 1950s but now suffering from neglect, aging infrastructure and blight. The logic of redirecting development inward holds many merits from a sustainability perspective, among them concentrating population density for transit viability, reducing costs of installation and maintenance for roads and utilities, shortening commuting time and distance, and lowering transportation emissions. Fiscal incentives which reward diverted development can be dually aimed at avoided deforestation, a mechanism largely absent from current climate policy and which itself has not been monetized in terms of economic and social benefits at local and regional planning levels. Avoided deforestation is a major lever for C abatement and should be considered the equivalent of local negative feedback in the way local emissions contribute positively to climate change.

## 6. Conclusions

This study considered land use change in fine-grain detail to assess the environmental effects of state-wide, incremental land conversion, principally of deciduous forestlands which comprised high-density C storage pools. The CLEAR satellite mapping of CT performed over the last two and a half decades provided cumulative data on LUCF and land cover conversion to new analytical tools adapted to model responses to climate change. CLEAR's land cover data set is to our knowledge the only state-wide mapping project in the United States of this longevity [66]. The application of this data for the analysis presented here demonstrates novel possibilities for quantifying and valuating C removal in the light of LUCF analysis—a process heretofore disregarded for accounting reasons—to better inform environmental policy choices that come before state and regional governments.

The results of this research prove the importance of land use in achieving a full spectrum of C accounting which includes both $CO_2$ emissions output and C sink estimation. Estimates of C sequestered within all land use categories and the changes within each type create a three-dimensional mosaic of land utility for states to construct global warming solutions. Energy, transportation and environmental policy-makers can benefit from the analysis of land use mapping in order to integrate carbon sink preservation into state policy-making aimed at combating climate change.

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## References

[1] United States Environmental Protection Agency (2014) State and Regional Climate Policy Tracking. US EPA. http://epa.gov/statelocalclimate/state/tracking/index.html

[2] Connecticut General Assembly (2008) Connecticut House Bill 5600, PA 08-98. An Act Concerning Connecticut Global Warming Solutions. State of Connecticut Department of Energy and Environmental Protection Climate Change. http://www.cga.ct.gov/2008/FC/pdf/2008HB-05600-R000755-FC.pdf

[3] United States Environmental Protection Agency (2012) State Inventory Tool for GHG Accounting. http://www.epa.gov/statelocalclimate/state/activities/ghg-inventory.html#three

[4] United States Environmental Protection Agency (2012) Developing a Greenhouse Gas Inventory. http://epa.gov/statelocalclimate/state/activities/ghg-inventory.html

[5] World Resources Institute/World Business Council for Sustainable Development (2005) The GHG Protocol for Project Accounting. WRI/WBCSD. http://www.ghgprotocol.org/files/ghg_project_protocol.pdf

[6] Colorado State University (n.d.). Agriculture and Land Use National Greenhouse Gas Inventory Software. National Resource Ecology Lab. http://www.nrel.colostate.edu/projects/ALUsoftware

[7] Intergovernmental Panel on Climate Change (2006) Appendix VII: Methodology for Determining Greenhouse Gas In-

ventories in the Agriculture, Forestry and Other Land Use Sector. https://www.ipcc.ch/meetings/session25/doc4a4b/vol4.pdf

[8] Connecticut Department of Energy and Environmental Protection (2010) Appendix A: Connecticut 2009 Greenhouse Gas Inventory Data Graphics. Climate Change. http://www.ct.gov/deep/lib/deep/climatechange/2009_ghg_update_-_appendix_a.pdf

[9] Sohl, T.L., Sleeter, B.M., Zhu, Z., Sayler, K.L., Bennett, S., Bouchard, M., *et al.* (2012) A Land-Use and Land-Cover Modeling Strategy to Support a National Assessment of Carbon Stocks and Fluxes. *Applied Geography*, **34**, 111-124. http://dx.doi.org/10.1016/j.apgeog.2011.10.019

[10] U.S. Geological Survey (2014) National Assessment of Ecosystem Carbon Sequestration and Greenhouse Gas Fluxes: Spatially Explicit Modeling of Land Use and Land Cover. U.S. Department of the Interior, Washington DC. http://www.usgs.gov/climate_landuse/land_carbon/

[11] Solecki, W.D. and Oliveri, C. (2004) Downscaling Climate Change Scenarios in an Urban Land Use Change Model. *Journal of Environmental Management*, **72**, 105-115. http://dx.doi.org/10.1016/j.jenvman.2004.03.014

[12] Jo, J.H., Golden, J.S. and Shin, S.W. (2009) Incorporating Built Environment Factors into Climate Change Mitigation Strategies for Seoul, South Korea: A Sustainable Urban Systems Framework. *Habitat International*, **33**, 267-275. http://dx.doi.org/10.1016/j.habitatint.2008.10.020

[13] Mashayekh, Y., Jaramillo, P., Samaras, C., Hendrickson, C.T., Blackhurst, M., MacLean, H.L. and Matthews, H.S. (2012) Potentials for Sustainable Transportation in Cities to Alleviate Climate Change Impacts. *Environmental Science & Technology*, **46**, 2529-2537. http://dx.doi.org/10.1021/es203353q

[14] Heres-Del-Valle, D. and Niemeier, D. (2011) $CO_2$ Emissions: Are Land-Use Changes Enough for California to Reduce VMT? Specification of a Two-Part Model with Instrumental Variables. *Transportation Research Part B*: *Methodological*, **45**, 150-161. http://dx.doi.org/10.1016/j.trb.2010.04.001

[15] Rudel, T.K., O'Neill, K., Gottlieb, P., McDermott, M. and Hatfield, C. (2011) From Middle to Upper Class Sprawl? Land Use Controls and Changing Patterns of Real Estate Development in Northern New Jersey. *Annals of the Association of American Geographers*, **101**, 609-624. http://dx.doi.org/10.1080/00045608.2011.560062

[16] Willson, R.W. and Brown, K.D. (2008) Carbon Neutrality at the Local Level: Achievable Goal or Fantasy? *Journal of the American Planning Association*, **74**, 497-504. http://dx.doi.org/10.1080/01944360802380431

[17] Sierra Club (2000) Sprawl Costs Us All: How Your Taxes Fuel Suburban Sprawl. Sierra Club, San Francisco.

[18] Center for Land Use Education and Research (2010) Basic Land Cover Information Showing Changes to the Landscape since 1985. Connecticut's Changing Landscape. http://clear.uconn.edu/projects/landscape/index.htm

[19] Stein, S.M., McRoberts, R.E., Alig, R.J., Nelson, M.D., Theobald, D.M., Eley, M. *et al.* (2005) Forests on the Edge: Housing Development on America's Private Forests. General Technical Report No. PNW-GTR-636, USDA Forest Service, Washington DC. http://www.fs.fed.us/openspace/fote/housing.html

[20] Center for Land Use Education and Research (2012) Interactive Land Cover Maps. http://clear.uconn.edu/data/interactive.htm

[21] Orfield, M. and Luce, T. (2003) Connecticut Metro Patterns: A Regional Agenda for Community and Prosperity in Connecticut. Office of Urban Affairs of the Archdiocese of Hartford, Hartford. http://www.hartfordinfo.org/issues/wsd/SmartGrowth/CT_Metropatterns_English.pdf

[22] United States Census Bureau (2011) 2010 Census Population Profile Maps. http://www.census.gov/geo/www/maps/2010_census_profile_maps/census_profile_2010_main.html

[23] Butler, B.J., Barnett, C.J., Crocker, S.J., Domke, G.M., Gormanson, D., Hill, W.N., *et al.* (2011) The Forests of Southern New England, 2007: A Report on the Forest Resources of Connecticut, Massachusetts, and Rhode Island. USDA Forest Service, Northern Research Station, Newtown Square, Vol. 55, 1-48.

[24] Theobald, D.M. (2005) Landscape Patterns of Exurban Growth in the USA from 1980 to 2020. *Ecology and Society*, **10**, 32. http://www.ecologyandsociety.org/vol10/iss1/art32/

[25] Martinuzzi, S., Gould, W.A. and Ramos González, O.M. (2007) Land Development, Land Use, and Urban Sprawl in Puerto Rico Integrating Remote Sensing and Population Census Data. *Landscape and Urban Planning*, **79**, 288-297. http://www.sciencedirect.com/science/article/pii/S0169204606000478 http://dx.doi.org/10.1016/j.landurbplan.2006.02.014

[26] Jaeger, J.A.G., Bertiller, R., Schwick, C. and Kienast, F. (2010) Suitability Criteria for Measures of Urban Sprawl. *Ecological Indicators*, **10**, 397-406. http://gpe.concordia.ca/documents/Poster%20Landscape%20Fragmentation%20in%20Europe.pdf http://dx.doi.org/10.1016/j.ecolind.2009.07.007

[27] Zeng, H., Sui, D.Z. and Li, S. (2005) Linking Urban Field Theory with GIS and Remote Sensing to Detect Signatures

of Rapid Urbanization on the Landscape: Toward a New Approach for Characterizing Urban Sprawl. *Urban Geography*, **26**, 410-434. http://dx.doi.org/10.2747/0272-3638.26.5.410

[28] Wood Institute for the Environment, Stanford University (2012) InVEST Model. http://ncp-dev.stanford.edu/~dataportal/invest-releases/documentation/current_release/carbonstorage.html

[29] Wood Institute for the Environment, Stanford University (2011) Carbon Storage and Sequestration, the Natural Capital Project. Prod. Stanford University, Stanford. http://ncp-dev.stanford.edu/~dataportal/invest-releases/documentation/current_release/carbonstorage.html

[30] Thompson, J.R., Foster, D.R., Scheller, R. and Kittredge, D. (2011) The Influence of Land Use and Climate Change on Forest Biomass and Composition in Massachusetts, USA. *Ecological Applications*, **21**, 2425-2444.

[31] Bradford, J.B., Weishampel, P., Smith, M.L., Kolka, R., Birdsey, R.A., Ollinger, S.V. and Ryan, M.G. (2009) Detrital Carbon Pools in Temperate Forests: Magnitude and Potential for Landscape-Scale Assessment. *Canadian Journal of Research*, **39**, 802-813. http://dx.doi.org/10.1139/X09-010

[32] Bradford, J.B., Weishampel, P., Smith, M.-L., Kolka, R., Birdsey, R.A., Ollinger, S.V. and Ryan, M.G. (2010) Carbon Pools and Fluxes in Small Temperate Forest Landscapes: Variability and Implications for Sampling Design. *Forest Ecology and Management*, **259**, 1245-1254. http://www.fs.fed.us/rm/pubs_other/rmrs_2010_bradford_j001.pdf http://dx.doi.org/10.1016/j.foreco.2009.04.009

[33] McGuire, A.D., Melillo, J.M., Kicklighter, D.W and Joyce, L.A. (1995) Equilibrium Responses of Soil Carbon to Climate Change: Empirical and Process-Based Estimates. *Journal of Biogeography*, **22**, 785. http://dx.doi.org/10.2307/2845980

[34] Wofsy, S.C., Goulden, M.L., Munger, J.W., Fan, S.M., Bakwin, P.S., Daube, B.C., *et al.* (1993) Net Exchange of $CO_2$ in a Mid-Latitude Forest. *Science*, **260**, 1314-1317. http://dx.doi.org/10.1126/science.260.5112.1314

[35] Bugbee, G. (2012) Soil Carbon Values for CT.

[36] Pouyat, R.V., Yesilonis, I.D. and Nowak, D.J. (2006) Carbon Storage by Urban Soils in the United States. *Journal of Environmental Quality*, **35**, 1566-1575. http://dx.doi.org/10.2134/jeq2005.0215

[37] Pouyat, R., Groffman, P., Yesilonis, I. and Hernandez, L. (2002) Soil Carbon Pools and Fluxes in Urban Ecosystems. *Environmental Pollution*, **116**, S107-S118. http://dx.doi.org/10.1016/S0269-7491(01)00263-9

[38] Qian, Y. and Follett, R. (2010) Carbon Dynamics and Sequestration in Urban Turf Grass Ecosystems. In: Lal, R. and Augustin, B., Eds., *Carbon Sequestration in Urban Ecosystems*, Springer, Dordrecht, 161-172. http://dx.doi.org/10.1007/978-94-007-2366-5_8

[39] Rossi, F. (2010) Turf Grass Carbon Pools.

[40] Post, W.M. and Kwon, K.C. (2005) Soil Carbon Sequestration and Land-Use Change: Processes and Potential. *Global Change Biology*, **6**, 317-328. http://cdiac.esd.ornl.gov/programs/CSEQ/terrestrial/postkwon2000/postkwon2000.html http://dx.doi.org/10.1046/j.1365-2486.2000.00308.x

[41] Qian, Y., Follett, R.F. and Kimble, J.M. (2010) Soil Organic Carbon Input from Urban Turf Grasses. *Soil Science Society of America Journal*, **74**, 366-371. http://dx.doi.org/10.2136/sssaj2009.0075

[42] Compton, J.E. and Boone, R.D. (2000) Agricultural Legacies on Soil Carbon and Nitrogen. *Ecology*, **8**, 2317-2330.

[43] Conant, R.T., Paustian, K. and Elliott, E.T. (2001) Grassland Management and Conversion into Grassland: Effects on Soil Carbon. *Ecological Applications*, **11**, 343-355. http://cdiac.esd.ornl.gov/programs/CSEQ/terrestrial/Conant2001/conant2001.html http://dx.doi.org/10.1890/1051-0761(2001)011[0343:GMACIG]2.0.CO;2

[44] Birdsey, R. and Heath, L.S. (1992) Forest Inventory Data, Models, and Assumptions for Monitoring Carbon Flux. In: Lal, R. and Follett, R.F., Eds., *Soil Carbon Sequestration and the Greenhouse Effect*, Soil Science Society of America, Madison.

[45] Lal, R., Follett, R.F., Kimble, J. and Cole, C.V. (1999) Managing US Cropland to Sequester Carbon in Soil. *Journal of Soil and Water Conservation*, **54**, 374-381.

[46] Raciti, S.M., Fahey, T.J., Thomas, R.Q., Woodbury, P.B., Driscoll, C.T., Carranti, F.J., *et al.* (2012) Local-Scale Carbon Budgets and Mitigation Opportunities for the Northeastern United States. *BioScience*, **62**, 23-38. http://dx.doi.org/10.1525/bio.2012.62.1.7

[47] West, T.O. and Post, W.M. (2002) Soil Organic Carbon Sequestration by Tillage and Crop Rotation: A Global Data Analysis. *Soil Science Society of America Journal*, **66**, 1930. http://dx.doi.org/10.2136/sssaj2002.1930

[48] Davidson, E.A., Savagea, K., Bolstadb, P., *et al.* (2002) Belowground Carbon Allocation in Forests Estimated from Litterfall and IRGA-Based Soil Respiration Measurements. *Agricultural and Forest Meteorology*, **113**, 39-51. http://dx.doi.org/10.1016/S0168-1923(02)00101-6

[49] Lal, R. (2008) Carbon Sequestration. *Philosophical Transactions of the Royal Society B*: *Biological Sciences*, **363**, 815-830. http://dx.doi.org/10.1098/rstb.2007.2185

[50] Smith, J.E. and Heath, L.S. (2002) A Model of Forest Floor Carbon Mass for United States Forest Types. US Department of Agriculture, Forest Service, Northeastern Research Station, Newtown Square, 37.

[51] Luyssaert, S., Inglima, I., Jung, M., Richardson, A.D., Reichstein, M., Papale, D., *et al.* (2007) $CO_2$ Balance of Boreal, Temperate, and Tropical Forests Derived from a Global Database. *Global Change Biology*, **113**, 2509-2537. http://dx.doi.org/10.1111/j.1365-2486.2007.01439.x

[52] Lal, R. (2005) Forest Soils and Carbon Sequestration. *Forest Ecology and Management*, **220**, 242-258. http://dx.doi.org/10.1016/j.foreco.2005.08.015

[53] Fang, J., Chen, A., Peng, C., Zhao, S. and Ci, L. (2001) Changes in Forest Biomass Carbon Storage in China between 1949 and 1998. *Science*, **292**, 2320-2322. http://dx.doi.org/10.1126/science.1058629

[54] Bridgham, S.D., Megonigal, J.P., Keller, J.K., Bliss, N.B. and Trettin, C. (2006) The Carbon Balance of North American. *Wetlands*, **26**, 889-916. http://dx.doi.org/10.1672/0277-5212(2006)26[889:TCBONA]2.0.CO;2

[55] Haeseker, S.L. and Wills, D. (2008) Evaluation of Two Release Operations at Bonneville Dam on the Smolt-to-Adult Survival of Spring Creek National Fish Hatchery Fall Chinook Salmon. Columbia River Fishery Program Office US Fish and Wildlife Service, Vancouver.

[56] Wojick, D.E. (1999) Carbon Storage in Soil, the Ultimate No-Regrets Policy? A Report to Greening Earth Society. http://lists.ibiblio.org/pipermail/permaculture/2002-November/017349.html

[57] Patton, D., Moore, R., Covich, A.P. and Bergstrom, J.C. (2013) Ex-Post Reliability Assessment of Benefit Transfer Valuation Estimates of Wetland Ecosystem Service Supported by Okefenokee National Wildlife Refuge. Social Science Research Network, Rochester, NY, SSRN Scholarly Paper ID: 2294080.

[58] Scheller, R.M., Tuyl, S.V., Clark, K.L., Hom, J. and Puma, I.L. (2011) Carbon Sequestration in the New Jersey Pine Barrens under Different Scenarios of Fire Management. *Ecosystems*, **14**, 987-1004. http://dx.doi.org/10.1007/s10021-011-9462-6

[59] Ghosh, D. (2012) Utility Forest Maintenance.

[60] United States Energy Information Agency (2012) Connecticut State Profile and Energy Estimates. Department of Energy, Washington DC. http://www.eia.gov/beta/state/?sid=CT

[61] Connecticut Department of Energy and Environmental Protection (2010) Appendix B: 2009. Connnecticut's Greenhouse Gas Inventory Data Graphics. Climate Change. http://www.ct.gov/deep/lib/deep/climatechange/2009_ghg_update_-_appendix_b.pdf

[62] Hadley, J.O., O'Keefe, J., Munger, J.W., Hollinger, D.Y. and Richardon, A.D. (2008) Phenology of Forest-Atmosphere Carbon Exchange for Deciduous and Coniferous Forests in Southern and Northern New England. In: *Phenology of Ecosystem Processes*, Springer, New York, 119-141.

[63] Foster, D.R., Donohue, B.M., Kittredge, D.B., Lambert, K.F., Hunter, M.L., Hall, B.R., *et al.* (2010) Wildlands and Woodlands: A Vision for the New England Landscape. Harvard Forest, Harvard University Press, Cambridge.

[64] Foster, D.R. and Aber, J.D. (2004) Forests in Time: The Environmental Consequences of 1000 Years of Change in New England. Yale University Press, New Haven.

[65] Holdt, B.M., Civco, D.L. and Hurd, J.D. (2004) Forest Fragmentation Due to Land Parcelization and Subdivision: A Remote Sensing and GIS Analysis. *Proceedings of the ASPRS Annual Convention*, Denver, 23-28 May 2004. http://clear.uconn.edu/publications/research/tech_papers/Holdt_et_al_ASPRS2004.pdf

[66] Arnold, C. and Wilson, E. (2012) Using CLEAR Long-Term Data to Map Carbon Sequestration Change in Connecticut.

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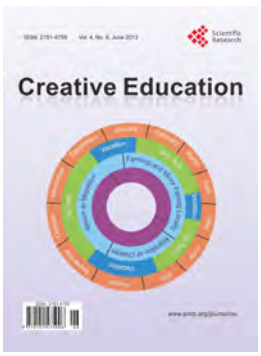


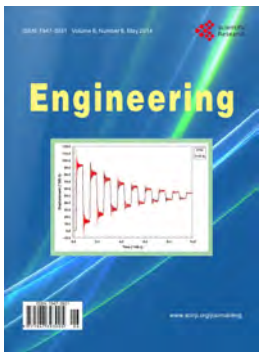






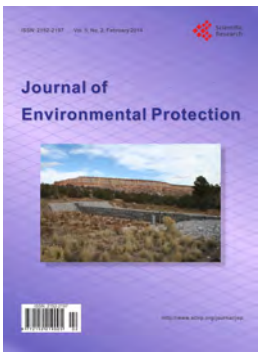


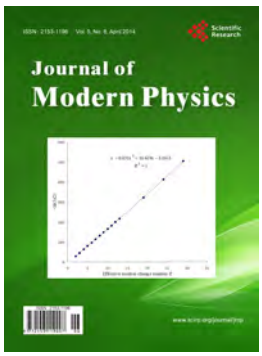



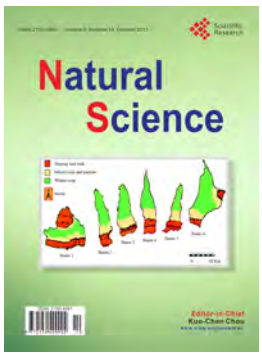


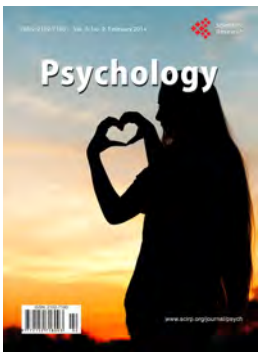

**Comments regarding the Forests Sub-Group Draft Report, October 21, 2020**

Thank you for the opportunity to comment on the Forests Sub-group Draft Report. This extensive document addresses a wide range of issues that affect CT's forests, their ability to mitigate and adapt to climate change, and describes the many benefits that our forests provide. It will help guide forest management decisions with consideration of climate change and carbon storage/sequestration in the future. Kudos to those who contributed your time, expertise and energy.

I have spent the better part of the last decade working on restoration of our native rabbit, the New England cottontail (NEC), and other declining young forest/shrubland-dependent species. As such, I will confine my comments to the points that concern wildlife conservation with respect to managing Connecticut's forests.

Specifically I would like to address two statements in the report and their implications:

- Page 21. "Look for appropriate opportunities to reforest currently non-forested lands that would have historically supported forest vegetation and are not currently or likely in the near term to be utilized for agriculture, to provide additional habitat for early successional species."
- Page 28. "Greatly reduce clear-cutting of mature forests as a habitat management practice benefiting young forest species."

Given that the statement on page 28 appears with no explanation or justification, the implication is that management for young forest species is not needed or no longer needed ... or may be sufficiently addressed by the statement on page 21. This is not the case. With regard to reforesting land for early successional species, doing this on large lawns/turf may be somewhat helpful, although many large lawn areas occur in urban settings with a myriad of urban predators. Reforesting functioning meadows and grasslands is not however a good idea, as these habitats and the species they support are in even greater danger/decline than young forests and their attendant species. Currently we do look to old field and pasture as potential shrubland habitat, although these areas are prime real estate for development (witness the economic development zone around Oxford Airport – former rabbit habitat). Generally, reforestation opportunities are limited.

In the Regional NEC Conservation Strategy (https://newenglandcottontail.org/resource/conservation-strategy-new-england-cottontail-0) habitat loss and degradation is cited as the primary cause of the species' decline. Explicit objectives (83 in all) for habitat restoration and other actions were set forth in the Strategy with measurable outcomes. In the September 15, 2015 Federal Register (https://www.govinfo.gov/content/pkg/FR-2015-09-15/pdf/2015-22885.pdf), the US Fish & Wildlife Service states in its "Finding" that listing NECs under the Endangered Species Act was not warranted:

"Based on our evaluation of the threats to the New England cottontail, we find that the present or threatened destruction, modification, or curtailment of its habitat or range (Factor A) is the most significant threat to the species. This directly affects the species through insufficient resources to feed, breed, and shelter and indirectly affects the species by amplifying the effects of predation (Factor C), competition with eastern cottontails (Factor E), and small population size (Factor E). **Without the ongoing and planned implementation of the conservation measures described in the Conservation Strategy, these identified threats would remain at a level that would warrant listing of the New England cottontail** (bold mine)...

... the conservation actions implemented have demonstrably improved the population status of the New England cottontail at some locations, and that **improvement is expected to continue through the Conservation Strategy's 2030 planning period, based on a high degree of certainty that the conservation effort will continue to be implemented and effective** (bold mine)..."

My point is that management for species such as NEC must continue. It is our statutory responsibility, and it is our ethical responsibility. We may argue about to what extent the pre-Columbian CT landscape was young forest, but it was present. Natural forces that once created larger patches of young forest, such as fire, river flooding, and major beaver activity, are largely controlled today to protect human life and property. A natural shrubland that once extended along our coast is nearly obliterated now by development. Today, more than 50 wildlife species of greatest conservation need in CT rely on young forest and open woodlands. A small canopy gap caused by a fallen mature tree is not sufficient to sustain most of these species. Young forest patches not only sustain obligate wildlife species, but most forest animals (including interior birds after fledging) utilize these areas to take advantage of the abundant food and cover.

How we manage in light of the need for forest carbon sequestration/storage may be modified to some degree, but we will still need to manage for young forest species. Traditionally, this has been done through some type of even-aged forest cutting (clearcuts with reserves, seed-tree cuts, shelterwood cuts), which promotes the desired dense regeneration for wildlife food and cover. In real terms, the extent of this work over the last decade has been quite small. CT DEEP has conducted forest cutting on ~626 acres of 34,000 acres in Wildlife Management Areas (<2% of WMA land), mostly to benefit NEC, and an additional 164 acres for NEC in State Forests (<0.1% of State Forest land). On private and municipal land, largely through the Farm Bill, we've managed forest on another 2,500* or so acres in the name of young forest species (* this is probably close to double the actual footprint as there is double counting of acres managed by both forest cutting and invasive species treatment). Taken together, we may have managed ~3,290 acres out of 1.8 million acres of forest land (<0.2 %) over a decade. There's really not a whole lot of management to reduce here, let alone "greatly".

Some recent research indicates that NECs may do quite well in areas with residual canopy cover, and we are looking into modifying our approach to leave more standing mature trees where appropriate. But, we will still need to remove enough canopy to allow sunlight in to promote dense woody growth. Other areas may none-the-less require more intensive even-aged management, especially forests that have heavy disease, insect and/or invasive plant burdens. In most wildlife cuts, managers look to leave large old trees that provide dens, cavities, mast and, perhaps new to our thinking, carbon storage. We always work with a certified forester to insure that the work we do makes sense not only for target wildlife, but for the long-term benefit of the forest.

The Forests Sub-Group Draft Report acknowledges the lack of age diversity in CT's forests. The age class graphic on page 6 clearly shows minimal percentages in the youngest and oldest age classes. And on page 11, under Forests benefit to wildlife, the report states "Healthy forest landscapes often include a variety of tree species of varying age classes." But the subsequent statements describe **not** a forest of various age classes, rather a forest patch with vertical structural diversity. "Tall, canopy-layer trees grow above smaller sub-canopy trees, with a shrub layer and diverse plants on the forest floor. This suite of vegetation supports wildlife, from bear and moose to resident and migratory birds..." Vertical structure is extremely important, but it does not negate the need for horizontal structural diversity, including some areas of young forest.

My suggestion is to modify the statement on page 28 to recognize the importance of young forest as vital habitat for many wildlife species, and suggest ways to manage for these species in a way that also considers the importance of carbon storage and sequestration. We need to consider all conservations issues in how we manage in the future.

Lisa Wahle
Contractor to the Wildlife Management Institute at the CT DEEP
Lisa.wahle@ct.gov, 860-304-6184

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 5:39 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

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FYI

-----Original Message-----
From: Lisa Yoreo <lisayoreo@yahoo.com>
Sent: Wednesday, October 21, 2020 5:24 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: Protect nature and science for the public and the future

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To DEEP Climate Change,

Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit.

Nature is essential for the future and for everything we need, and serves the public good now and for the long term.

We have so many beautiful natural areas, and some need to be protected for nature study, hiking, and places that people can count on. This has never been more important.

We need systems that support good jobs, local resource use, AND natural areas.

Our public land is held in the public trust.

We need your leadership.

Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

Thank you,
Lisa

Sent from my iPhone

Comments re climate change working group reports and issues addressed
Lynne Bonnett, 675 Townsend Ave. New Haven CT 06512, October 21, 2020

Thank you for your hard work in promoting public input into this process. I have two main points that I would like to make. One of them is an area that I think has gotten short shrift, sewage sludge incineration. This topic was placed in non-energy section of the cross sector group. I sympathize with the group leader who thought this was not a topic that he knew anything about. Sewage sludge incineration uses fossil fuels to get rid of organic material that could be used to create renewable natural gas that could ultimately decrease our reliance on fracked gas. All of the incinerators are located in environmental justice communities. New Haven, for example, incinerates 45% of the sludge from other cities such as Bridgeport and approximately 20 other communities in addition to the regional sewage from New Haven, Woodbridge, East Haven and Hamden-a total of about 14,400 dry tons/day. Sewage sludge incinerates emit chemicals that harm our health causing premature death from cancer, respiratory illnesses, asthma, and heart disease to name a few. There is no SAFE amount, the emission limits established by the State of CT called BACT only support what the incinerator's technology is capable of doing, not what is good for the public. The EPA clearly states that there are no safe exposure levels for these emissions and recommends making beneficial use of the sewage sludge.

Roughly 2/3 of CT's sewage is trucked over the road to one of 7 incinerators. Two thirds of CT's sewage sludge does not have to be incinerated in an environmental justice community. We can establish sewage treatment facilities (anaerobic digesters, I hope) in other areas that are not heavily populated.

Incinerators are aging and need to be replaced. This is the time to transition to a more sustainable method of disposal such as anaerobic digestion that makes beneficial use of this material and move the main facilities out of environmental justice communities. We definitely should not be building new incinerators at this time. This is akin to building more gas-powered power plants. The lifetime of these facilities extends at least 30 years. The cross sector group proposes a study by an independent agency. Any new proposals for additional incinerators need to be put on hold pending the outcome of an independent study. We already know that we need to change, now is the time to stop kicking the can down the road.

The second area of concern is the tepid, almost absent, promotion of solar array electricity generation for renters in CT. New Haven has a preponderance of renters in 2-4 unit multifamily properties. Property owners that want to put up solar arrays face so many barriers that it is not feasible for them to invest in solar for their tenants; this needs to change now. In addition to rooftop solar, New Haven has many vacant properties, brownfields, large parking areas that could be used for solar arrays to allow virtual net metering to residents that want to access solar remotely. We can't afford to wait for the "greening of the grid". While there are many good things proposed in the electricity/utility subgroups they ignore our need to robustly invest in solar generation for all residents, not just single home property owners. The SCEF program requires developers that have large resources and does not adequately allow for residents that invest in them to lower their energy burden on par with net metering, for example.

I don't know all of the things that need to change but something needs to happen. We can't afford to keep going on a path that is not sustainable and making climate change worse. We need robust solar development on a municipal scale in New Haven and I don't see it coming our way. That failure is sad for all of us. We could do so much better.
Thank you. /Lynne Bonnett/

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**Alec Shub <alec.shub@uconn.edu>**

# GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:38 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

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**From:** Manuela Meza <manuelameza510@gmail.com>
**Sent:** Wednesday, October 21, 2020 9:26 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:**

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To DEEP Climate Change,

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Meanwhile - we are burning and exporting our public forests? Who benefits? This is beyond disturbing.

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We need your leadership.

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Alec Shub <alec.shub@uconn.edu>

# FW: GC3, Rivers Sub-Group report

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 11:40 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

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**From:** Margaret Miner <margaret.miner@charter.net>
**Sent:** Wednesday, October 21, 2020 11:26 AM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Cc:** alicea <alicea@riversalliance.org>; Margaret.Miner@charter.net
**Subject:** GC3, Rivers Sub-Group report



## RIVERS SUB-GROUP DRAFT REPORT

## For The Governor's Council on Climate Change

## Public Comment from Margaret Miner

## Thank you for the opportunity to comment. Sub-Group Chair Alicea Charamut is Executive Director of Rivers Alliance of Connecticut and Co-chair of the Water Planning Council Advisory Group. I have held those positions myself in the past, and am so relieved that someone so expert has stepped up.

## This report is a well-organized and intelligent overview of the value, conditions, and critical, immediate needs of our rivers. The perils related to climate change are introduced at the outset. We can see in this very dry summer that our rivers and other freshwater

**resources are in peril.** ***This report realistically reflects and explains this peril.***

**Much of the material in the report may seem familiar. Since the 1970s, the state has returned over and over again to water policy, the latest effort being the State Water Plan. We are heavy on plans but light on action.** ***The GC3 should require action on the most important recommendation*****s.**

**The topic allocation among the sub-groups reflects one of the key problems on state water policy. Many (arguably all) of the GC3 groups must consider water issues. As the Rivers report stresses, wetlands, headwaters, aquifers, lakes, rivers, and the waters of the Sound are all one water. Clean water is needed for the survival of humans and all plants and other wildlife; we use it for industrial energy, for cooling, for heating, for cooking, and washing. However, responsibility for its use and protection is fragmented among numerous authorities. Water is governed through all three branches of state government, plus local authorities. The Water Planning Council comprises four state agencies, not including the Department of Agriculture. River protections and water policy necessarily involve science and politics.** ***At this time, good science and good politics must be brought together. Recommend that the GC3 take action to rationalize and integrate water policy and authorities.***

**There is especially extensive overlap of the Sub-Group topics assigned to the Forestry, Wetlands, and Rivers sub-groups.** ***A shared guiding principle is that water quality is best protected by good land management, in particular maintenance of forests and woods connected to waters.***

**An overarching theme of the Rivers Report is to reduce interruptions of water flow and to protect or restore connectivity. This can be done in a number of simple ways (for example, culvert redesign and maintenance, preference for hydropower technology NOT reliant on**

**a dam). *Connectivity must be a prime consideration in water-management policy.***

**Finally, the Rivers Sub-Group Report diplomatically touches on some significant flaws in our water laws and regulations. My list includes the Water Diversion Policy Act (1982), the Aquifer Protection Act (2005), and the Streamflow Regulations (2014). The Policy Act evidently permits a person to take water at the rate of 50,000 gallons per day every day of the year from the same place. The Aquifer Protection Act is weak on rules for existing structures and facilities. The Streamflow Regulations do not include protection for groundwater, although wells and wellfields are increasingly important water-supply sources. The regulations exempt numerous dams, and where they do apply (to certain water company dams), implementation can be delayed for years. *I urge GC3 to demand a clear-eyed assessment of the weaknesses and loopholes in these laws.***

**Thanks so much for your work on these vital policy issues.**

**Margaret Miner, South St, Roxbury CT**

203-788-5161

# Sharon Land Trust

*Preserving the rural heritage of Sharon, CT*



October 21, 2020

Via email: deep.climatechange@ct.gov
Connecticut Department of Energy and Environmental Protection
Office of Climate Planning
79 Elm Street
Hartford, CT 06106-5127

To the Esteemed Members of the GC3 Council,

On behalf of Sharon Land Trust, I respectfully submit the following comments on the Governor's Council on Climate Change (GC3) draft Working Group Reports.

Sharon Land Trust (SLT) is a non-profit conservation organization that protects over 3,200 acres of land in Northwest Connecticut. SLT is a member of the Litchfield Hills Greenprint Collaborative, a Regional Conservation Partnership active throughout a 29-town region of Northwest Connecticut. With our colleagues we have joined in pursuit of a regional conservation strategy incorporating the Follow the Forest multistate initiative to protect core forests and the natural areas connecting them. Greenprint's partners, including SLT, are responsible for the care and stewardship of existing and newly protected land within our respective communities, and for managing public access to protected lands for outdoor recreation and appreciation of nature. The Working Group Reports deeply resonate with and impact our work.

We strongly support a great many of the recommendations and goals included in the draft reports while highlighting herein some of the bold recommendations of the Working and Natural Lands Working Group, as well as those of the Science and Technology Working Group.

1. We must ***prioritize the capacity of Connecticut's forests*** to mitigate climate change through carbon storage and sequestration. Proforestation (growing existing natural forests) has recently been recognized as the most powerful, low cost, and immediate mitigation opportunity with multiple immediate co-benefits and proven long-term resilience to the stresses of climate change; New England's forests have been specifically identified as part of the "Global Safety Net" needed to stabilize the climate. Connecticut's forests are critical within this Safety Net due to their considerable capacity to store aboveground carbon and their situation within climate corridors of connected core forest habitat running from Long Island Sound to Canada on either side of the State.

We must:

- ***Keep Forest as Forests***. Commit to *no net loss in statewide forest cover* and the permanent protection of *at least 50%* of Connecticut's medium (>250 ac.) and large (>500 ac.) core forests by 2040.

67 Main Street • PO Box 1027 • Sharon, CT 06069 • (860) 364-5137
email:info@sharonlandtrust.org
www.sharonlandtrust.org

- ***Establish Extensive Natural Area Forest Preserves*** on existing and new state conservation lands. Establish criteria and processes for protective designation to prioritize proforestation and ensure old-growth forest and remnants are protected.

- ***Increase land protection funding*** from all available sources, including annual bond authorizations of at least $25 million for DEEP's Recreation and Natural Heritage Trust Fund and $25 million for the Open Space and Watershed Land Acquisition (OSWA) program. SLT has benefited from these funding sources to protect hundreds of acres of land, including forests, farmland, and headwaters streams.

- ***Encourage land stewardship behaviors that support ecosystem services.*** Provide funding and policy incentives to encourage carbon storage and sequestration, reduction of habitat fragmentation and protection of vulnerable habitats, and increased connectivity among other natural climate solutions, on non-state lands including through the purchase of easements.

- ***Action must start right now***. We should not wait on final reports to act where the science is already sound. Land conservation organizations including those in the Greenprint plan to protect land and natural resources in perpetuity. We appreciate the long-term effort needed to effectively meet the challenges posed by our rapidly changing climate, but also the immediacy of the need to respond in accordance with proven science. The bold recommendations above can and should be implemented immediately.

2. We must be ***guided by science and do no harm***. GHG mitigation policies in particular should ensure that gains are not offset by (i) poorly sited solar and wind installations that convert forestland and remove stored carbon, or (ii) timber sales on state lands that are far more valuable for their carbon storage as living trees than the generally low value that the state generates from the sale of logs (and associated leakage of stored carbon from the state).

3. We must ***support research and education***. Provide funding to target areas where research is still needed to discover, monitor, and develop the science needed to adequately and rapidly mitigate climate change. Augment, accelerate and formalize a broad program of positive education and cultural change across all sectors of state government, municipalities, NGOs, and public schools.

We appreciate the cross-sector nature of many of the Working Groups' recommendations and recognize the possibilities in coordinating work around the recommendations. Community nonprofits can effectively partner at the municipal, regional, and state levels.

Sharon Land Trust can help by protecting and responsibly stewarding conservation land, including that expressly protected as natural area forest preserves. SLT has already taken steps to manage several of our preserves so that they attain an old growth stage of forest development, enrolling almost 500 acres of forest into the Old Growth Forest Network. We can look broadly at land use planning taking into account the large landscape while using community knowledge and connections to work locally. We can provide needed education to the broad public and to the youth who will inherit our climate and carry on our mitigation and adaptive strategies. We can provide access to protected lands for scientific research needed to inform ongoing and future policy decisions. And we can provide all people with the benefits of outdoor recreation and experiences in nature.

Thank you once again for your leadership in this significant work, and for providing this opportunity to present comments on the recommendations. We look forward to assisting in their implementation.

Respectfully,

Maria Grace
Executive Director

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:37 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

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FYI

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**From:** Maria Martinez <majomaru2009@gmail.com>
**Sent:** Wednesday, October 21, 2020 9:24 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change, Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit. Nature is essential for the future, for evolution and for everything we need, and serves the public good now and for the long term. We have so many beautiful natural areas, and some need to be protected for nature study, hiking, and places that people can count on. This has never been more important. Meanwhile - we are burning and exporting our public forests? Who benefits? This is beyond disturbing. We need systems that support good jobs, local resource use, AND natural areas. Our public land is held in the public trust. We need your leadership. Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

Best,

Maria

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:37 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Howlett, Marissa (2022) <marissa.howlett@trincoll.edu>
**Sent:** Wednesday, October 21, 2020 9:24 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change,

Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit.

Nature is essential for the future, for evolution and for everything we need, and serves the public good now and for the long term.

We have so many beautiful natural areas, and some need to be protected for nature study, hiking, and places that people can count on. This has never been more important.

Meanwhile - we are burning and exporting our public forests? Who benefits? This is beyond disturbing.

We need systems that support good jobs, local resource use, AND natural areas.

Our public land is held in the public trust.

We need your leadership.

Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

Thank you!

Marissa Howlett '22

Biology Major

Cultural House Coordinator of Umoja House

Imani Black Student Union Secretary

S.M.A.R.T Power Skills Student Program Coordinator

Health Center Peer Health Educator

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 8:35 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: darkmeponte@everyactioncustom.com <darkmeponte@everyactioncustom.com>
Sent: Wednesday, October 21, 2020 7:31 AM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Dr. Mark DePonte
29 Pine Rd  Griswold, CT 06351-2629
darkmeponte@gmail.com

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UNIVERSITY OF CONNECTICUT

**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 6:24 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** martha hillemeir <hillkuma@yahoo.com>
**Sent:** Wednesday, October 21, 2020 6:22 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change, Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit.

Wildlife depends on the Massacoe State Forest. Please don't alter, in any way, this healthy and undisturbed corridor that allows movement and habitat for local wildlife, and a peaceful refuge for our family to hike through.

Nature is essential for the future, for evolution and for everything we need, and serves the public good now and for the long term.

We have so many beautiful natural areas, and some need to be protected for nature study, hiking, and places that people can count on. This has never been more important.

Meanwhile - we are burning and exporting our public forests? Who benefits? This is beyond disturbing.

We need systems that support good jobs, local resource use, AND natural areas.

Our public land is held in the public trust.

We need your leadership.

Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

Very sincerely,

Martha Hillemeir

West Simsbury, CT

Sent from Yahoo Mail on Android

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 6:22 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Risser, Martha K. <Martha.Risser@trincoll.edu>
**Sent:** Wednesday, October 21, 2020 5:55 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change,

I am writing to beg you to please protect every cubic inch of nature preserves Connecticut still has (we do not have enough!). It is crucial that all areas of intact nature be protected in this state that is already so terribly overdeveloped. Our natural resources are essential to our health and well-being, biodiversity, climate protection, clean water, food, everything in our future, our children's future, our descendants' future. Healthy ecosystems are our lifeline. We need to protect what we have, invest in establishing more protected and connected nature preserves, and support interdisciplinary research.

Martha Risser

53 North Beacon Street

Hartford, CT 06105

**Fairfield Forestry Committee comments on the GC3 Forests Working Group Draft Report for the Working and Natural Lands Sub-Committee**

We applaud the impressive output of this group and do not wish to repeat the wonderful comments we have seen from many of our colleagues. We do want to emphasize our support of the no net loss of forest, the need to plant trees and the understanding there is a need to find funding for this, the need to do a better job by the utilities in particular in trimming only trees that need it an only to the extent that will leave them healthy and to ask PURA, the legislature and the governor to find the path to put as much of our electric and telecomm infrastructure underground as is possible in an expeditious manner. The amount of funds spent maintaining the above ground infrastructure year after year, not just tree trimming but the overburdened polls with wires that are never removed so that new, bigger, stronger poles are required is absurd. We must move to a new model. Microgrids and battery storage are also part of that model. I know much of that is not part of this report but it applies because it affects how we address trees.

**Specific to the Forests Working Group report:**
On page 24 of the report in the section on **Connecticut's Carbon Forest Storage and Future Role in Climate Mitigation** the authors note that "Connecticut's forests are estimated to be >100 years of age, the highest percentage in the Northeast." We would like to suggest that there be a suggested culling and planting program using scientific data so that we harvest our older growth, less able trees that are likely to be damaged in extreme storm events and replace them with new trees in a planned manner. Doing this in a planned, programmatic way would mitigate the risks of climate change and provide a potential income stream to pay for the planting program, especially in an urban forest setting.

On page 36 in the second to last paragraph there is a typo in the fourth line, "suggests suggest that the loss of trees" and a word needs to be removed.

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Environmental preservation

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 10:47 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Mary Hourdequin <mehourdequin@gmail.com>
**Sent:** Wednesday, October 21, 2020 9:31 AM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Environmental preservation

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Don't let our beautiful outdoor resources in CT become endangered. Please protect all species, our forests, our lakes and rivers. We can't buy them back once these natural assets are degraded or destroyed.

Thanks in advance for preserving CT for future generations and for ensuring clean air and water as basic rights.

Mary Hourdequin

47 Harriet Rd

New Hartford, CT 06057

Mary Hourdequin

UCONN
UNIVERSITY OF CONNECTICUT

**Alec Shub <alec.shub@uconn.edu>**

# GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:38 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Mary Meza <marymeza0414@gmail.com>
**Sent:** Wednesday, October 21, 2020 9:25 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:**

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change,

Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit.

Nature is essential for the future, for evolution and for everything we need, and serves the public good now and for the long term.

We have so many beautiful natural areas, and some need to be protected for nature study, hiking, and places that people can count on. This has never been more important.

Meanwhile - we are burning and exporting our public forests? Who benefits? This is beyond disturbing.

We need systems that support good jobs, local resource use, AND natural areas.

Our public land is held in the public trust.

We need your leadership.

Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

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**Alec Shub <alec.shub@uconn.edu>**

# FW: protect NATURE!!

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:39 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** mary meza <marymeza@ccpaedu.com>
**Sent:** Wednesday, October 21, 2020 9:27 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** protect NATURE!!

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change,

Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit.

Nature is essential for the future, for evolution and for everything we need, and serves the public good now and for the long term.

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Meanwhile - we are burning and exporting our public forests? Who benefits? This is beyond disturbing.

We need systems that support good jobs, local resource use, AND natural areas.

Our public land is held in the public trust.

We need your leadership.

Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

--

Mary Meza

"Start by doing what's necessary; then do what's possible; and suddenly you are doing the impossible"

- Francis of Assisi

21 October 2020

**deep.climatechange@ct.gov**
c/o Rebecca French, Mary-beth Hart, and Katie Dykes
Connecticut Department of Energy and Environmental Protection
79 Elm Street
Hartford, CT 06106-5127

*RE: comments Governor's Council on Climate Change (GC3) Working Group draft reports*

We deeply appreciate this opportunity to comment upon draft reports prepared by the GC3 Working Groups. The GC3 process demonstrate the impressive commitment of elected officials, organizations, individuals, business leaders and government staff to address the climate crisis. Park Watershed, a 501c3 community-based organization, emerged from goals outlined by the North Branch Park River Watershed Management Plan, which was approved by US EPA and Connecticut Department of Environmental Protection in 2010. While efforts to improve the North Branch through persistent advocacy, cleanups, and green infrastructure implementation projects are laudable, the results remain insufficient. North Branch water quality, originally listed as Class A, which could once support swimming, boating, fishing and diverse aquatic life, is now listed as impaired. Across Connecticut, over five hundred[1] waterbodies and waterways, like the North Branch, have been identified as impaired.

Given threats from drought conditions, rising temperatures, hurricanes, fires, and flooding; Connecticut could prioritize re-imagining and re-engineering relationships between vibrant regenerative ecosystems and development, so as to prepare for increasing volatility, necessity and benefits of clean water. For this reason, as the GC3 process moves forward, site-specific implementation projects, based on science, are essential to advancing robust improvements. This work will require coordination of place-based project goals and funding opportunities across various government agencies as well as within Ct DEEP Bureaus. Synthesis of Working Group report recommendations into affordable implementation projects is needed to ensure the State can increase resilience to climate impacts, as well as to prepare communities to adjust and even thrive amidst the challenges. As this process advances, we recommend the GC3 consider **place-based** goals that prioritize knowledge of regenerative ecosystems, as follows:

- Synthesize aspects of all Working Group recommendations into watershed-based pilot project-areas that strengthen resilience connectivity from rural headwaters through suburban areas into urban neighborhoods. Designated watershed-based pilot areas (coastal and inland) will help the State merge "silo" interests in order to cultivate symbiotic relationships between infrastructure (development) and regenerative ecosystems (nature).
- Invest in regenerative ecosystem service benefit by shifting limited funding away from conventional State property grounds management practices towards pilot projects, programs and organizations that cultivate measurable benefits of regenerative ecosystems.
- Measure urban ecosystem service benefits, so that efforts to conserve and re-establish ecosystem functionality will be rooted in science and innovation, rather than dated planning conventions.
- Involve and educate diverse communities in detailing local ecosystems services through empirical field research. Utilize field research findings to conserve, strengthen, and re-establish ecosystem services in symbiotic relationships with infrastructure, recreation, cultural heritage, and farming.
- Encourage funding for design innovations that facilitate resilience and local business prosperity.

The GC3 Working Group reports are inspiring examples of collaboration in policy development. The reports thoroughly outline policy recommendations, along with projected climate crisis impacts on Connecticut, progress based on the 2018 GC3 recommendations, and references to current research and regional state planning strategies. Our general comments per report are as follows:

**Working and Natural Lands** –

While from policy perspective, there is a need for the Working and Natural Lands reports to be divided into four separate sub-groups. However, this need exposes the problem of conventional management strategies, which involves professional skills that isolate natural resources rather than cultivating diverse co-benefits. While our proposal – for designated GC3 watershed-based pilot project-areas (coastal and inland) – offers opportunities to GC3 merge 'silos' from all Working Groups, watershed-based pilots are most relevant to implementation of recommendations from the four Working and Natural Lands Sub-Groups, which could cultivate symbiotic relationships between infrastructure (development) and regenerative ecosystems (nature) and so strengthen resilience connectivity from rural headwaters through suburban communities into urban neighborhoods, while also improving the Long Island Sound.

~~~

**Agriculture/Soils** –

- Involve indigenous perspectives and approaches to re-envisioning forage foods, especially with respect to re-establishment of ecosystem benefits in high-density, urban-suburban areas.

- Provide training to individuals and families in urban-suburban areas that are learning small-scale self-reliance farming. Support could include funding to build/install community gardens along with educational programs that hire retired and/or emerging farmers as trainers.

- Support development of urban farm centers that can build neighborhood productivity, *(as noted by City of Hartford Plan of Conservation District, on page 9, as proposed feature of a North End Wellness District).*

- Fund design/development of better farmers market facilities that are adjacent to neighborhood retail and restaurant establishments. Design and development of facilities that support four-season farmers markets, with sheltered and open-air booths, can also serve as temporary retail outlets for other venders that support small businesses within walkable communities.

- Gather information on the availability of fresh foods sources within walking/bicycling distances to residential neighborhoods. Collaborate with Sustainable CT to advance local farms, farmers markets, community gardens and summer school/educational gardening programs.

- Advance State legislation that recognizes soil health initiatives, as well as establishes funding that will help farmers improve soil health and carbon sequestration.

~~~

**Forests** –

- **Minimize mowing in city parks so as to allow selective forest re-growth, (and save funds).** Currently the trend for greening urban neighborhoods is tree planting. While tree planting is clearly beneficial, the City of Hartford has just completed a "Tree Action Canopy Plan" (which is featured in the GC3 Forests report) that is **not** based an accurate assessment of where the forests actually exist within the city. There needs to be science leadership and funding to study where trees actually exist as thriving, robust forests in urban-suburban areas, such as the dense (unprotected) forests along the North Branch of the Park River.

  The 'Hartford Tree Action Canopy Plan' emphasizes planting trees in city parks - rather than in urban neighborhoods where low income residents need assistance in purchasing and planting trees. While it might be easier to arrange community tree planting projects in city parks, the city could simply select areas in which to stop mowing so as to allow indigenous trees to sprout from seeds of the surrounding trees. Rather than purchasing tree from nurseries, minimizing mowing would save limited funding, which could be directed towards supporting community science projects. Local urban community science projects could develop knowledge and skills to cultivate regenerative ecosystem service benefits. Monies spent on mowing result in the need to purchase trees cultivated outside of the city, which does not support sustainable neighborhood prosperity. Given most Hartford city parks were established over a century ago, cultivating indigenous forest adaptation to changing climate conditions could increase diversity as well as resiliency. Planting trees purchased from nurseries could introduce unexpected problems into established, indigenous city park forests.

  Established tree professionals support organizations that largely depend upon funding allocated to the billable service of tree planting. In addition to funding for tree plantings in neighborhoods where residents cannot afford new street trees (or removal of dangerous trees), funds need to be directed towards conservation management and revitalization of existing native ecosystems. Funding to research urban forests ecosystems in high density urban-suburban areas may very well highlight a more urgent need to re-introduce native understory vegetation, such as shrubs and ground covers, as well as remove invasive plants. This type of project work could be conducted by local non-profits such as Knox, which currently rely largely upon community tree planting projects.

~~~

**Rivers** –

Park Watershed fully supports the three general recommendations of the *Rivers* report, because healthy waters support healthy communities and healthy economies! Our comments are as follows:

**2020.R.1:** "Protect the future ecosystem service value of inland waters"

*"Employ and mainstream nature-based solutions at scale"* consider including the following:
— Strengthen guidelines for stream buffer within urban-suburban areas so that planning and zoning commissions will not easily approve parking lots, synthetic turf athletic fields, and one-lane roads/paved recreational trails within urban-suburban stream buffers and floodplains.
— Emphasis on conservation of last landscapes, "open space" along waterways in urban areas.

*"Re-establish free-flowing character and connectivity of inland waters and hydrological connectivity"* consider
— Support research that reveals filled wetlands within high-density neighborhoods. Involve (and pay) citizens to assist with field (science **not** simply public opinion) research. Utilize neighborhood ground-water research to inform planners and municipal decision-makers about ways in ecosystems
~~~

and watershed terrain increase site-specific vulnerabilities or provide resiliency benefits within urban neighborhoods. Vulnerable communities need support for neighborhood ecosystem field research.
— Pilot projects that collaborate with communities to explore establishment of native plants as food sources along riparian corridors. Include historic knowledge from indigenous communities of native plants that could increase foraging. Conduct studies to determine if pollutants foul forage foods.

*"Create safe, equitable opportunities for people of diverse background to access and enjoy water resources."*
— Target/Indicator, *consider adding:* "Increase access to clean water resources that support fishing and/or boating within walking/bicycling to distance to high-density urban neighborhoods.
— Implementation Entities, *consider adding:* "schools, and summer camps"

**2020.R.2:** "Safeguard water quantity for both "fish and faucet" . . ."
*"Promote demand-side water conservation and water reuse."*
— Implementation Action, *consider adding:* Study the impact of increased evaporation rates, due to higher temperatures, on water resources. Current research is needed to clarify the impact of droughts on state natural resources, agriculture, and public health.

**2020.R.3: "**Further develop policies, education/outreach, research, and funding opportunities that encourage protection for inland waters." This point is especially appreciated given the large percentage of State and Federal funding focused on coastal community resilience.
*"Fund and enhance stormwater management programs - Fund and enhance education, outreach and research"*
— Target/Indicator, *consider adding:* "nature-in-neighborhoods field research that includes local jobs for project assistants."
— Implementation Entities, *consider adding:* "schools, and summer camps"

We hope the GC3 will utilize the State Water Plan, and the Water Planning Council Advisory Group to align the wide range of water quality and quantity management concerns within the GC3 implementation process. In addition, Park Watershed also appreciates that our draft proposal for watershed-based GC3 pilot implementation projects has been included as Appendix B.

**~~~**

**Wetlands** –
While this report mentions inland wetlands, most of the recommendations are focused on coastal areas.

**2020.W.2** "Communicate the value of wetlands to Connecticut home and business owners through engagement on climate resilience efforts" #2 *"Re-evaluate Connecticut's Green Plan, . . ."*
— State leaders advance a campaign that encourages Connecticut communities and municipal leaders to make 21st land conservation investments that reflect large park planning initiatives of the late 19th/early 20th century. This campaign could be launched along with the national bicentennial celebration, Olmsted 2022, which is relevant given Fredrick Law Olmsted was born and buried in Hartford. For example, conservation of the North Branch Park River riparian corridor is comparable in scale to Central Park and landscapes along Muddy River that connect Boston's emerald necklace. Connecticut leaders need to encourage communities and civic leaders to envision new strategies for whole ecosystem conservation. Whole ecosystem conservation areas will be feasible through a mosaic of partners and funding strategies.

~~~

**Infrastructure and Land Use Adaptation** –

- Grounds management/landscape contractors routinely push piles of brush and grass clippings onto steep slopes and into forest edges of state and institutional properties. While landscape contractors, who are paid to clear large lawns and parking lots may not have access to appropriate composting sites, hidden damage to the health and integrity of ecosystems is pervasive. This is a problem especially in high-density urban-suburban areas, where improper disposal of yard-waste compromises functional ecosystems within parks and the last landscapes along riparian corridors. Distribution of invasive species compounds the detrimental blight of brush piling that forms a barrier between manicured lawns and the vibrant complexity of nature. In addition to penalty fees, better landscape design strategies need to be developed/required along with training for facilities manager and contractors about proper disposal of fallen tree limbs and grass clippings.

  Although this may seem like a marginal problem *(piles of brush in the woods beyond the parking lot)* grounds management is an achievable opportunity for the State to transition funding now used for conventional landscaping practices on state properties so as to support practices that increase resilience to the climate crisis. Proactive changes could include installation of green infrastructure features and removal of invasive plants. Transition of state landscape management conventions (and labor contracts) to successful sustainable practices could take five to ten years. Requiring climate resilient practices on State properties would evolve professional design standards and practices within landscaping trades – while cultivating visible change. This comment includes issues related to Working and Natural Lands, Equity and Environmental Justice, and Financing Adaptation and Resilience.

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**Science and Technology** –

- Innovation is needed to advance cultural change. Inclusive architecture, engineering, and landscape design competitions as well as makerspace challenges could, with input from scientists (and community stakeholders) plus award incentives, study a wide range of climate crisis problems, and generate hopeful interest in real change.

~~~

**Financing Adaptation and Resilience** –

- Park Watershed enthusiastically supports establishing a municipal stormwater authority pilot program. Incentives for municipalities that collaborate on formation of regional watershed stormwater authorities would be especially helpful with respect to the Park River regional watershed, which stretches across seven of the eight voting member District (MDC) municipalities. State incentives for stormwater authorities that foster collaboration among municipalities within regional watersheds would be conducive to strategic regional cooperation that is necessary to the advancement of effective watershed stewardship. This comment includes issues related to Rivers, and Infrastructure and Land Use Adaptation.

- Financing for local innovation that root economic prosperity into Connecticut communities is needed. While state and federal financing policy strategies are critical, there is a pressing need for funding that
~~~

can support growth and prosperity in diverse communities. State support is needed to bolster neighborhood economic sustainability and prosperity, rather than required daily commuting would also minimize fossil fuel usage in transportation. In addition to funding projects that build/revitalizes walkable communities, State leaders could encourage design schools to explore how 21st century cultural values can learn from 19th urban relationships that might alter 20th century car-dependent development conventions. This comment includes issues related to Infrastructure and Land Use Adaptation.

- Offer incentives for municipalities that successfully participate in Sustainable CT, as well as incentives for municipalities that periodically amend/update (within less than a decade) Plans of Conservation & Development with respect to current climate research and emergency preparation planning.

- Provide small-scale state funding, for a wide array of local, environmental efforts that may not yet be recognized planning conventions. Programs that support distribution of small-scale grant funding such as the Watershed Assistance Small Grants are needed to support pilot projects that engender innovative strategies.

- Identify and utilize a process framework through which diverse citizen stakeholders, professionals and staff from multiple CT DEEP Bureaus, can collaborate equitably to merge the GC3 recommendations into place-based projects with measurable, cost-effective goals. Perhaps the "lean" methodology can be adapted to identify and merge issues with respect to site-specific projects that through collaboration can achieve exponential results.

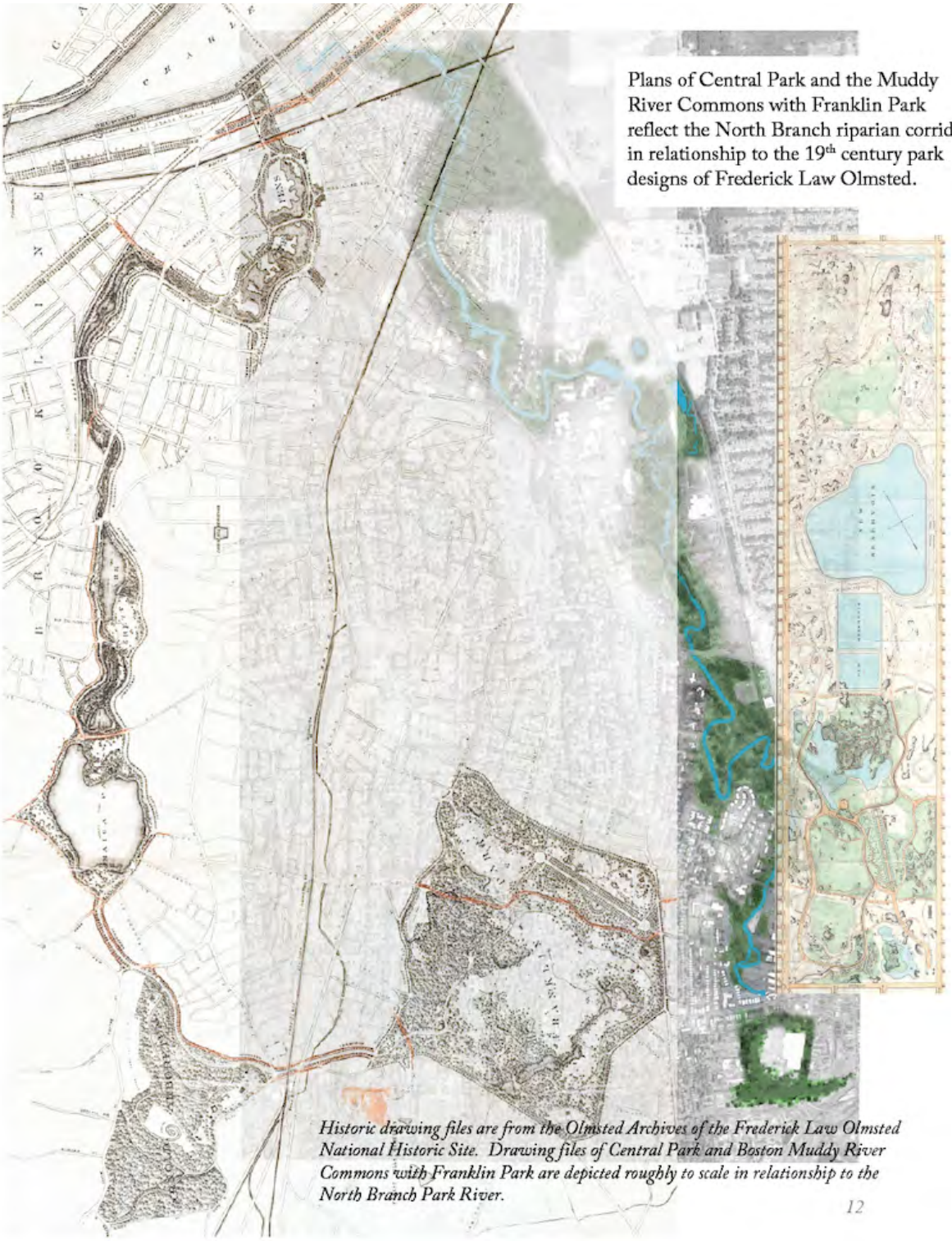
~~~

Once again, we welcome and appreciate this opportunity to comment upon the GC3 Working Group draft reports. We commend GC3 Working Group members for their good work and dedications to this process. Ideally Governor Lamont can move forward with GC3 recommendations, to convey urgency with purpose and hope for Connecticut.

Sincerely,

Mary Rickel Pelletier
Director of Park Watershed

[1] *(rough estimate based upon Appendix B-1 List of Impaired Waters of the Ct DEEP 2020 Draft Integrated Water Quality Report)*
~~~



Plans of Central Park and the Muddy River Commons with Franklin Park reflect the North Branch riparian corridor in relationship to the 19th century park designs of Frederick Law Olmsted.

*Historic drawing files are from the Olmsted Archives of the Frederick Law Olmsted National Historic Site. Drawing files of Central Park and Boston Muddy River Commons with Franklin Park are depicted roughly to scale in relationship to the North Branch Park River.*

12

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Comments on Draft Report of the Science and Technology Working Group

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:48 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Garden Club of New Haven, Inc. <gcnhtreesandpower@gmail.com>
**Sent:** Wednesday, October 21, 2020 11:02 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Comments on Draft Report of the Science and Technology Working Group



The Garden Club of New Haven submits the following comments for your consideration:

On page 11 of your report, you state: "A strategic plan to bury power lines and prioritize resilient, distributed, clean energy prevents impacts, protects health and solves multiple problems."

We urge you to carry this forward as an additional recommendation at the end of your report. It should at least be a part of your Recommended Implementation Action Title for distressed communities on page 34, which recommends "restore open space by planting trees if needed; and/or protect tree cover to increase carbon sequestration and protect carbon storage." As the draft report of the Forest Sub-Group for the Working and Natural Lands Working Group demonstrates, distressed communities often lack street trees that help reduce the heat island effect and offer many other health benefits. Overhead power lines make protecting those large trees that do exist and planting or replanting trees that will become large and provide greater benefits difficult. Only small trees can be planted under the wires. Placing power lines underground should be a high priority in distressed communities.

Respectfully submitted,

Mary-Michelle (Mikey) Hirschoff

Spokesperson on Trees and Power

The Garden Club of New Haven

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UNIVERSITY OF CONNECTICUT

**Alec Shub <alec.shub@uconn.edu>**

# FW: Science and Technology Working Group

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 8:36 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

---

**From:** Melinda Tuhus <melinda.tuhus@gmail.com>
**Sent:** Wednesday, October 21, 2020 8:08 AM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Science and Technology Working Group



Oct. 20, 2020

Dear Members of the Science and Technology Working Group,

I have worked for the past six years as part of the climate organization Beyond Extreme Energy to stop FERC from rubber-stamping all the permits for gas (mostly fracked gas) infrastructure that come before it. Not a lot of success stories there yet, but I've participated in several walks and other actions that have stopped projects once they were approved by FERC, in New York and Massachusetts (Constitution and Northeast Energy Direct pipelines, respectively).

Connecticut likely has more gas infrastructure than any other state in our region, which was the reason given for the Siting Council's approval of the Killingly Energy Center to be built by NTE and to provide power on the New England grid through ISO-NE. Our state doesn't need the power, which has been acknowledged by our top state officials, who are now challenging the role of ISO-NE in holding back the development of renewable energy over fossil energy.

Now I am happy to see that in September FERC issued Order 2222, will open up the wholesale grid market for Distributed Energy Resources. This will allow full-scale market participation by batteries, EV chargers, smart appliances and other resources – needed changes on the construction of any 'smart grid' implementation. This development, along with the growth of CT's offshore wind resources, makes it even clearer that construction of any more gas plants (KEC would be the third in three years) is locking in polluting, climate-destroying energy for all the decades we have left to transition away from these very sources in order to prevent climate catastrophe. (Although gas burns about half the CO2 that coal does, when you add in methane emissions that are 100 times worse than CO2 over ten years, the resulting pollution can be as bad or worse than that from coal over the precise period we have before the IPCC predicts climate tipping points if we don't act.)

Regarding E&EJ, although the town of Killingly itself is no longer considered an EJ community, many surrounding towns still are, and Windham County has the lowest income of any county in CT. Killingly already has one gas power plant, and putting another one there will certainly contribute to disproportionate air pollution.

I urge Gov. Lamont and DEEP to be on the right side of history and KILL KILLINGLY!

Sincerely,

Melinda Tuhus

103 Carmalt Rd.
Hamden, CT 06517
203.623.2186

"Resistance is usually portrayed as a duty, but it can be a pleasure, an education, a revelation." *Rebecca Solnit*

Connecticut Green Building Council
P.O. Box 9739
New Haven, CT 06536



October 21, 2020

Governor's Council on Climate Change
Connecticut Department of Energy & Environmental Protection
Office of Climate Planning
79 Elm Street
Hartford, CT 06106
deep.climatechange@ct.gov

Dear Governor Lamont, GC3, and State of Connecticut Stakeholders,

Thank you for providing this opportunity to comment on the GC3's Draft Report of the Progress on Mitigation Strategies Working Group.

We applaud the attention to equity and environmental justice in the working group process because the anticipated massive investment and transformation of the building stock to reduce greenhouse gas emissions needs to also address a more comprehensive view of success. It is important to learn the lessons of urban renewal, the last massive infrastructure investment in which a narrow view to advance a culture of single occupant vehicles and the migration to the suburbs shortsightedly left behind vulnerable communities, and from which cities are still trying to heal.

As demonstrated in the 2018 report, the building sector is one of the largest contributors to GHG emissions, and therefore meeting the State's ambitious climate goals will require ambitious regulation and incentives that address energy efficiency, electrification, and embodied carbon in the built environment while supporting human health and lifting up our most vulnerable communities. The Connecticut Green Building Council (CTGBC) supports the inclusion of all the recommendations in Buildings Section of the Progress on Mitigation Strategies draft report and has further comments on the following items, and additional recommendations in **bold**:

1. **Require that insulation and other materials used in building envelope improvements funded by the energy-efficiency funds have low global warming potential.**

   Unfortunately some insulation materials release such a high quantity of greenhouse gas during manufacture or installation that they effectively increase global greenhouse gas emissions instead of reducing them. These insulation materials include XPS and closed cell spray foam.

2. **Prioritize Indoor Air Quality when performing weatherization upgrades.**

   Materials used for weatherization should be required to meet indoor air quality criteria such as Greenguard Gold. Balanced energy recovery ventilation should be standard on all weatherization projects. Even if air infiltration rates cannot be reduced significantly, balanced ventilation will guarantee clean filtered outdoor air supply, instead of depending on moisture laden air to infiltrate through the building envelope where it can cause mold growth and increase indoor allergens. Exhaust only ventilation causes negative pressure that forces air through the building envelope. We spend a majority of time in our homes and poor indoor air quality disproportionately affects our most vulnerable communities.

3. *Ensure building codes are continuously aligned with the most recent International Energy Conservation Code standards.*

   Unfortunately, due to COVID the current code cycle was postponed until the last quarter of 2021, which means that an entire year of new construction will be constructed using the 2015 IECC which was originally scheduled to be constructed under the more energy efficient 2018 IECC. The Codes and Standards committee has indicated that "a technical review of the 2021 I-Codes will be undertaken to identify any significant changes that should be brought forward into the adoption of the 2018 I-Codes." We recommend that the 2021 IECC be considered for full adoption in addition to the provisions in the 2021 IBC that allow for taller mass timber structures which have the potential to reduce the embodied carbon of new construction.

4. *In conjunction with the Department of Administrative Services, DEEP creates a task force to develop, oversee, enable, and enforce high-performance building codes.*

   Developing a strategy for implementation and enforcement is important to make the stretch code as effective as possible. We suggest that the legislation be revised to include the establishment of a committee or board similar to the Codes and Standards Committee for evaluating updates and reviewing appeal requests.

5. *The state develops a "stretch code" that can be voluntarily adopted by municipalities and updates its High Performance Building Code.*

   We recommend that the commercial stretch code and CT High Performance Building Standards be the same for simplicity and be implemented in a stepped fashion to get more stringent every year to allow the industry to adapt to changing requirements with the goal of requiring zero energy design by 2025. When evaluating alternative compliance paths with third-party certifications, the level of certification allowed should be equivalent or higher to that required by the high performance code, and we expect the highest level of certification will be required.

   In terms of overall costs to building owners, in Massachusetts, the first state to enact a stretch code in 2009, a 2016 Residential Cash Flow Analysis showed that homeowners saw a positive cash flow from day one purchasing a stretch code home vs. a base code compliant home, and studies of specific commercial buildings show that savings in energy costs far exceed the greater initial construction costs.

   The high performance code should take into account the added challenge of renovation versus new construction. We recommend that building renovations be undertaken holistically with a plan to achieve zero energy design by 2050 at the latest, and that systems replacements and upgrades be planned to cost effectively accommodate future energy efficiency improvements and building electrification.

6. **Align CHFA Affordable Housing Qualified Allocation Plan with the State's GHG reduction goals.**

   We recommend that state funded affordable housing be required to meet zero energy ready levels of energy efficiency and to perform embodied carbon analysis and reduction on the same schedule as the high performance building standards.

7. *Create a Building Performance Office to bring together, in one place, efforts to reduce GHG emissions from both new and existing buildings.*

   Perhaps other entities such as fire departments, insurers, and banks can also utilize the data collected by this office, and therefore contribute to fund this effort.

8. *Develop a strategic plan for transitioning from fossil fuels to renewable thermal technology, including electric heat pumps.*

   We feel that Biofuels/Biomass should not be considered renewable thermal technology. Combustion-free energy is particularly vital in low-income and environmental justice communities.

The byproducts of combustion reduce indoor air quality and increase rates of asthma and other illnesses.

9. *Enhance outreach efforts by using social media campaigns, webinars, case studies, testimonials, and customer-engagement platforms*

   CTGBC would be happy to collaborate with the GC3 in these efforts. We have been holding our Green Building Awards annually since 2006 to celebrate the most sustainable projects, people, and organizations in our state. We are happy to create a library of case studies, and create programming to educate the general public and building owners about measures that will help the state meet its GHG reduction goals.

10. **Create a zero energy accelerator to advance zero energy and high performance design in the State.**

    Convene professionals, legislators and industry to develop educational resources such as white papers and case studies and provide support to pilot projects attempting innovative design practices. There is the potential to partner with other organizations to increase the effectiveness such as the Department of Energy, the International Living Future Institute or Passive House.

11. *Create a fast track for critical work skills. Allocate some funds to help contractors train new workers.*

    CTGBC is happy to continue our previous collaboration with DEEP to provide GPRO training. GPRO is a comprehensive green building training and certificate program. Developed by the trades for the trades, GPRO teaches the people who build, renovate, and maintain buildings the principles of sustainability combined with trade-specific green construction knowledge.

We encourage DEEP and the Governor's Office to implement all the recommendations of the GC3. We strongly endorse allocating tax dollars to combat climate change and protect CT from an uncertain energy and water future. Current events have highlighted the importance of protecting human health and promoting social equity, and a sustainable built environment supports these goals. We are working hard to protect our future through healthy and environmentally responsible buildings, and we believe the full support of the State through regulations, incentives, and education is required to achieve a better quality of life for all CT residents.

The Connecticut Green Building Council (CTGBC) is a 501(c)(3) non-profit organization and a chapter of the US Green Building Council (USGBC). We are committed to transforming the way our buildings are designed, constructed, and operated through sustainable building practices. Our goal is to build spaces that are better for the environment and healthier for us to live, work and play in. Our membership includes developers, architects, engineers, building operators, public officials and more.

Sincerely,

Kai Starn, LEED AP BD+C
Board Member, CT Green Building Council
Co-chair, Advocacy Committee
Senior Sustainability Consultant, Steven Winter Associates

Melissa Kops, AIA, LEED AP BD+C, LFA
Board Vice Chair, CT Green Building Council
Co-chair, Advocacy Committee
Associate, Pirie Associate Architects

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 9:06 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: merrittjuliano@everyactioncustom.com <merrittjuliano@everyactioncustom.com>
Sent: Wednesday, October 21, 2020 8:59 AM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.
5. Include mental health in any public health resilience programming.

Thank you again for the opportunity to submit comments.

Sincerely,
Merritt Juliano
95 Long Lots Rd  Westport, CT 06880-3919 merrittjuliano@protonmail.com

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:32 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Meza Celis, Mary (2022) <mary.mezacelis@trincoll.edu>
**Sent:** Wednesday, October 21, 2020 9:09 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change,

Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit.

Nature is essential for the future, for evolution and for everything we need, and serves the public good now and for the long term.

We have so many beautiful natural areas, and some need to be protected for nature study, hiking, and places that people can count on. This has never been more important.

Meanwhile - we are burning and exporting our public forests? Who benefits? This is beyond disturbing.

We need systems that support good jobs, local resource use, AND natural areas.

Our public land is held in the public trust.

We need your leadership.

Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

Mary Meza Celis

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 7:04 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Grubb, Michael A. <michael.grubb@trincoll.edu>
**Sent:** Wednesday, October 21, 2020 6:46 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change,

Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit.

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We need systems that support good jobs, local resource use, AND natural areas.

Our public land is held in the public trust.

We need your leadership.

Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

Best,

Michael

**Michael A. Grubb, Ph.D.**

Assistant Professor of Psychology

Department of Psychology and Neuroscience Program

Trinity College

Hartford, CT

AttentionPerceptionDecision.com

he/him/his

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 6:21 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** MICHAEL AKPAN <metima@netscape.com>
**Sent:** Wednesday, October 21, 2020 5:48 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>; MICHAEL AKPAN <metima@netscape.com>
**Subject:** Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change, Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit. Nature is essential for the future, for evolution and for everything we need, and serves the public good now and for the long term. We have so many beautiful natural areas, and some need to be protected for nature study, hiking, and places that people can count on. This has never been more important. Meanwhile - we are burning and exporting our public forests? Who benefits? This is beyond disturbing. We need systems that support good jobs, local resource use, AND natural areas. Our public land is held in the public trust. We need your leadership. Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

Michael Akpan

860 514 3213

NEW ENGLAND FORESTRY FOUNDATION

October 21, 2020

Dear Members of the Governor's Council on Climate Change,

New England Forestry Foundation (NEFF) is grateful for the work of the various committees reporting to the Connecticut Governor's Council on Climate Change (GC3) and thankful for the opportunity to submit public comment on draft climate policy reports. Please find below public comment in reference to the following draft reports:

- Progress on Mitigation Strategies (see pages 1-4)
- Science and Technology (see pages 4-7)
- Infrastructure and Land Use Adaptation (see page 8)
- Forests Sub-Group (see page 8)

NEFF owns and manages more than 140 community forests covering 30,000 acres throughout New England, including four in Connecticut. Through the application of our core expertise in conserving forestland and advancing Exemplary Forestry, NEFF's mission is to help the people of New England to sustain their way of life, protect forest wildlife habitat and ecosystem services, and mitigate and adapt to climate change.

Consistent with that mission, NEFF advances a holistic, systems approach to addressing climate change that includes forest conservation (both wildlands and working woodlands), improved forest management and substitution of long-lived wood products for other building materials whose production creates significant carbon emissions, as part of a suite of strategies to achieve natural solutions from the forest sector.

**NEFF respectfully submits the following public comments in reference to the draft report of the Progress on Mitigation Strategies Working Group:**

These comments are divided between, 1) specific additions and adjustments to wording in the Buildings Sector chapter of the Progress on Mitigation Strategies draft report and, 2) a more comprehensive argument for further investigation on the part of DEEP and GC3 through 2021 of the benefits of modern wood products, such as mass timber, to minimize embodied carbon in state-funded construction.

**1.** The Buildings Sector Chapter in the Progress on Mitigation Strategies Report makes promising recommendations to address embodied carbon emissions and to build with lower-embodied carbon materials. In order to maximize the climate mitigation impact of these recommendations, NEFF recommends incorporating the following specific points of emphasis and additions into the final version of the report:

1.1. NEFF strongly supports the chapter's recommendations to be proactive with the adoption of building codes, described in the Enhancement section on page 8. In particular, Connecticut can make an important leap forward in facilitating low-embodied carbon construction by adopting the 2021 edition of the International Building Code (IBC), which includes provisions for building

with low-embodied carbon materials. Adopting the latest version of the IBC code should be a preliminary step towards implementing the new embodied carbon and stretch codes called for elsewhere in the chapter. NEFF therefore recommends adding the following strategy to the list on page 8: "Strategy 5: Department of Administrative Services prioritizes the adoption of the 2021 International Building Code." California, Oregon, Washington, and Utah have already adopted the 2021 IBC ahead of schedule, and Massachusetts is scheduled to adopt it on January 1, 2021. NEFF hopes that the buildings chapter will push Connecticut to prioritize this important update as well.

1.2. To ensure that embodied carbon accounting is applied to the full scope of state-funded construction, NEFF recommends making the following additions (highlighted in yellow) to Strategy 4 on page 8: "The state adopts a protocol for state-sponsored construction, affordable housing, school construction or renovation, and infrastructure projects that establishes goals, actions, and accounting and reporting procedures on minimizing embodied carbon."

1.3. NEFF recommends including the following additions to the fourth bullet point on page 9, which describes the Zero Carbon sustainability measure, for reasons explained further in the second portion of these comments on the benefits of wood construction: "Buildings designed to come close to carbon neutral (net zero) can become carbon negative through careful selection of carbon sequestering building materials, such as massive (mass) timber from sustainably harvested wood. In an optimal situation, this wood would come from working forests in Connecticut or at least the northeastern U.S."

1.4. On page 11, NEFF recommends that a bullet point be added to the New Strategy titled "Create a Building Performance Office," along the lines of the following: "The BPO would be charged with:… maintaining a data clearinghouse on embodied emissions in line with the embodied carbon codes and standards recommended in this chapter; and assisting individuals, developers, and other state agencies with strategies to reduce embodied carbon and to meet these standards in new construction projects of all types."

1.5. The concern for embodied carbon data reporting should also be folded into the New Strategy on page 12, titled, "Harness the power of data to guide, initiate, and track change." Collecting and administering data and information on embodied carbon will help stakeholders involved in new construction to reduce the climate impacts of building material selection. Specifically, this strategy should extend the same data gathering and reporting procedures that it currently describes for operations and retrofitting to the embodied emissions of new construction.

1.6. NEFF commends the Buildings Sector work group for including State Embodied Carbon Standards in Appendix 3B, "Strategies for Achieving High Performance Standards." Public leadership on reductions in embodied emissions will be crucial for developing familiarity with low-carbon construction materials and techniques, and thus their adoption more broadly. NEFF suggests strengthening the strategy on page 27 by making the following changes and additions: "We recommend that State agencies require the reduction of embodied carbon of materials and construction as a criterion when contracting for state-funded projects such as buildings, affordable housing, school construction or renovation, and infrastructure projects. Under this policy, new construction and infrastructure projects will be incentivized or required to reduce their embodied emissions by a certain amount below a baseline reference, which can be

tailored to various measures, for example the number of occupants, the building's size, its use, or a typical building from a certain year. This policy could be structured as a direct requirement for state-funded construction, or a greater cost share or lower interest rate financing as embodied emissions decrease. Moreover, we recommend that new state-funded building and infrastructure projects report their embodied emissions for public distribution, using specified state-approved methodologies. This informational policy can help to raise familiarity with embodied emissions among developers, architects, builders, and sustainability managers and serve as a data resource for future reductions efforts. Finally, the state's accounting and reporting procedures for embodied carbon should consider impacts across the entire lifecycle of construction materials, from the initial emissions associated with their extraction, harvesting, and/or production to the end-of-life impacts due to their disposal or, in an optimal situation, their recyclability."

**2**. While the Buildings Sector chapter currently takes a neutral stance towards the selection of materials in its embodied carbon recommendations, NEFF believes that Connecticut has much to gain from further investigating the benefits of sustainably harvested wood building elements, such as mass timber, as part of embodied carbon policies for state-funded construction. By recommending further study of the relationship between wood procurement for public buildings and forest management, Connecticut will be better positioned to explore the broader, systemic implications of individual materials. To efficiently tie embodied carbon policies to the necessary pre-cursor of improved forest management as part of nature-based solutions, NEFF recommends that the Buildings Sector chapter include the following: "We recommend that DEEP and GC3 investigate the co-benefits across GC3 sector priorities that could be realized by a policy that supports long-lived wood products, such as mass timber, sustainably harvested from Connecticut or nearby working forests, in state-funded buildings and affordable housing."

Wood procurement is an increasingly common tool for low-carbon public construction (deployed in various policies in California, British Columbia, and France, to name a few jurisdictions). A recommendation to investigate mass timber as an option for Connecticut should include pro-active public engagement of residents, neighbors, employees and small business people to review design elements and development impacts during community planning. Beyond the question of pursuing the most efficient policies, a preference for local, sustainably harvested wood could provide environmental justice and equity co-benefits:

- It is less expensive to build with massive (mass) timber at the mid-rise level (6-12 stories) of construction than with steel and concrete. This makes the wood materials a good candidate to go along with urban planning for fairer, denser development patterns. When mid-rise affordable housing is situated near transportation and community resources, it increases the number of low- and middle-income (LMI) individuals with equitable access to these resources including transportation options to employment that are not dependent on private automobiles; well-planned mid-rise housing can provide homes for more people in desirable locations than low-rise affordable housing. By improving access to necessary resources and services, such as public transit, grocery markets, schools, and job opportunities,

mid-rise mass timber development can foster more equitable and stronger communities, at a reasonable price point.

- Exposed mass timber can establish an additional connection with nature for urban residents, bringing some of the qualities of green spaces and forests into areas that may have reduced access to these amenities. When left exposed, mass timber also brings visual and aesthetic variety to urban landscapes and interiors. The colors and patterns of natural wood create a unique contrast with traditional urban construction materials. These attributes of mass timber augment and diversify the experience of the urban built environment. Finally, the field of environmental psychology has established the mental and physiological benefits of living spaces that include natural materials and patterns, such as those of wood. The findings of this discipline demonstrate that mass timber can provide significant advantages for the wellbeing of occupants, a key consideration that should be factored into state-funded affordable housing planning.

- Construction with mass timber requires far less time and heavy equipment on-site than construction with steel and concrete. It takes a crew of a few workers and a crane to construct a mass timber building in a fraction of the time required for a building made with traditional materials. These advantages decrease pollution from traffic obstructions and incoming construction vehicles. Communities where mass timber projects take place are thus less impacted by the construction process, both in terms of pollution exposure and noise and traffic disturbances. These features of mass timber construction minimize the negative impact on the quality of life for residents in surrounding areas – another important environmental justice consideration for any public development project.

**NEFF respectfully submits the following public comments in reference to the draft report of the Science and Technology Working Group:**

The GC3 Draft Report of the Science and Technology Working Group includes scientifically unfounded references to a new and untested approach to forest management on pages 12, 16 and 37 of the draft report PDF. The draft report claims that:

"Proforestation (growing existing natural forests) has recently been identified as the most powerful, low cost, and immediate mitigation opportunity with multiple immediate co-benefits and proven long-term resilience."

As evidence for this broad statement, the report first cites the 2019 paper that defined proforestation, coauthored by the committee's co-chair.[1] This report has since been cited 26 times since publication according to a Google Scholar search on the term "proforestation." By contrast, a search on scholarly articles for "sustainable forestry" and "climate change" yields 22,600 results. At this point in time, proforestation is not a well-established term with a history and track record of scientific study that provide an adequate basis for public policy. It is, at best, a hypothesis.

[1] William R. Moomaw et al., "Intact Forests in the United States: Proforestation Mitigates Climate Change and Serves the Greatest Good," *Frontiers in Forests for Global Change* 2 (2019): 1-10.

The cited paper also provides no data on costs and only compares the power of the mitigation opportunity to afforestation, reforestation, and biomass energy use—not to the full suite of forest management approaches or forest products. Thus the statement as worded is a substantial exaggeration of the claims of the cited paper.

The article that first put forward "proforestation" defines the term as "growing additional existing forests as intact ecosystems." Their definition of, proforestation seems to imply leaving forests unharvested forever for carbon build up opportunities. Unfortunately, the authors of the paper do not acknowledge the potential for improved forest management under the umbrella of the proforestation term and have made repeated public appearances and comments to this effect. The language in the report itself does the same thing. The term "proforestation," through the efforts of these authors, has come to mean a no-harvest, forest reserve scenario. The term has divided the forest community at a time when we should be promoting both the creation of forest reserves and the improvement of forest management to meet the climate crisis. Consequently, we believe the term should be eliminated from the report and replaced with appropriate language and citations supporting the creation of reserve areas for climate change.

According to supporters of the proforestation approach, the goal is to mitigate climate change by reducing forest harvest in existing forests. At a regional or state level, reductions in harvest have repeatedly been shown to result in leakage—the transfer of harvest to other locations, which may consume or cancel out 90% or more of any carbon accumulation locally. The article does not address either this leakage problem, or the global equilibrium economic effects of reducing harvest at a scale that would matter for carbon accounting; specifically, reducing forest harvest globally. Reducing harvest on a global scale will raise the prices of wood, causing increased use of alternatives such as plastics, steel and concrete—all of which have much higher carbon footprints. The net effect on a global scale could be a perverse increase in atmospheric carbon dioxide levels. In short, in their 2019 paper, Moomaw et al. present a strong case that growing additional existing forests as intact ecosystems could sequester more carbon than afforestation or reforestation, but they do not compare the effect of securing more intact forests to the effect of improving forest management on those same parcels, and they do not include the impacts of leakage or substitution on any carbon savings—both of which terms have been recognized as important principles of forest carbon accounting for 20 or more years.

For a report on science and technology, a more sophisticated analysis is both necessary and appropriate. Specifically, beyond the critique above the draft report also includes inappropriate and inaccurate citations of the studies it cites in support of proforestation. For example, it claims that proforestation "is one of three main strategies featured by the International Union for the Conservation of Nature." But the citation leads to an opinion blog, not a policy statement of the IUCN. The opinion blog focuses not on proforestation, which is briefly mentioned, but on the importance of conserving primary forests. The Working Group draft report next cites the Committee on the Environment, Public Health and Food Safety to the European Parliament; again the citation is exaggerated. The amendments referenced were proposed amendments to a draft opinion on the European Forest Strategy, which were ultimately omitted from the final resolution passed by the European Parliament on October 8th. The resolution as

actually adopted repeatedly cites sustainable forest management and use of wood products as carbon sequestration methods of choice.[2] Next the report claims that recent research shows that "older forests are best able to withstand (and young trees are more vulnerable to) the stresses of climate change." The article cited to support this statement focuses on the effects of warming and rainfall on growth of seedlings of six deciduous tree species, and in fact *only measured seedling mortality in its experimental framework.* No results relevant to distinguishing sensitivity of older versus younger forests are reported.

In contrast, McDowell and others (2020)[3] analyzed global data sets and determined, "Ongoing changes in environmental drivers and disturbance regimes are consistently increasing mortality and forcing forests toward shorter-statured and younger stands, reducing potential carbon storage." They also noted that "Large trees are the most susceptible to die from LUC-induced forest fragmentation (112, 113), drought (26), rising temperature or VPD (54, 62) (Fig. 4), windthrow (114, 115), biotic attacks (116), and lightning (101), with variable size impacts of fire (117). The abundance of size-dependent mortality drivers and disturbances should logically push stands toward younger and smaller distributions of trees and shorter statured species assemblages (118)."

These results are echoed in:

- Brodribb and others (2020)[4] who analyzed tree response to water stress and concluded that trees, like coral reefs, may face inflexible damage thresholds associated with water availability that are likely to be exceeded in the face of climate change with older, larger trees more vulnerable.
- Anderegg and others (2020)[5] who document increasing risks to forest carbon permanence over time and asserted that "nonstationary permanence risks must be rigorously assessed using the best available scientific tools and datasets and be included in policy and project planning."

These recent studies place new urgency on lessons from New England history. For example, the 1938 hurricane blew down 2.6 billion board feet in a single day. As this wood broke down it would release approximately 7.2 million metric tons of CO2, plus perhaps an equivalent additional amount of CO2 from leaves, branches and roots. Some of the best work on hurricane and wind disturbance has been done in New England, for example Boose et al 2001[6], Foster and Boose 1992[7] and Foster 1988.[8] Particularly significant is that Foster 1988 showed that increasing stand age, particularly in hardwood stands, results in progressively greater probability of blowdown. Thus, as Connecticut's primarily hardwood forests

[2] See paragraphs 5, 10, 13, and 24 of *European Parliament resolution of 8 October 2020 on the European Forest Strategy - The Way Forward*, available here: https://www.europarl.europa.eu/doceo/document/TA-9-2020-0257_EN.html

[3] Nate G. McDowell et al., "Pervasive shifts in forest dynamics in a changing world," *Science* 368, (May 2020).

[4] Timothy Brodribb et al., "Hanging by a thread? Forests and drought," *Science* 368 (2020): 261–266.

[5] William Anderegg et al., "Climate-driven risks to the climate mitigation potential of forests," *Science* 368, (2020).

[6] Emery R. Boose, Kristen E. Chamberlin, and David R. Foster, "Landscape and Regional Impacts of Hurricanes in New England," *Ecological Monographs* 71, no. 1 (2001): 27-48.

[7] David R. Foster and Emery R. Boose, "Patterns of Forest Damage Resulting from Catastrophic Wind in Central New England, USA," *Jounral of Ecology* 80, no. 1 (Mar. 1992): 79-98.

[8] David R. Foster, "Species and stand response to catastrophic wind in central New England, USA," *Journal of Ecology* 76 (1988): 135-151.

grow over the next 30 years, they will be at progressively greater risk of catastrophic blowdown from any given wind event. Exacerbating this trend is research showing the increasing strength of Atlantic hurricanes; for example, Holland and Bruyere (2014)[9] report "the proportion of Category 4 and 5 hurricanes has increased at a rate of ~25–30 % per °C of global warming after accounting for analysis and observing system changes." The combined effect is that each year the forests of New England are at greater risk of large-scale blowdown due to both greater age- and size-related vulnerability and growing hurricane intensity. Other disturbances also are widely reported to be growing in risk with climate change, including invasive insects and diseases; severe thunderstorms, microbursts, and derechos; and drought and the potential for large-scale fire.

Highlighting that increased windthrow is not the only risk to older forests is forest response in Europe over the last several decades. Following the severe summer 2018 European drought, which provides an interesting analogue for potential drought impacts on New England forests, Schuldt et al. (2020)[10] reported widespread mortality across genera common in New England including *Quercus, Pinus, Fagus,* and *Picea*. In particular, they note "unexpectedly strong drought-legacy effects were detected in 2019. This implies that the physiological recovery of trees was impaired after the 2018 drought event, leaving them highly vulnerable to secondary drought impacts such as insect or fungal pathogen attacks. As a consequence, mortality of trees triggered by the 2018 events is likely to continue for several years. Our assessment indicates that many common temperate European forest tree species are more vulnerable to extreme summer drought and heat waves than previously thought. As drought and heat events are likely to occur more frequently with the progression of climate change, temperate European forests might approach the point for a substantial ecological and economic transition." Other research suggests this transition is already underway. Senf et al (2020, preprint)[11] show that canopy mortality across temperate European forests increased steadily from 1985 to 2018, and projected future mortality. Their results project that "a continued increase in canopy mortality will strongly alter forest demography, with the median forest age falling below 30 years in more than 50% of Europe's countries by 2050."

To summarize, the most recent literature on forest disturbance does not support the hypothesis that proforestation would produce forests more resistant to increasing disturbances associated with climate change, and strongly suggests the opposite conclusion. By contrast, high quality forest management would allow foresters to accelerate adaptation of Connecticut forests to future climate by selecting tree species adapted to projected conditions, which could reduce unexpected carbon loss in forests and store some existing forest carbon as long-lived forest products. The report of the Science and Technology Working Group mischaracterizes the very literature it cites to attempt to make a case for the proforestation hypothesis, and ignores the vast body of other work supporting alternative approaches to using forests to mitigate the climate crisis.

[9] Greg Holland and Cindy L. Bruyere, "Recent intense hurricane response to global climate change," *Climate Dynamics* 42 (2014): 617-627.
[10] Bernhard Schuldt et al., "A first assessment of the impact of the extreme 2018 summer drought on Central European forests," *Basic and Applied Ecology* 45 (2020): 86-103.
[11] Cornelius Senf et al., "Increases in canopy mortality and their impact on the demographic structure of Europe's forests," (2020). Preprint, available at: https://www.biorxiv.org/content/10.1101/2020.03.30.015818v2.

**NEFF respectfully submits the following public comments in reference to the draft report of the Infrastructure and Land Use Adaptation Working Group:**

NEFF strongly supports the report's recommendations to update the state's building codes, described on page 23. In particular, Connecticut can make an important leap forward in facilitating low-embodied carbon construction by adopting the 2021 edition of the International Building Code (IBC), which includes provisions for building with low-embodied carbon materials. NEFF therefore recommends adding the following phrasing to the action description on page 23: "The Department of Administrative Services should prioritize the adoption of the 2021 International Building Code." Currently, Connecticut relies on the 2015 edition of the IBC. California, Oregon, Washington, and Utah have already adopted the 2021 IBC ahead of schedule, and Massachusetts is scheduled to adopt it on January 1, 2021. NEFF hopes that the Infrastructure and Land Use Adaptation report will push Connecticut to prioritize this important update as well.

**NEFF respectfully submits the following public comments in reference to the draft report of the Working and Natural Lands – Forests Sub-Group:**

NEFF joins the Connecticut forestry community in calling for the removal of the term "proforestation" from the Forests Sub-Group draft report. Proforestation is at times portrayed by its small group of supporters as the creation of appropriate forest reserves where no or minimal management takes place, an approach which NEFF in principal supports. However, the proforestation position has in reality taken on a much more extreme connotation through the discourse and advocacy behind it, becoming associated with a drive to end sustainable, multi-use management of forests in New England. This approach ignores much of the systemic complexity of forests and their role in climate change mitigation, as it is based on a narrow embrace of in-forest carbon sequestration; carbon leakage and the social benefits and burdens associated with natural resource production are excluded from the proforestation analysis. In contrast, NEFF and its partners across the Connecticut forestry community support a science-based, systemic approach to sustainable forest management and forest-based climate change mitigation. NEFF strongly believes that the implementation of the proforestation concept would be detrimental for the people of Connecticut, its forests, and state and regional efforts to mitigate climate change, and could well result in a perverse increase in atmospheric carbon dioxide levels. We recommend that this term be removed from the draft report.

Thank you again for considering these comments. NEFF is grateful for the dedicated work of GC3 members and DEEP staff. We look forward to continuing our engagement with you all to help Connecticut mitigate and adapt to climate change.

**Sincerely,**

**Robert T. Perschel, Executive Director**

**Frank Lowenstein, Chief Operating Officer**

**New England Forestry Foundation**
**32 Foster St,**
**Littleton, MA 01460**

**Bob Perschel** joined NEFF as Ex. Dir. in April 2012. In his 35 years as an environmental professional he has worked on forestry, large landscape conservation, and wilderness issues. Previously Eastern region director for the Forest Stewards Guild, Bob worked for the forest industry before establishing his own forestry consulting business, including work in Connecticut, and founding the Land Ethic Institute. He is an original co-founder of the Forest Stewards Guild. Bob has a master's degree in forestry from the Yale School of Forestry and Environmental Studies and a psychology degree from Yale College.

**Frank Lowenstein** joined New England Forestry Foundation as Deputy Director in December 2013, and is now COO. He has played a critical role in overseeing and advancing NEFF's climate change mitigation and adaptation work, policy engagement and strategic planning. He also leads NEFF's Exemplary Forestry Center, which seeks to maximize the contributions of New England forests to mitigating damaging climate change. Prior to joining NEFF, Frank worked for more than 20 years for The Nature Conservancy, where he led programs ranging from community-based conservation in the Berkshires and Connecticut's Northwest Corner to leading the organization's global climate adaptation work. He is a Switzer Fellow, a former Senior Fellow in the U.S. Department of State's Energy and Climate Partnership of the Americas, author of three books including Clothed in Bark, and adjunct faculty in Environmental Studies at Brandeis University and the Masters of Sustainability program at Harvard University Extension School.

**From:** Michael Ferrucci, Professional Forester

**To:** The Governor's Council on Climate Change, Forests and Working Lands Subcommittee

**Copy:** The Governor's Council on Climate Change, Climate Change, Science and Technology

**Re:** Draft report on Forests and Working Lands

As a professional forester with 41 years of field experience and two professional forestry degrees I submit my comments on the Draft Forests and Working Lands Subcommittee Report.

My comments are primarily drawn from my experience as a forest manager, as a sustainable forestry auditor with experience in 37 states, and as a forestry consultant. In my forestry work I strive to incorporate the best available science. Although I am not a scientist or researcher myself, I have worked with many scientists throughout my forestry career. I have sought to understand their results and to ask questions to help guide their efforts to provide research that can answer practical forestry problems. I provide my credentials at the end of this letter.

Page-specific edits are provided separately (within two additional MS Word documents). Many of these page-specific edits were developed by others, with the understanding that I would review, edit, and then submit these. I support all of these edits/comments. As such you can consider them mine, but I must acknowledge the significant work done by others who choose to remain anonymous, or whose name was removed unintentionally in the compilation process.

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Many parts of the "Forests Sub-Group Draft Report" make compelling and important points which I agree with. Overall, with notable exceptions, I find the report to be reasonable.

The report has several significant shortcomings, which I list in an order based on both their importance to me and my level of understanding of the factors involved.

1. There is insufficient scientific or practical support for the ideas associated with "proforestation". This unproven concept should be removed from this report, and from the report of the Climate Change, Science and Technology Subcommittee. If left in these reports, the report's sections which advocate proforestation will be used by the proforestation movement to increasingly hamper efforts to sustainably manage our forests, affecting all of the other issues mentioned below.

2. The emerging fields of forest carbon dynamics, as well as forest science of all types, are providing new insights into how our forests function. There is much that we know, but there is also much scientific uncertainty remaining. For example, we don't really know that old forests are the best answer for "climate forcing gasses". The role of methane from trees in old forests is starting to become apparent. And while older forests may store more carbon, younger, faster-growing forests appear to be better at taking up (sequestering) carbon. These uncertainties would argue against a dramatic change of course in terms of managing our forests.

3. The importance of managing for resilience is not emphasized enough in the report. Nor are the practical challenges of doing so. Many of the emerging techniques, including methods for the recruitment and establishment of young trees and the control of invasive, exotic plants, will be difficult and expensive to implement. The report should emphasize ways to provide more resources for forest managers to deploy. Instead there is an emphasis on removing opportunities to harvest useful, valuable forest products that could help defray some management costs.

4. The report does not give adequate weight to the problems stemming from an aging, dynamic forest subject to both natural and man-caused or enhanced disturbances.

5. Single-use management has a history of failure. I elaborated on this in my letter to the Science and Technology Work Group, which was copied to this group. Our forest managers know how to manage forests for multiple values, services, benefits, and products. Forest managers are learning to factor carbon considerations into the decision-making process. Placing carbon storage as the sole goal, or even making it the most-important goal at all times and in all forests, will have negative consequences for many other forest values.

6. The forests we enjoy now are valuable in part due to "natural" forces and components. However, it is the political, social, and economic actions and polies that people have conceived, articulated, and implemented which have primarily shaped this amazing forest. This legacy of **active forest management** is not emphasized enough in the report. In the future Connecticut's citizens will not be blessed with a similarly-valuable and useful forest without active forest management, and more of it than we have now.

7. Foresters who have long managed many parts of the state's forestlands have been mostly absent from the discussions that led to this draft. This can be addressed by fairly considering and fully incorporating the many comments you have received from practicing foresters, including this one.

8. The use of forest products that have been grown and harvested in our state is not sufficiently emphasized. Recent events have shown that it would be wise for all Americans to resist the impulse to obtain life's necessities from far away. With forest products this is often done to avoid the seemingly unpleasant aspects of productive, "working" lands. Until fairly recently, New England's people produced a significant share of our food and fiber locally. Carbon costs associated with transportation of these resources from afar should be considered, and local production encouraged.

9. The draft report gives insufficient treatment of the role of long-lived forest products in the report. Our planet's population is increasing. All people seek a better life. Wooden housing and wooden commercial buildings of all kinds can store carbon and provide important components of that good life. Some of the lumber for these wooden buildings

and building components can come from Connecticut.

10. There are missed opportunities to address the urban-rural divide, in terms of access to resources and equity considerations of an approach that prevents rural industries and rural people from access to timber and firewood. Forests **are** amazing places for humans to enjoy, relax, exercise, study nature, learn, refresh, and restore. Many of our state's urban and rural people lack the understanding and resources to fully realize the opportunities. But rural people can often struggle economically. For them, and others, forests are more than places to enjoy and recreate. The forest can provide meaningful work for those who live in and near it, including jobs in management for forest products and jobs in support of recreational activities. The economic equity considerations should be prominent in the report.

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I have previously communicated a significant process concern. Forestry issues should properly only be addressed in your subcommittee, and not in the Science and Technology Working Group. Your committee members encompass a range of professional and scientific credentials essential to understanding the complexities of forest carbon dynamics. Further, your subcommittee has heard from practicing foresters, although perhaps not enough of them prior to the release of your draft report. Finally, foresters and forest scientists expected your subcommittee to work on the issues that we are involved with, while few of us knew of the work done in the Science and Technology Working Group until their draft report was released.

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**Process Note:**

There are two separate word files provided in conjunction with this letter:

A. GC3 Forest Sub.Comments.DEEP.Urban.Vulnerable.COMPILED by FERRUCCI A

B. GC3 Forest Sub.Comments.COMPILED by FERRUCCI B

These edits and comments from various colleagues were compiled by Mike Ferrucci. This compilation was done in an attempt to help streamline the process used by the subcommittee to review comments. (There are two separate word documents because I couldn't combine these two documents without introducing errors and formatting issues.)

The edits should be easy to see if the "Markup" is shown, by selecting "All Markup" under "Track Changes" in MS Word.

Please contact Mike Ferrucci (mferrucci@iforest.com ) if it would be helpful to provide these comments in a different format or alternative version of MS Word.

**Michael Ferrucci Bio**

mferrucci@iforest.com

26 Commerce Drive, North Branford, CT 06471

203-887-9248 (Office and Cell Phone)

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## General Background

Mike Ferrucci has 42 years of forestry experience. His expertise is in sustainable forest management planning; in certification of forests as sustainably managed; in the application of easements for large-scale working forests, and in the ecology, silviculture, and management of mixed species forests, with an emphasis on regeneration and management of native hardwood species. Mike has conducted or participated in assessments of forest management operations throughout the United States, with field experience in 4 countries and 37 states. Mike has been a member of the Society of American Foresters for over 42 years.

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## Employment History

**Senior Consultant, R.S. Berg and Associates**

October 2014 to Present Time

Principal Duties

1. **SBP, SFI, PEFC and FSC Forestry and Chain of Custody Consultant**

Provide strategic advice, detailed certification programs, training, internal audits, and responses to non-conformances for a range of clients in all sectors of the US forest products industry.

**Managing Partner, Interforest LLC**

January 1, 1996 (incorporation of the company) to Present Time

Principal Duties

1. **Company Management**

Responsible for all aspects of managing the company, including HR/personnel, accounting, marketing, sales, and project management. Hired and supervised three full-time employees, and recruited and assigned more than 20 consultants to various projects.

2. **SFI and FSC Forestry and Chain of Custody Lead Auditor/Consultant**

Trained and experienced as an auditor for the Sustainable Biomass Partnership (SBP), an SFI Lead Auditor for Forest Management, Procurement (Fiber Sourcing), and Chain of Custody, as an FSC Lead Auditor Forest Management and Chain of Custody, as a PEFC Lead Auditor for Chain of Custody, and as a Tree Farm Group Certification Lead Auditor. He is also trained as a

RAB-QSA Lead Auditor (ISO 14001 Environmental Management Systems) and as a Greenhouse Gas Lead Auditor.

Led Sustainable Forest Initiative® (SFI®) certification and precertification reviews throughout the United States. Led or participated in joint SFI and Forest Stewardship Council® (FSC®) certification projects in nearly one dozen states and a joint scoping or precertification gap-analysis project on tribal lands throughout the United States. Co-led the pioneering pilot dual evaluations on two U.S. National Forests. Experienced on all aspects of forest management certification since 2000.

For 12 years (October 2002 through September 2014), working as a contractor through Interforest, served as the part-time SFI Program Manager for NSF – International Strategic Registrations responsible for all aspects of the firm's SFI Certification programs. Developed and managed one of the largest forest and chain of custody certification programs in the U.S.

Conducted Chain of Custody audits for all segments of the forest products industry, including printers, corrugated and box producers, integrated paper companies, paper distributors, solid wood mills, engineered wood products facilities, brokers, and distributors. In audits with pulp mills, corrugated producers, and box plants addressed the issues involving recycled content.

**3. Senior Consultant**

Participated as a consultant and project leader working on integrated teams of experts to help clients reexamine their goals, assess their current strategies to reach their goals, define gaps between current goals and reality, and create pathways to pursue excellence. Projects generally had elements of:

•Resource management strategy development and spatial planning (on the ground);

•Organizational and leadership development (inside the organization); and

•Survey research and public involvement strategies (with important publics)

**<u>Managing Co-Partner, Ferrucci & Walicki LLC</u>**

January 1981 to December 2003 (Also Silent Partner January 2004 to July 1, 2013)

Principal Duties

**1. Company Management**

Responsible (with a partner) for all aspects of managing the company, including HR/personnel, accounting, marketing, sales, and project management. Hired and supervised many full-time employees. Developed an on-going forest management consulting business that still operates.

**2. Field Forester**

Provided forest management services including forest inventory, management planning and the development of silvicultural prescriptions, locating property boundaries, selling forest products

(chiefly sawtimber) and managing forested watersheds for the protection of public drinking water reservoirs. Clients included families, youth and church camps, water and electric utilities, and investors. Most of the work was in Connecticut, with some clients in the adjacent states of Rhode Island, Massachusetts, and New York.

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**Instructor, Yale School of Forestry and Environmental Studies**

January 1996 through June 2020

Primary Courses Taught (in order from longest involvement to least involvement):

- Forest Management Operations (18 years)
- Southern Forest Management Field Trip (Led or Co-Led 17 one-week trips)
- Professional Forest Ethics (14+ workshops)
- Yale-TUM (Munich) Field Trips
  (7 weeks including US, Germany, France, Austria, Slovenia, and Croatia)
- Fall Forest Management Field Trip (2013, 2014, 2015, 2016, 2018, 2019)
- Other (team taught): Forest Management, Private Forestry, and Financial Analysis

DRAFT 9.10.2020 for Public Comment

Forests Sub-Group
Working and Natural Lands Working Group
9/10/2020

NOTES: Edits and comments from various colleagues were compiled by Mike Ferrucci and are placed within a word version of the draft report. This compilation was done in an attempt to help streamline the process used by the subcommittee to review our comments, and then hopefully incorporate them.

The edits can be readily seen if the "Markup" text is shown, by selecting "All Markup" under "Track Changes" in MS Word. There are also many substantive comments.

Please contact Mike Ferrucci (mferrucci@iforest.com) if it would be helpful to provide these comments in a different format or alternative version of MS Word.

A. GC3 Forest Sub.Comments.DEEP.Urban.Vulnerable Populations.COMPILED by FERRUCCI A (this document)
B. GC3 Forest Sub Report. Comments.COMPILED by FERRUCCI B

## Acknowledgements

Over the course of 5 months, the Forests Sub-Group held 9 public meetings, organized 20 presentations from experts on various issues related to forests and climate change, built a resource catalog of over 40 peer-reviewed journal articles, and kept up an enthusiastic pace thanks to the wisdom, expertise, and commitment of its members.

The following members of the Forests Sub-Group who all contributed to this report are listed below with their organizational affiliations:

- Tim Abbott, Housatonic Valley Association
- Mark Ashton, Yale School of Forestry & Environmental Studies
- Patrick Comins, Connecticut Audubon Society
- Thomas Easley, Yale School of Forestry & Environmental Studies
- Robert Fahey, University of Connecticut, Natural Resources and the Environment
- Edward Faison, Highstead
- David Gumbart, The Nature Conservancy – CT Chapter
- Eric Hammerling, Connecticut Forest & Park Association, Chair
- Lisa Hayden, New England Forestry Foundation
- Charles Leigus, Supreme Forest Products, Inc.
- Amy Paterson, Connecticut Land Conservation Council
- Herb Virgo, Keney Park Sustainability Project

The CT Department of Energy and Environmental Protection also deserves enormous credit for supporting the efforts of this Sub-Group in addition to their "day jobs." In particular, the SubGroup wants to thank Commissioner Katie Dykes for enabling Rick Jacobson, Chris Martin, Cary Lynch, and Jaimeson Sinclair to be so engaged and helpful throughout this process.

We also want to recognize the other Sub-Groups of the Working and Natural Lands Working Group – Agriculture/Soils, Rivers, Wetlands – as well as the Equity and Environmental Justice Working Group, the Science & Technology Working Group, and the Progress on Mitigation Strategies Working Group for their partnership on forest issues and to make our Sub-group and process as inclusive as it should be.

Lastly, we thank Governor Lamont for re-energizing the Governor's Council on Climate Change through Executive Order #3 which gave our Sub-Group its overall charge to create this report.

In the following report, the Forests Sub-Group endeavors to give you a better understanding of Connecticut's forests and the important role they play in helping Connecticut to adapt, become more resilient, and mitigate the many challenges we face due to climate change.

## Contents

## Executive Summary

### Background

In its 2018 report, Building a Low Carbon Future for Connecticut: Achieving a 45% GHG Reduction by 2030,[1] the Governor's Council on Climate Change (GC3) recognized natural and working lands as important carbon sinks that could help mitigate emissions from the electricity generation, transportation, and building sectors which together produce almost 60% of Connecticut's greenhouse gas (GHG) emissions.[2]

The GC3 recommended that Connecticut continue to work with non-governmental organizations like the U.S. Climate Alliance in efforts to regionally develop carbon sequestration and storage practices.[3] The council also recommended that "DEEP should work with land trusts, forest owners, and working lands managers to help adopt carbon accounting methodologies that further support sustainable land-use practices."

In 2018, Connecticut joined with over 25 states in accepting the U.S. Climate Alliance's Natural and Working Lands Challenge[4] with a commitment to the following actions:

- Improve inventory methods for land-based carbon flux;
- Identify best practices to reduce GHG emissions and increase resilient carbon sequestration;
- Advance programs, policies, and incentives to reduce GHG emissions and enhance resilient carbon sequestration;
- Undertake actions that will support a collective, Alliance-wide goal to maintain natural and working lands as a net sink of carbon and protect and increase carbon storage capacity, while balancing near- and long-term sequestration objectives; and
- Integrate priority actions and pathways into state GHG mitigation plans within two years of joining this challenge.

Although none of these actions are "completed" at this time, Connecticut continues to work toward these goals both individually and in partnership with neighboring states, academia, and nonprofit organizations as well as the private sector. Many of the recommendations in this report are tied to furthering the commitments Connecticut made in 2018.

### Summary of Report

Climate change is an enormous threat to Connecticut's forests and people, and we must respond boldly with urgent action.

This report recommends policy, funding, conservation, research, and stewardship actions which would both make forests more resilient and enhance their potential for sequestering and storing carbon as a significant and growing offset for GHG emissions from other sectors.

Following is a summary of the major recommendations and findings in this report:

***We are all forest dwellers.*** Connecticut's dominant land type is "forest" which covers approximately 59% of the state. Go here for more on the Status of Connecticut's forests.

***Resilient forests provide many benefits to people and nature***, such as reducing heat stress and lowering energy bills by providing shade; improving air quality and providing physical and mental health benefits; supporting local wood products, jobs, and economic benefits; sustaining wildlife habitats and more livable communities for people; storing and sequestering carbon; and much more. Go here for the benefits forests provide to Connecticut.

***Forest resiliency is threatened by various factors***. Although forests are an important carbon sink in Connecticut, our forests may become less resilient and effective at adapting to and mitigating climate change due to a mix of factors (invasive plants and forest pests; over-browse by deer impacting forest regeneration; forest conversion to other uses creating more vulnerable forest edges; air pollution; more intense weather events; etc.). Go here for threats to forest resiliency.

***Connecticut's forests are valuable for carbon storage***. Connecticut's forests are the most "carbon dense" (most above-ground carbon stored/acre), oldest (~16% of our forests are 100+ years old), and have the highest annual net growth in forest biomass in the Northeast (net growth exceeds net removals from timber harvests or salvage operations by more than 500%). Go here for forests as mitigation to climate change.

***Keep forests as forests***. Protecting healthy forests and preventing the conversion of forestland to other uses are likely the most important things we can do to allow forests to both adapt to and mitigate climate change. Recommendations in the report include setting a goal for increasing Connecticut's forest cover, protecting and connecting core forests, and dedicating more resources to work with private landowners (who own ~71% of Connecticut's forestland). Go here for recommendations on forest adaptation/resiliency, and go here for recommendations on mitigation.

***Retain large trees in forests and residential areas***. Large trees often provide a significant amount of the carbon and other benefits that trees provide in both urban/residential and rural settings. Retaining large trees and forest cover whenever possible should be actively encouraged. Go here for recommendations on large trees.

***Climate change is impacting vulnerable people the hardest, and there are significant inequities*** both in the locations where trees are, and are not, currently providing benefits to people. These inequities are most apparent in our cities where communities with the highest poverty rates and health inequities tend to also have the lowest tree canopy cover and direct connections to green spaces. Go here for impacts of climate change on vulnerable populations.

***Energize a Youth Conservation Corps*** for another "tree planting army" like the original Civilian Conservation Corps (CCC) to provide outdoor jobs, build trust and cultural understanding of green spaces at the community level, clean-up/plant-up open spaces to benefit both urban and rural environments, and at the same time encourage conservation career opportunities for people of color. Go here for supporting community interest in trees and green spaces.

***Vulnerable forest types require focused protection.*** There are a number of specialized forest types (freshwater forested wetlands, pitch pine-scrub oak, riparian forests alongside cold-water

streams and headwaters, lowland Atlantic white cedar, and other forest types) that should be priorities for protection. Go here for the impacts of climate change on special forest types.

***Establish forest carbon baseline and goals for Connecticut***. Under the Global Warming Solutions Act (GWSA), Connecticut has established significant goals for reducing emissions from the transportation, energy, and building sectors to combat climate change. Connecticut should add similar goals to the GWSA for carbon storage and ongoing "negative emissions" (carbon and other greenhouse gas sinks) that forests, wetlands, soils, and other natural climate solutions can provide. Go here for the need for Connecticut's forest carbon baseline and goals.

***Commitments to funding, programs, and resources are critical.*** Enhancing existing funding programs, funding long-term research initiatives, establishing new sources of revenue, and providing tax incentives for acquisition and stewardship must be priorities. Go here for recommended funding, programs, and resources.

***Adopt a "No Net Loss of Forest" policy for Connecticut*** to support all of the recommendations above by:

(1) Keeping forests as forests to retain the multiple benefits of carbon storage, biodiversity, public health, green infrastructure, etc.

(2) Protecting healthy, intact forests to ensure that impacts upon forests, sensitive habitats, and other natural climate solutions are considered at every level of planning.

(3) Offsetting all planned or permitted forest losses through a combination of compensatory mitigation requirements and other tools.

(4) Providing financial incentives for stewardship, forest retention, and forest resiliency on privately-owned forestlands; and

(5) Protecting urban forests, building more parks, and planting more trees and gardens to maximize the benefits to people of trees and green spaces. Go here for more on a "No Net Loss of Forest" policy for Connecticut.

There are many factors to consider simultaneously with forests which makes any single recommendation on their future insufficient. It will likely require a full suite of conservation strategies working together to manage for a variety of values and uses on a long-term timescale using peer-reviewed science and a holistic understanding of forest systems.

In addition, any comprehensive climate policy solutions for forests should strive to address the challenges of 1) the *longevity* of the approach, 2) *additionality* (that the action would not have taken place anyway), 3) *leakage* (that the mitigation action is not pushing the activity elsewhere where it may cause more damage), and 4) *substitution*, the carbon implications of using one material instead of another compared to keeping carbon stored in the forest.[5,6] This kind of approach can help ensure that southern New England forests continue to capture and store carbon, maintain ecosystem functions and services, and decrease global deforestation.[7]

## Status of Connecticut's Forests

Connecticut's forests and trees add immensely to the quality of life for the people of the state. They filter the air that is breathed, safeguard private and public drinking water sources, produce locally grown forest products, provide essential habitat for wildlife, and moderate summer and winter temperatures near homes and businesses. They also have the potential to absorb and store atmospheric carbon which is currently increasing beyond historic and naturally occurring levels.

### Carbon Storage in Connecticut's Forests

The most recent national Forest Carbon Inventory published by the USDA Forest Service documents 191 million metric tons (MMT) of Carbon in Connecticut's forests in 2019, which has increased by ~9 MMT over the past decade. Of note, these Forest Service figures do not include individual trees or groups of trees that may not fit the standard definition of "forest." The Forest Service's definition of forest land is at least one continuous acre of forest canopy cover.[8] A different type of carbon pool exists in the urban forest. Connecticut is a heavily urbanized state. According to Forest Service analysis, 36.4% of the land area of the state is urban (1.13 million acres), with 87.7% of the population, nearly 3 million people, living in these urban areas (FIA). Despite the high population concentration in these areas, these same lands have a fairly high degree of tree cover, with tree canopy cover estimated at nearly 50%. These urban trees are storing about 22.5 million tons of carbon and continue to sequester carbon at the rate of about 744 thousand tons per year (FIA). The importance of urban trees is magnified by their proximity to people and co-benefits for health, energy savings, flood retention, and more.[9]

### Forest Quantity is Good but Highest Quality Forests are Getting Fragmented

Approximately 59% of Connecticut is "forested" and this percentage has remained relatively flat since 2010.[10]

**Figure 1.** Historic Forest Cover in Connecticut.[11]

Connecticut's forests have made a remarkable comeback after being cleared, primarily for agriculture, starting in the 1700's. At the low point in ~1860, only 30% of Connecticut's forests remained (approximately half of the forest cover we enjoy today). As the forests grew back they were repeatedly cut for charcoal fuel that fed the industrial age until about 1920 when coal and petroleum replaced wood-based fuel.

Of the 59% forested area, preliminary findings show ~53% of Connecticut's forest are core forest, larger blocks of forest that are generally more important for wildlife habitat, drinking water supply protection, ecological resilience, and a sustainable supply of lumber, homeowner firewood, and other forest products.

**Larger core forests of 500+ acres have been the fastest declining forest type losing approximately 120,000 acres over 30 years from 1985 to 2015**.[12] In fact, 1985 to 2015, Connecticut lost about 465 km2 of forest cover to development—about 5.8% of the forest that existed in 1985. Loss of core forest during that period was about 719 km2, a relative change of 15.7% from 1985 levels. In fact, core forest was lost at a pace (24 km2 per year) more than 1.5 times the pace of the loss of total forest (15 km2 per year).[13]

**Figure 2.** Forest fragmentation by forest category. Source: 2015 CT Forest Action Plan. **Note that Connecticut's 2020 Forest Action Plan is due to be published at the end of 2020.

### Dominant Forest Types and Age Structure

Oak/Hickory is the most common forest type with red maple being the most common tree. Regarding tree age and forest demographics, Connecticut's forests are growing older with less age diversity. Despite significant tree mortality between 2013 and 2018 due to Gypsy moth and Emerald ash borer infestations, net annual growth in aboveground forest biomass continued to exceed annual removals by more than five times.[14]

The following figures provide a quick snapshot of Connecticut's forest types and age structure:
**Figure 3.** Percentage of forest cover in Connecticut by forest type. Source: 2015 CT Forest Action Plan.
**Figure 4.** Forest cover in Connecticut grouped by age classes. Source: 2015 CT Forest Action Plan.

### Who Owns the Woods?

Of Connecticut's approximate 1.8 million acres of woodlands, 71% is owned by private individuals, corporate landholders (including private water companies), and land trusts. The remaining forestland is owned by the state (17%), municipalities (11%), and minimal federal lands (1%).

**Figure 5.** Forestland in Connecticut with percentage of ownership. Private includes individuals/families, land trusts, private water companies, and corporate landowners. Source: USDA Forest Service FIA Program (2018).

Likely contributing to an aging forest is the low interest in active forest management by most individual forest landowners. A 2015 Connecticut Woodland Owners (CWO) Survey report documented that the primary ownership objectives tend to be beauty/scenery, privacy, wildlife viewing, and nature protection, with only 21% having cut trees at some time during their ownership. 59% of these landowners have cut trees for their personal home heating purposes. Many woodland owners believe that "hands off, let nature take its course" is the best approach.[15]

The 2015 CWO Survey also showed these owners believe conserving their woodlands is extremely important - they almost unanimously say they would like their land to stay wooded (95%). Hence there exists considerable opportunity to retain Connecticut existing forests as forest. However, most woodland owners would require financial compensation to permanently protect their forest values through a conservation easement.

These same woodland owners are also discouraged and deeply concerned with invasive plants and insects which are disrupting their woodlands. Fortunately, the USDA Natural Resources Conservation Service has invested millions of dollars in Connecticut annually for several years through federal assistance programs such as the Environmental Quality Incentives Program and Regional Conservation Partnerships Programs. These USDA Farm Bill-funded programs encourage property owners to engage and invest in the health, diversity and sustainability of their woodlands. DEEP's Cooperative Forestry Program also offers technical assistance to these woodland owners supported by the USDA Forest Service. DEEP Service Foresters direct woodland owners to these resources and qualified professional foresters and wildlife biologists to make informed decisions. The more programs and professionals that engage with landowners on stewardship of their woods, the more likely these landowners will continue as long-term, dedicated stewards of their woodlands.

Deleted: 8

**Because the vast majority of Connecticut's forests are privately owned, engaging family forest landowners, corporate landholders, and land trusts is critical to maintain and increase resilient sequestration and storage of forest carbon in Connecticut.**

## Management of Forests on Department of Energy and Environmental Protection (DEEP)DEEP Properties

The concept of a State Forest system in Connecticut was conceived by foresters and other conservationists in the late 1800s. These visionaries were dismayed by the poor condition of privately-owned woodlands that were repeatedly cut over and burned with no regard for the future.

In 1903, the first Connecticut State Forest was established in 1903 to serve as a demonstration area for sound forestry practices.[1]

Connecticut has 33 State Forests on about 175,000 acres that are managed for the sustainable growth of wood products, forest health, watershed protection, carbon sequestration and storage, diverse wildlife habitat, and recreation compatible with these uses.

These lands are well protected from development. In 2018, an amendment to the State's Constitution was passed which requires a public hearing and a 2/3 vote by the General Assembly before DEEP lands can be transferred, sold, or otherwise conveyed.[2]

## Forest Management Plan Status

Forest Management Plans are developed by DEEP State Lands foresters. The Plans are based on data from extensive inventory plots and receive input from other DEEP Divisions such as Wildlife, Fisheries, Parks, Natural Diversity Database, local officials, and organizations such as historical societies and conservation groups. The plans are due to be updated every 10 years. It has been challenging for DEEP to keep its Forest Management Plans up-to-date due to inadequate staff resources. All active Forest Management Plans are posted online by DEEP.[3]


**Figure 6.** Status of Forest Management Plans on State Forests with acres and percentages as of June, 2020. Source: DEEP Forestry

**Deleted:** All forested land held by the CT Department of Energy & Environmental Protection (DEEP) can¶
be classified as either "actively managed" or "passively managed." Actively managed lands may¶
support periodic forest, or wildlife habitat management through commercial sales of forest¶
products or other tree and vegetation removal treatments. Passive management lands are¶
generally reserved from commercial forest product harvesting, and left to grow without¶
designed professional intervention.¶

**Deleted:** State Forests are managed based upon Forest Management Plans developed by professional¶
state land foresters at DEEP. These Forest Management Plans, which receive input from¶
interested parties (which varies based upon location) as well as DEEP resource managers in the¶
Wildlife and other divisions, are due to be updated every 10 years. It has been difficult for DEEP¶
to keep its Forest Management Plans up-to-date due to inadequate staff resources to stay on¶
top of this ongoing planning need. All currently active Forest Management Plans are posted¶
online by DEEP.16¶
**Figure 6.** Status of Forest Management Plans with acres and percentages as of June, 2020. Source: DEEP Forestry.¶
9¶

## Active and Passive Management on DEEP Properties

State Forests and Wildlife Management Areas (WMAs) are subject to periodic forest and wildlife habitat management with the goals of improving forest health and augmenting conditions for wildlife.

### State Forests

There are 33 State Forests on approximately 175,000 acres (because not all DEEP land records have been added to the GIS DEEP Property Layer to date, the figure of 168,960 acres of State Forests will be used); 162,379 acres are forestland.[4]

All DEEP forested land can be classified as either "actively managed" or "passively managed." Actively managed lands may support periodic forest or wildlife habitat management through commercial sales of forest products or other tree and vegetation removal treatments. Active management uses silviculture that promotes both horizontal and vertical structural complexity. Durable wood products from timber harvests, such as lumber and railroad ties, store carbon and substitute for more carbon intensive products such as concrete, aluminum, and steel.[5]

Planning guidelines allow for designed passive management, or forest reserve areas in the State Forests, called Old Forest Land Management Sites (OFLMS). They are selected to be subject to the forces of nature with minimal or no human intervention.

As shown in Figure 6, 64,579 acres of State Forests have current management plans.

**Active management**: 28,150 acres (44% of acres with management plans) are classified as active management.
On average, DEEP conducts active management on 1,000 – 1,500 acres/year (less than 1% of all State Forest lands) based upon forest management plan prescriptions.[6]

All timber harvests on DEEP lands are administered by DEEP State Lands foresters and use Best Management Practices. The draft 2020 Forest Action Plan written by the Division of Forestry (currently undergoing internal review as of this writing, and soon to be available to the public) states that from 2015-2019, 17.3% of the annual growth on State Forests was harvested each year.

**Passive management**: 36,429 acres (56% of acres with management plans) are classified as passive management.
These fall into the following categories:

- **Old Forest Management Sites** (planned Forest Reserves): **14,077 acres**
- **Inoperable Sites** (surface stones, excessive soil moisture, steep slopes, etc.): **16,864 acres**
- **Inaccessible Sites** (cannot currently be accessed to be managed): **5,488 acres**

### Wildlife Management Areas (WMAs)

There are 34,000 acres of Wildlife Management Areas; 19,812 acres are forestland using GIS analysis and CT Land Cover Assessment data.
State WMAs are managed to provide habitat for both common and uncommon wildlife and to provide for wildlife-based recreation (hunting, fishing, trapping and wildlife viewing) in support of



**Deleted:** Active and Passive Management on DEEP Properties¶
State Forests and Wildlife Management Areas (WMAs) are subject to periodic forest and¶
wildlife habitat management with the goals of improving forest health and augmenting¶
conditions for wildlife.¶
State Forests¶
32 State Forests cover approximately 170,000-acres and include a mix of active and passive¶
management.17 On average, DEEP is conducting active management on an average of 1,000 –¶
1,500 acres/year (less than 1% of all State Forest lands annually) based upon forest¶
management plan prescriptions.18 Current program-specific planning guidelines allow for¶
designed passive management, or forest reserve areas within and throughout the State Forest¶
landscape. Old Forest Land Management Sites (OFLMS) are selected to grow and evolve¶
naturally in an attempt to reach advanced stages of vegetative succession and develop as¶
forests subject to the forces of nature with minimal or no human intervention.¶
There are 36,429 acres -- ~21.4% of all State Forest lands – that today are considered to be¶
under passive management (this figure does not include 104,000+ acres of State Forest lands¶
that do not have active Forest Management Plans). These passive management forest lands fall¶
into the following three categories:¶
• **Old Forest Management Sites** (planned Forest Reserves): **14,077 acres**¶
• **Inoperable Sites** (land perpetually passively managed due to site conditions, such as¶
abundant surface stones, excessive soil moisture, steep slopes, etc.): **16,864 acres**¶
• **Inaccessible Sites** (land which cannot currently be accessed to be managed): **5,488 acres**¶

the Division's overall mission of conserving the state's wildlife resources for the use and appreciation of the public. The vast majority of the funding to manage these lands comes from the U.S. Fish and Wildlife Service Wildlife and Sport Fish Restoration (WSFR) program. WSFR funding is provided to restore, conserve, manage and enhance wildlife habitat and to provide wildlife-based recreation. Activities, uses or encumbrances which interfere with the purpose of the WSFR funding are not allowed.

The need for old forest management areas on WMAs would be determined at the site-specific level and would take into consideration existing physical and biological natural resource conditions and the management objectives for the property. Opportunities to designate no management or reserve areas to function as old forest management areas would vary widely, due to the diversity of habitat types found on WMAs. If it was determined that a particular wildlife species required it and/or it would enhance overall biological diversity, the Wildlife Division would consider passive management (or even active management) to set the stage for well– developed old forest management areas. Ideally old forest management areas would either provide for or be able to grow into areas characterized with large trees, a diversity of tree species and complex multi-layered structure, canopy gaps, standing dead trees, fallen trees and trees with cavities. For this discussion, no passive management in forests on WMAs is shown in Table 1.

## Passive Forest Management Acreage by DEEP Land Classifications

Except for State Forests and WMAs, the DEEP Land Classifications on the following table generally receive no planned forest management. The forested-acreage numbers attributed to each classification are derived based on Land Cover analysis. Any forestry activity implemented on lands other than State Forests or WMAs would be in response to an immediate public safety issue or large-scale forest health concerns.[7]

Table 1. DEEP Land Classifications by Acreage, Forested Acreage, Passively Managed Acreage, and Acreage without Forest Management Plans

| DEEP Land Classification (does not include water bodies) | Total Acres | Forested Acres | Passive Forest mgmt. acres | % of total Forested Acres | Acres without mgmt. plans |
|---|---|---|---|---|---|
| State Forest | 168,960 | 162,379 | **36,429** | 22% | **104,381** |
| Wildlife Mgmt. Area | 34,000 | 19,812 | 0 | 0 | 25,604 |
| State Park | 34,115 | 27,167 | 27,167 | 100% | N.A. |
| Fish Hatchery | 744 | 393 | 393 | 100% | N.A. |
| Flood Control | 4,434 | 2,627 | 2,627 | 100% | N.A. |
| Natural Area Preserve | 2,508 | 2,452 | 2,375 | 97% | Unknown |
| Other Lands | 1,498 | 1,063 | 1,063 | 100% | N.A. |
| Water Access | 1,588 | 900 | 900 | 100% | N.A. |
| Wildlife Sanctuary | 1,500 | 1,280 | 1,280 | 100% | N.A. |
| Total | 249,347 | 218,073 | 72,234 | 33% | 129,985 |

As stated earlier, 64,579 acres of State Forests have management plans.
Table 1 shows that 36,429 of these acres, or 56%, are classified as passive management.

**Deleted:** Wildlife Management Areas¶
Of the 34,000 acres of Wildlife Management Areas, 19,812 acres are considered to be forest¶
land using GIS analysis and CT Land Cover Assessment data.¶
State WMA's are managed to provide habitat for both common and uncommon wildlife and to¶
provide for wildlife based recreation (hunting, fishing, trapping and wildlife viewing) in support¶
of the Division's overall mission of conserving the state's wildlife resources for the use and¶
appreciation of the public. The vast majority of the funding to manage these lands comes from¶
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the WSFR funding are not allowed.¶
The need for old forest management areas would be determined at the site specific level and¶
would take into consideration existing physical and biological natural resource conditions and¶
the management objectives for the property. Opportunities to designate no management or¶
reserve areas to function as old forest management areas would vary widely, due to the¶
diversity of habitat types found on our WMAs. If it was determined that a particular wildlife¶
species required it and/or it would enhance overall biological diversity, the Wildlife Division¶
would consider passive management (or even active management) to set the stage for well–¶

**Commented [MF1]:** This total apparently does not include Centennial Watershed State Forest – total would be over 184,000 acres if it did.

Table 1 also shows that 104,381 acres of State Forests do not yet have management plans. It is reasonable to assume that if these acres *were* under management plans, given Connecticut's landscape, that 56% of that acreage (58,453 acres) would also be passively managed.

Adding 58,453 acres to the current total acreage of passively managed acres in State Forests (36,249 acres) equals 94,702 acres, or 58% of all forested acres in State Forests.

1. Hawes, Austin. (1957). History of Forestry in Connecticut.
2. https://ballotpedia.org/Connecticut_Amendment_2,_Legislative_Requirements_to_Transfer_State_Properties_Amendment_(2018)
3. https://portal.ct.gov/DEEP/Forestry/Management-on-State-Lands/Forest-Management-on-State-Lands
4. Based on analysis of a 168,960-acre forest stands database by DEEP.
5. Southern New England Forest Management in an Era of Climate Change (May 2020). https://nesaf.org/about-us/divisions-chapters/yankee-division/
6. Estimate of average annual active forest management provided by DEEP's State Forester, Christopher Martin.
7. An assessment of the DEEP property layer was conducted in June 2020 by DEEP Forestry staff, and the Summary of Passive DEEP Land by Category has been produced summarizing the results. In presenting the assessment they noted this analysis is somewhat incomplete since not all DEEP land records have been added to the GIS property layer to date, but efforts are underway by DEEP Land Acquisition and Management staff to capture all holdings.

**Deleted:** developed old forest management areas. Ideally old forest management areas would either¶
provide for or be able to grow into areas characterized with large trees, a diversity of tree¶
species and complex multi-layered structure, canopy gaps, standing dead trees, fallen trees and¶
trees with cavities. At this time, no passive management in WMAs for forests is shown.¶
**Passive Forest Management Acreage by DEEP Land Classifications**¶
The DEEP Land Classifications on the following chart generally receive no planned forest¶
management. The forested-acreage numbers attributed to each classification are derived based¶
on Land Cover analysis. Any forest activity implemented on these lands would be in response to¶
an immediate public safety issue or large scale forest health concern.19¶
**Table 1.** Passive Forest Management Acreage on DEEP-held lands shown by DEEP Land Classification.¶
→→**Passive Forest**¶
**Management Acreage**¶
**by DEEP Land**¶
**Classification**
... [1]

## Benefits of Forests to Ecosystems and Society

Forests are one of nature's most powerful solutions to human-caused climate change. Whether we live near a forest or not, our human communities are intricately connected with the services they provide. These natural benefits include homes and food for wildlife, pumping oxygen into the air we breathe, filtering runoff that helps clean the water we drink, and delivering nutrients to the soil when leaves and branches decompose.[20]

### Forests benefit wildlife

Healthy forest landscapes often include a variety of tree species of varying age classes. Tall, canopy-layer trees grow above smaller sub-canopy trees, with a shrub layer and diverse plants on the forest floor. This suite of vegetation supports wildlife, from bear and moose to resident and migratory birds. Butterflies and insect pollinators help ensure that same vegetation produces the next generation of life-supporting trees. Many of Connecticut's wildlife species rely on forest habitats. With greater biodiversity comes forest resilience and a greater ability to adapt to changing conditions related to climate change.

### Forests mitigate climate change and clean the air

By doing what they naturally do, the trees in Connecticut's forests – covering an estimated 1.8 million acres, about 59% of the state's land cover[21] – provide innumerable benefits to people, including removing heat-trapping carbon emissions our activities release into the atmosphere. The U.S. Climate Alliance estimates that "within Alliance states [including Connecticut], natural and working lands offset 16% of the GHG emissions from energy, transportation, and other sources in 2016."[22]

The ability of trees to take in or sequester and store carbon dioxide, turning it to wood and other forest components including soil, provides significant potential to mitigate climate change by retaining existing forests and improved forest management. A study in the Proceedings of the National Academy of Sciences finds that "natural climate solutions" could reduce landbased emissions and store additional carbon equivalent to more than a third (37%) of needed emissions reductions to keep global temperatures at or below 2 degrees Celsius through 2030, although benefits decrease beyond that date due to saturation of natural systems among other factors. Among the strategies found to deliver the most benefit, according to the paper, are "reforestation" (conversion of non-forest to forest) and "avoided forest conversion" that along with "natural forest management," represent easily available and effective solutions. [23]

Trees are also effective air filters, removing pollution and particulate matter through their respiration, with studies showing significant reduction of asthma and improved respiratory health in urban areas with more tree cover.[24] Roadside trees could reduce nearby air pollution by more than 50%,[25] but the potential for air pollution reduction varies among species and as a function of tree size and landscape position.[26]

### Forests protect water resources

Forests are also indispensable in production of our drinking water. Approximately 85% of Connecticut residents get their drinking water from public water systems.[27] Forests that

**Commented [MF2]:** "For fiber, we assume that any reduced timber production associated with implementing our Natural Forest Management pathway is made up by additional wood production associated with Improved Plantations and/or Reforestation pathways.' In there near- or long-term, can the group explain how lost timber production in CT will be made up by these two approaches?

**Commented [MF3]:** (Our) understanding is that much of the pollution, including particulate, removal is through simple adhesion.

**Commented [MF4]:** Unclear sentence, especially as to what it intends to say. Net pollution removal by trees is apparently well established but micro-environmental effects can be both complex and confusing. Trees, for instance, can trap pollutants at ground level and so raise, not lower, pollution in the near environment and for various durations of time. Trees are also know VOC emitters, an observation that has been interpreted in various ways, including, by air pollution professionals, as giving trees a role in causing local ozone buildup. I suggest deleting the sentence.

surround public water supply reservoirs and private wells improve water quality and can greatly reduce costs for treatment by filtering surface water and maintaining groundwater reserves, ensuring this vital natural resource is not degraded. Forested wetlands and floodplains along rivers retain and slow the movement of vast quantities of water during storm events, protecting nearby municipalities from flooding and reducing stormwater runoff.

### Forests provide wood products and economic benefits

In Connecticut, the Land of Steady Habits, generations of families have harvested trees from their land to heat their homes, to build the post and beam barns on their farms and perhaps sell some timber to generate income. The vistas of forested hills and fields along country roads, and tree-lined suburban streets are part of our New England cultural identity.

Trees are a renewable resource – and in New England, where conditions usually allow seeds to take root and regenerate, working forests can also supply a local source of wood products. Connecticut consumes an estimated 80.4 million board feet of roundwood or about 22.77 board feet per person each year.[28] For a relative measure, building a typical 2,000 square foot home would require about 16,000 board feet of roundwood.[29]

Depending on the goals and desired outcomes of private or public owners of forests, cutting some trees according to a variety of silvicultural practices or prescriptions, can enhance the health and vigor of remaining trees, generate income from the sale of timber to produce wood products for human needs, and silviculture can be employed to create a wide variety of habitat conditions and specific habitat features to benefit various wildlife species.[30]

Harvesting timber grown sustainably in our own region can help to reduce transport emissions and global deforestation by avoiding a shift of pressure to harvest primary forests in other nations with less stringent environmental policies. In its 2015 report, the North East State Foresters Association estimated Connecticut's forest products and forest recreation industries produce an annual gross output of $3.38 billion and almost 13,000 jobs (figure below).[31]

Long-lived wood products – from your grandmother's antique desk to the cabinets in your renovated kitchen – also lock up and store carbon until the wood decomposes. From paper to plywood and barrels to baseball bats, some wood products are well known; other forest products such as rayon, mulch, medicines, fiber, gums, resins and tannins (such as witch hazel)

**Commented [MF5]:** Inclusion of this report is misleading, as much, perhaps the majority of it, is based on production from forests that are not in Connecticut. Also, it can be seen as conflicting with the message being presented earlier in this paragraph, where the report talks about "Harvesting timber sustainably in our own region…"

are less obvious.[32,33] Lumber can also be reclaimed from old structures and recycled into new uses for furniture or building materials, keeping carbon out of the atmosphere longer.

### Forests support recreation and health

Connecticut's forests provide recreational settings for people to get outside to exercise and enjoy nature through countless activities, such as hiking, mountain biking, horse riding, bird watching, camping, hunting and fishing, and serve as attractions that support tourism and natural resource-related businesses that generate economic benefits to Connecticut.

Forests also offer solace and spiritual renewal to people seeking to unplug from hours of "screen time" spent for work and entertainment. Particularly during the 2020 pandemic, forest trails and open space available for public access has provided physical and mental health benefits. One study on the Japanese practice of forest bathing (shinrin-yoku), found that pulse rate, systolic and diastolic blood pressure were significantly lower among a group of 128 people (ages 45-86) after a two-hour program in the forest which indicated physiological benefits from stress recovery.[34] A recent "Forests Make Us Healthier" campaign by the Northeast Forest Network provides a toolkit with much more information on the important connection between forests and mental and physical health.[35]

### Forests provide shade and make communities more livable

By releasing water vapor through transpiration, street trees can help alleviate the urban "heat island effect" that has caused deaths in some cities during heat waves, which may become more common with higher extreme temperatures.[36] An improved tree canopy can cool residential neighborhoods and reduce energy use, while potentially making communities more attractive, livable and safe.

Connecticut should balance public safety with the health benefits of urban and suburban street trees in reviewing policies for tree planting in residential areas and hazard tree removal implemented by utility companies or municipalities.

By maintaining Connecticut's existing forests, and significantly increasing the acreage of permanently protected forest land, we can help ensure our state's natural and human communities can continue to thrive in the face of climate change.

**Commented [MF6]:** As (we) understand it, the urban heat island effect is more of a surface temperature effect than an air temperature effect. Any cooling due to transpiration or lowered surface temperature at the leaf level as compared to what it might be if the surface were asphalt or concrete would influence air temperature, which means that it would be rapidly diluted in air mixing. The main tree benefits regarding the urban heat island, again, as I understand it, have to do with the shade cast by trees, in that they keep the energy of the sun from being converted to heat by urban impervious surfaces and then stored for re-release by those some materials.

## Adopt Statewide "No-Net-Loss of Forest" Policy

**Top Priority Action**

The Forests Sub-Group recommends an overarching "no-net-loss of forest" (NNLF) policy for Connecticut. This policy would support the top priority recommendation in both the Adaptation/Resilience and Mitigation sections of this report which is to KEEP FORESTS AS FORESTS.

To achieve this NNLF policy goal will take concerted actions at the local, regional, and statewide levels. Fortunately, the state of Maryland has been working on implementing its "no-net-loss of forest" policy which was adopted in in 2013 with passage of the MD Forest Preservation Act.[37] This landmark legislation accomplished four goals:[38]

- Establishing no-net-loss of forest as the policy of the State of Maryland.
- Encouraging the retention of family-owned forests by doubling the income tax credit for forest management activities and expanding the range of activities to include the planting of streamside forests, removing invasive species, and improving wildlife habitat.
- Broadening the State Reforestation Law to support tree planting and forest health management on family-owned forests.
- Ensuring that local fees under the Forest Conservation Act of 1991 are used for tree planting and conservation.

The NNLF policy has helped establish several mechanisms at the statewide and county levels to slow the rate of forest losses in Maryland. This policy should be adapted to work for Connecticut, and the climate crisis makes this an urgent priority. The following recommendations are based on those proposed for Maryland to implement its NNLF policy:[39]

(1) **Avoid Forest Conversion** – protect existing public- and privately-owned forestland from conversion to non-forest purposes to retain the benefits of increased carbon storage, biodiversity, public health, green infrastructure, etc. (see benefits in previous chapter);

(2) **Protect Healthy, Intact Forests** – ensure that impacts upon forests, sensitive habitats, and other natural climate solutions and priorities (wetlands, soils, rivers, farmland, etc.) are considered at every level of planning – urban, suburban, and rural – and across all landscapes;

(3) **Offset All Planned or Permitted Forest Losses** – it is not practical to protect all forested areas from conversion and periodic natural disturbances may also result in temporary forest losses. However, it is essential to offset all planned or permitted forest losses through a combination of compensatory mitigation requirements and tools such as compensatory reforestation, replanting programs, and acquiring local or regional forest mitigation banks;

(4) **Provide Incentives for Stewardship, Forest Retention, and Forest Resiliency** – since 71% of the state's woodlands are privately owned by individuals/families, corporate landholders, and land trusts, a no-net-loss policy must include financial and technical assistance measures to

- **Adopt a statewide "No-Net-Loss of Forest" policy** in the CT General Assembly.

engage private landowners in maintaining and increasing sequestration and storage of forest carbon as well as incentives for critical ecosystem services that their forests provide. For example, as a participating state in the Regional Greenhouse Gas Initiative or RGGI, Connecticut should study forest carbon offset allowances available through compliance and voluntary markets for reforestation, improved forest management, avoided conversion, and proforestation as well as programs that aggregate, evaluate and monitor forest offsets, in order to implement a system of paying landowners for enhanced carbon sequestration and storage with verifiable climate benefits and strict certification standards in place; and

(5) **Protect Urban Forests, Build More Parks, and Plant More Trees** – planting, re-planting, and caring for trees and establishing neighborhood parks in Connecticut's cities not only provides improved health, reduced energy costs, and other co-benefits, but also often provides more equitable access to parks and the outdoors for people of color and other vulnerable communities disproportionately impacted by climate change. If this is implemented with appropriate community engagement rather than as a top-down program, this can result in more healthy, equitable, and resilient communities.[40]

## Adaptation and Resilience Considerations for Connecticut's Forests

Resilience is the fundamental ecological ability of a forest to change and adapt to stressors and provide the functions and values that society demands.[41,42]

Following are the primary components of resilience and their relevance for Connecticut's forests:

1. Forests and their native species (especially trees) have an inherent ability to endure and selforganize after disturbances with which they have co-evolved.

In Connecticut, the predominant oak-hardwood forest type has co-evolved with disturbances that are mostly episodic (e.g. hurricanes, microbursts, tornadoes, droughts) – rather than frequent and chronic (e.g. small canopy wind events).[43,44] The historic frequency and intensity of storms may be different in the future as climate changes occur.

2. Greater tree species diversity confers greater stability, in the form of resistance to change in forest stands (and landscapes) related to disturbance and stress.[45,46]

The primary environmental drivers of our forest diversity follow (in general order of importance for forests in Connecticut):

a) The ability of plant species to specialize in relation to each other on different soils and topographies (a.k.a. niche partitioning);[47]

b) The ability of different plant species (trees) to have different growth habits and forms such as herbs, shrubs, small trees and canopy trees which is closely tied to precipitation and soil moisture (a.k.a. crown stratification);[48,49,50,51]

c) The ability of different tree species to grow and live for different lengths of time as a forest grows back after an episodic disturbance such as tornadoes, microbursts and hurricanes (a.k.a. successional development);[52,53]and

d) Ability for various species to "hide" amongst unrelated neighbors to avoid insects and diseases specific to that species. This process in and of itself promotes diversity (a.k.a. negative density dependence).[54,55]

Connecticut's forest diversity is relatively young, since these drivers have been dynamically interacting over the past 20,000 years (since the peak of the last glaciation) with human-related land uses, climate, and other stressors (mostly human-related) and disturbances. Its current diversity is largely controlled by three diversity drivers: a) niche partitioning - because of Connecticut's inherent soil and topographic variability; b) crown stratification - promoted by moist soils from the relatively high rainfall Connecticut receives; and c) succession - disturbances that are punctuated by periods of recovery long-enough to promote sun-loving long-lived canopy trees (ash, oak, hickory and pine) to grow as canopy dominants with longerlived shade tolerant species (beech, hemlock, maple) more characteristic of northern New England Forests.

3. Redundancy is a form of resilience where multiple species have the same roles or functions in a developing forest.[56]

Generally speaking, Connecticut's forest redundancy is high meaning that there are multiple species and multiple unrelated genera. For example, oak, hickory, and maple trees all have multiple species found across the state that can inhabit the same space and function in a forest. Hence, the elimination of one species through insects, disease, or other stressors would not limit the ability of a forest to recover and retain its basic structure and composition. Of course, the removal of multiple species will reduce or eliminate redundancy and will have a dramatic impact in a forest's resilience. Evidence suggests this is beginning to happen, for example with the functional elimination of chestnut, elm and ash and the decline in beech, hemlock, and oak. There are other drivers of Connecticut's forest resiliency that are not covered in this report, such as "driver" and "passenger" species relationships[57,58,59] and biogeographic effects.[60]

### The Resilience of Connecticut's Forests is currently Threatened and Declining

There are multiple factors and stressors that have combined to threaten the resilience of our forests:

1. Forest Age Classes and Structure are Not Diverse – Legacies of Connecticut's agriculture, chronic selective logging, and development history has left a relatively age- and structuresimplified second growth forest across most of our state.[61,62]
2. Most Forests Are Mature and Getting Older – The pattern of a large proportion of forests in the landscape simultaneously reaching maturity has the potential to reduce resilience as maturing forests are more susceptible to multiple stressors (e.g. insects, disease, pollutants, and drought).[63] Old growth forests have enormous ecological and social value, are rare in the modern landscape, and can have substantial resilience to disturbance. Also disturbances in mature forests can promote the age and structural diversity missing from the forest landscape, but novel stressors described below may affect these values and outcomes.[64,65]
3. Most stressors are human caused but beyond our immediate control – Abiotic stressors to trees such as ozone and NOx[66] can be significant, as can biotic stressors such as invasive insects, plants, and diseases. Both have been impacting the development of the Connecticut forest for over a century and will continue to impact future forest composition and structure.[67,68]
4. Fragmented forests with permanent "edge" are more prone to degradation -- Permanent edge exists because of persistent and continuous disturbance from: i) farming and agricultural activities; ii) development and suburban expansion through roads, lawns, and lots; and iii) through continuous activities in the forest such as recreation (e.g. trails), frequent rather than episodic timber harvesting, and the chronic imbalance of predator-prey in wildlife populations (e.g. deer).[69]
5. Climate Change is Increasing Disturbances – Climate change is exacerbating chronic issues for forests such as incremental mean increases in temperature resulting in increased respiration stresses and decomposition processes. Climate change also heightens episodic stresses such as periods of drought during the growing season, extra-normal rainfall and snowfall events, and increased abnormal and high severity disturbance events such as ice storms, tornadoes, hurricanes, and microbursts.[70,71]

6. Climate Change Can Reduce Forest Carbon Sink Potential -- Climate change is producing, facilitating, and reinforcing negative impacts from stressors already present in low-resilience forests. This can cause a degradation spiral which further simplifies forest composition and structure, increases dominance of non-native species, may reduce standing biomass, increases decomposition processes, and lowers soil carbon.[72,73,74]

**The bottom line is that forests will not be impactful to mitigate climate and carbon if they are not resilient.**

## Actions to Increase Adaptation and Resilience of Connecticut's Forests

### Top Priority Actions

### Short Term (1-5 year) Recommendations

#### Monitoring, Evaluation, and Planning

- Create a monitoring network to evaluate forest ecosystem conditions in naturally regenerating forests (i.e., not mowed or maintained ground cover) across the rural to urban gradient throughout Connecticut at a more refined scale than the National FIA and that complements other existing programs such as the Breeding Bird Survey. Incorporate or establish additional network for "maintained trees" across the state.
  - Include a wide diversity of measurements beyond forest growth and change in composition: such as breeding bird census, invasive plant monitoring, insects and diseases, disturbance characterization from a variety of sources (timber harvest, wind, insects, pathogens, and fire) and periodic measures of soil carbon.
  - Ensure that data are accessible and usable by stakeholders through an open access data portal and that the importance and utility of the data are communicated to potential users.
- **KEEP FORESTS AS FORESTS** with mechanisms to encourage private landowners to protect forestland through easements, tax incentives, ecosystem payment mechanisms, and strong markets for local forest products.
- **Create forest monitoring network** to evaluate forest ecosystem conditions in naturally regenerating forests across the rural to urban gradient, various land ownerships, and including trees in more developed areas.
- **Sponsor research on active and passive ways to create greater resiliency in forests** through alteration or natural development of structure, function, and diversity. Encourage financial incentives to apply the results of this research on public and private lands by stakeholders to promote more resilient forests.
- **Ensure statewide, regional, and local actions align to maintain un-fragmented forests** (both reserves and actively managed) within and across political boundaries with emphasis on connections to waterways and wetlands, core forests, and wildlife habitat linkages.

- Create a citizen science program where trained and mentored individuals (from across life stages – including students and adults) conduct some of the monitoring – e.g., bird census on a specific series of days at the sampling points, camera trap monitoring for mammals, or amphibian surveys. If well planned, this could be systematic part of the design for the monitoring program carried out by or alongside professionals. This could be developed as a component of a college or high school curricula.

- Identify areas that are especially important to landscape-level resilience through partnerships with TNC's Staying Connected Initiative,[75] HVA's Follow the Forest Initiative,[76] and other climate corridor proponents to identify and prioritize the protection and enhancement of climate and habitat corridors in Connecticut. TNC's Resilient Lands Mapping Tool[77] can also be used for site assessments in Connecticut to measure the capacity of different lands to withstand climate change.
  - Identify areas where wildlife movement between core forests becomes constrained by roads, culverts and bridges, and design mitigation efforts to improve wildlife passage.

### Experimentation

- Sponsor experimental studies to investigate both active and passive ways of creating greater resiliency in forests through management-promoted or natural development of structure, function, and diversity. Use these studies as baselines for adaptive management of forests in different contexts. Initiate studies across the rural-urban gradient, ownership and land use types, and in both maintained and naturally regenerating forest systems.
  - Promote and expand on existing examples such as Adaptive Silviculture for Climate Change program at UConn[78] and many efforts of USFS Northern Institute of Applied Climate Science.[79] Create a state-wide list/portal of existing and newly created projects where their outcomes can be communicated.
  - Explore funding streams through USFS and other agencies for expanded efforts.

### Forest Management Approaches

- Increase the reserve (passive management) acreage in the state to promote local and landscape/regional resilience (e.g., as buffers against extinction/extirpation[2]) and to provide controls to assess the outcomes of experimental manipulations.
  - Reserves should be representative of the entire landscape in order to provide suitable controls (i.e., similar environments) for actively managed areas.
- Implement active forest management approaches that can increase structural, age class, and species diversity in low-diversity second-growth forests.[80][81]
  - Promote silviculturally-informed, resilience-focused management approaches across ownership categories and especially on private lands.
- Respond to ongoing elevated tree mortality (related to gypsy moth, drought, emerald ash borer, etc.) across the urban to rural gradient with hazard tree removals, limited

salvage harvesting where appropriate (e.g., not in reserves and to a very limited extent on public lands where public safety including wildfire risk is not increased), and tree additions (seedling/sapling planting) where needed based on regeneration monitoring.
- Coordinate and share information on tree mortality patterns and safety concerns.
- Set up specialized monitoring program to assess tree regeneration patterns across affected and unaffected stands.
- Re-vitalize the State Tree Nursery to promote seedling availability.
- Retain snags and deadwood to promote wildlife habitat and carbon storage wherever feasible based on hazards and economic considerations.

● Respond to ongoing invasive pests and pathogens and prepare for future introductions.
- Adopt and promote biocontrol methods where possible and work with partners from the federal level to test and apply these methods.
- Continue and expand monitoring programs and early warning systems.
- Continue and fund firewood and horticulture regulations to limit new introduction.

● Promote regeneration of native and future-adapted tree species (especially oaks and hickories) across forest types, stand conditions, and ownership types.
- Develop and promote herbivore population control measures where appropriate and based on monitoring of regeneration and herbivore populations.
- Include regeneration as a primary focus of monitoring and experimentation plans outlined above.
- Implement forest management approaches and planting initiatives to promote regeneration of mid-tolerant and intolerant species such as oaks and hickories where needed and appropriate (based on monitoring or protected status).

### Education and Outreach

● Continue and expand education and outreach/training efforts focused on promoting the importance of resilient forests, and forest management approaches (both passive and active) that promote resilience, as linchpins of state climate adaptation and mitigation strategies.
- Create and fund a Connecticut Youth Conservation Corps, on the model of the Civilian Conservation Corps, to provide jobs and paid job training to young people that prioritize tree planting and reforestation activities with an emphasis on explicitly creating employment opportunities for young people from Environmental Justice communities (as defined under section 22a-20a of the CT General Statutes) to carry out planting and reforestation activities in EJ communities.

**Longer Term (5-10 year) Recommendations**

### Forest Protection Strategies

● KEEP FORESTS AS FORESTS with "no-net-loss of forest" policies and financial incentives to encourage private landowners to protect forestland through easements, tax incentives, ecosystem sustaining payments, and strong markets for forest products.
● Develop active outreach programs to connect and engage private woodland owners with conservation-based estate planning resources, such as tax benefits of conservation, family facilitation in succession planning, and guidance about options to sell carbon credits as market opportunities emerge.
● Ensure statewide, regional, and local actions align to maintain un-fragmented forests (both reserves and actively managed) within and across political boundaries with emphasis on connections to waterways and wetlands, core forests, and wildlife habitat linkages.
○ Reduce fragmentation, protect sensitive soils and waterways, and create a forest structure and composition that is a buffer to edge, diverse in composition and structure - making it resilient to both acute (hurricanes) and chronic (pollutants) disturbances.
● Keep wetlands as wetlands, wooded wetlands and riparian forests (floodplains), and enact amplified land protection strategies to avoid wetland and riparian forest conversion.
○ Promote restoration of forested wetlands to more diverse species composition, including coniferous component where appropriate.[82]
● Protect the most significant forest cores and wildlife habitat linkages and actively restore connections where wildlife movement (terrestrial and aquatic) is constrained by roads, culverts, dams, and bridges.

### Forest Restoration and Acquisition Strategies

● Acquire riparian lands for rehabilitation and restoration back into forest.
● Look for appropriate opportunities to reforest currently non-forested lands that would have historically supported forest vegetation and are not currently or likely in the near term to be utilized for agriculture, to provide additional habitat for early successional species.
● Sponsor and develop a network of forest resilience nurseries developed and managed by landowners to propagate plant species of ecological concern for out-planting in forests and regions of Connecticut with extirpated populations (with appropriate oversight).

### Implementing Forest Resiliency

● Encourage financial incentives to implement what we learn from adaptive experimentation and monitoring (above) on public and private lands by stakeholders to promote more resilient forests in structure, function and diversity.

● Create a funded program for municipalities (especially in underserved/EJ areas) to increase urban tree canopy cover and resilience in plantings and post-establishment treatments/monitoring as well as in appropriate circumstances to maintain mature and large trees which provide especially high levels of ecosystem services such as cooling, pollution reduction, and habitat.
● Fund strategic state programs to control important emerging invasive insects, plants, and diseases.
● Develop and promote programs to increase resiliency of trees and forests in proximity to human (gray) infrastructure and reduce tree-infrastructure conflicts.

### Education and Outreach

● Create a funded educational program for forest landowners and interested citizens around what a resilient forest is and how promoting a resilient forest benefits society.
● Enhance outreach and education efforts focused on promoting the importance of tree and forest cover to human health and well-being to constituents.
● Develop programs and outreach/education materials that educate citizens, stakeholder institutions (e.g., highway departments and utilities), and policy-makers about the exceptional ecosystem services of maintaining large trees in gray infrastructure areas, but also balance with the "right tree, right place" message to avoid disbenefits[83] and work with communities to determine local priorities rather than a cookie-cutter, topdown approach.

### Changing Laws and Regulations

● Enact and enforce tougher firewood and horticultural State laws around invasives, fuelwood, and packaging across state lines – including a well-funded enforcement program.
● Very carefully regulate hunting of top predators to encourage development of intact top-down trophic food webs and to remediate the current imbalance regarding herbivory.

### Creating Strong Markets for Products and Services with Multiple Benefits

● Strengthen local markets for long-lived forest products to promote a local rural economy so that treatments to create more resilient forests are not paid for by the taxpayer but come “free.”
○ Include “Build with Wood” programs and market local timber products (e.g., Connecticut Grown wood) with certifications and requirements for implementation of resilience-focused forest management approaches to incentivize construction in wood and mass timber technologies and discourage more carbon-intensive building materials.
○ Incentivize local production and marketing of Connecticut Grown non-timber forest products (e.g., forest gardening of non-timber forest foods – maple syrup,

ramps, mushrooms, herbs, and berries as well as understory spices and medicinals).

● Create a fund to strengthen local markets and provide payments or services to promote social and economic resilience for landowners - particularly for rural economicallydisadvantaged and small-acreage landholders who are currently incentivized to sell or develop.

- Watershed services payments for private landowners.
- Recreational trail payments to landowners for public access on private lands.
- Payments for enhanced sequestration and/or storage of carbon through reforestation, improved forest management, or avoided conversion, with strict standards in place through programs that aggregate verified carbon credits from private lands in order to sell carbon offsets in voluntary or compliance markets.

## Mitigation Considerations for Connecticut's Forests

Climate mitigation involves both reducing the emissions of carbon dioxide ($CO_2$) and other greenhouse gases, and increasing the removal of $CO_2$ and other GHG's - e.g. methane, nitrous oxides, and ozone - from the atmosphere to reduce potential adverse effects of climate change. Natural ecosystems (grasslands, wetlands, forests) are, on balance, the best and most effective climate solutions available both for the uptake ("sequestration") and long-term storage of carbon, whereas human-made carbon capture technologies are still in their infancy.[84] Of these natural systems, forests sequester and store the most carbon and likely have the largest potential to remove additional $CO_2$ from the atmosphere.[85]

### Available climate mitigation solutions in forests

- A*voided conversion of forest* to non-forest sustains the mitigation value of forests and is a prerequisite for both *proforestation* and *improved forest management.*[86]
- *Proforestation* (natural forest growth in areas protected from timber harvesting) is likely the most effective solution to preserve and foster further growth of accumulated carbon storage in woodlands.[87,88,89]
- *Mitigation-focused forest management – (*e.g., extending rotation periods and retaining more and larger trees) has important potential to retain carbon storage on managed lands, while providing long-lived wood products.
- *Reforestation* (conversion from non-forest to forest) generally has the highest potential rate of carbon dioxide sequestration among these four solutions.

### Connecticut's Forest Carbon Storage

Connecticut's forests are, on average, the most carbon dense – in aboveground carbon stored per acre – of the nine Northeastern US states[90] and therefore have extraordinary mitigation value for this region in terms of their accumulated carbon stocks. A combination of *avoided conversion*, *proforestation, and mitigation-focused forest management* is critical to maintain these carbon stocks.[91]

### Connecticut's Forest Carbon Sequestration and Future Role in Climate Mitigation

Approximately 16% of Connecticut's forests are estimated to be >100 years of age, the highest percentage in the Northeast.[92] Annual net growth of Connecticut's forests is also estimated to be the highest in the region,[93] indicating that forest age is not currently constraining forest growth. In fact, Connecticut's forests have increased their rate of growth and standing biomass significantly over the past 10 years.[94] These increases have occurred despite, and perhaps in part because of, an increase in tree mortality resulting from insect outbreaks and windstorms over this time period.[95] Connecticut's forest resilience in the face of increased tree mortality can likely be attributed to the following:

- Natural disturbance events have resulted in relatively small fluctuations in carbon across the state as a whole.[96]
- Temperate deciduous forests typically develop structural complexity naturally as they age and are exposed to moderate severity disturbances; this complexity can lead to greater carbon sequestration that helps maintain carbon storage in mature forests well beyond the 100-year mark.[97] [98]

- Recent surveys of private forestland owners suggest a relatively low interest in timber harvests on their land with their top reasons for owning their woodlands being to enjoy the beauty and scenery, followed by privacy, home, and protecting wildlife habitat, nature, and biological diversity. That said, landowner attitudes can certainly change over time and it is difficult to generalize across this group.[99]

Though growth rates and carbon uptake rate will eventually slow as Connecticut's forests enter late successional and old growth stages, most of these forests will continue to accumulate carbon in live tree biomass, down and dead trees, and soils well past 200 years of age.[100,101,102] In fact, Connecticut's forests have the potential to almost double their carbon storage.[103] Natural disturbances, predicted with climate change to increase in both frequency and intensity, will generally sustain carbon sequestration levels up to a relatively high disturbance severity threshold, beyond which sequestration tends to decline.[104]

### Forest Conversion threats

Connecticut's forests cover ~59% of the state's land area,[105] and 53% of these forested areas is considered to be "core forest" as defined by UConn CLEAR in its landmark forest fragmentation study.[106] Over the past 10 years, Connecticut's forest area has changed little, ranging from a net loss of 400 acres per year to a net gain of 1,400 acres per year, depending on the calculation.[107] However, large core forest has declined sharply (see Figure 2 on page 4). The biggest ongoing and future threats from forest conversion and fragmentation occur in the Connecticut River valley and northern Fairfield, New London and Windham counties.[108]

### Reforestation Potential in Connecticut

Four hundred years ago, Connecticut was almost entirely forested.[109] Moderate mitigation potential exists for reforestation on lands that were once forested and are not currently being used for agriculture (i.e., lawns, vacant lots, barren lands and other non-agricultural fields in rural, suburban, and urban areas).[110] In Connecticut, the reforestation potential is highest in the rural areas of Litchfield county and in the settled areas of the Connecticut River valley and Fairfield County.[111]

### The Settled Treescape

Because of increased light, trees and forests that grow near edges, along roads and in settled areas are generally larger and store more carbon than trees in forest interiors.[112] Settled treescapes also cool buildings in summer and insulate them in winter, reducing $CO_2$ emissions from heating and air conditioning.[113] Large trees provide the largest cooling/insulation benefits and airborne pollution reduction compared to small trees.[114] Because of these significant benefits, removals and aggressive pruning of large trees by utility companies and highway departments can result in disproportionately large effects on climate mitigation and should be limited to trees in poor condition that are imminent threats to people or electric infrastructure.

### Timber harvesting in Connecticut

Connecticut's forests are currently harvested at a relatively low intensity – 17% of the state's annual forest growth in volume is being cut each year.[115] However, there is some concern that

Connecticut's forests are being high-graded (i.e., the largest and most valuable trees are being harvested.[116] *Mitigation-focused forest management* combined with incentives for landowners could help retain more of the state's larger trees and their carbon on managed forestlands.

## Actions to Increase Mitigation of GHG from Connecticut's Forests

### Top Priority Actions

Forests offer the single most effective land-based solution for removing carbon dioxide from the atmosphere and storing it long-term to limit some of the worst impacts of climate change.[117] From the deep "core forest"[118] to the individual, mature trees that shade our streets, all of our treescapes are essential to meeting the state's carbon emission reduction goals. As a co-benefit, forests sustain the health and well-being of the state's residents and the broad diversity of plant and animal life that comprise Connecticut's natural heritage. The protection, expansion and extension of forests are central to an effective and equitable approach to climate mitigation that Connecticut requires and deserves. The following recommendations are bold and necessary to address the enormous threats associated with climate change.

### Permanently Protect at least 50% of Core Forests >250 acres Statewide by 2040

*Avoided conversion* of forest to non-forest is a critical climate mitigation strategy. Connecticut's Forest Action Plan already recognizes core forest protection as a conservation priority**.** Public Act 17-218 further requires that the Commissioner of DEEP consider the environmental impacts to core forests from proposed solar projects and certify to the Connecticut Siting Council that such projects will not materially impact the status of core forests. Because of the many coecological benefits core forests provide in addition to climate mitigation, Connecticut should ensure that loss of core forest cover does not occur, or is offset by core expansion. Permanently protecting 50% or more of the state's medium and large[119] core forests by 2040 should be a conservation goal with the same statutory authority as the State's current 21% overall land conservation goal.[120]

#### Short Term (1-5 year) Actions

- Adopt statewide core forest permanent protection goal (cores >250 acres) of 50% by 2040, an increase of about 137,000 acres from 33.5%.[121] This goal would have the same statutory authority as the existing 21% overall conservation goal.
- KEEP FORESTS AS FORESTS and set statewide goal to permanently protect at least 50% of medium (>250 ac.) and large (>500 ac.) core forests by 2040.
- Develop Action Plan to Increase statewide forest cover from 59% to over 60% by 2040.
- Establish Criteria and Designate Core Forest Natural Area Preserves on state conservation lands.
- Retain large trees and forest cover in urban and residential areas to reduce carbon emissions from buildings and retain health and other co-benefits.
- Improve forestry practices in Connecticut's working forests by extending harvest rotations and retaining more large trees.

- Realign all state land protection program and funding sources in the Green Plan to reward and incentivize land protection that protects core forest land >250 acres in size.
- Actively discourage loss of core forest by incompatible land-uses through required mitigation, financial disincentives, and strong policies to avoid land-use conversion.
- Increase land protection funding from all available sources, including funds to increase capacity of DEEP land protection and stewardship staff necessary to sustain a fivefold increase in acres saved and tripling the number of conservation transactions accomplished each year. This should include annual bond authorizations of at least $25 million for DEEP's Recreation and Natural Heritage Trust Fund and $25 million for the Open Space and Watershed Land Acquisition (OSWA) program.

### Longer Term (5-10 year) Actions

- Ensure Forest Management Plans for state conservation lands include prioritization of protecting intact large core forest areas.
- Incorporate training on recognizing core forest areas into resources available for all state licensed forest practitioners.
- Ensure water utilities are made aware of medium and large core forest areas on their properties, and are incentivized to discourage activities that would fragment these valuable lands.
- Require an individual permit for any petition before the Connecticut Siting Council that would affect core forest.
- Consider increasing financial incentives such as PILOT payments to municipalities that exceed the statewide average of protected core forest.

**Develop Action Plan to Increase Forest cover from 59% to over 60% by 2040**

Approximately 59% of Connecticut is forested.[122] Although of varied size and uneven distribution, these forests already have significant aboveground carbon storage (averaging from 31.5 to 39 metric tons/acre),[123] especially compared to other states in the northeastern U.S. Using a no-net-loss policy in Connecticut to avoid deforestation and building upon it to increase forest cover to safely above 60% of the state's land area with *reforestation* (defined here as conversion of land from non-forest to forest) will expand carbon storage capacity, and increase the rate of carbon uptake ("sequestration"). In fact, reforestation is the single most effective forest-based solution to increase the sequestration rate on a per-acre basis in Connecticut.[124] This increase in forest land cover could be achieved through natural forest succession on currently unforested land in residential, rural, and urban areas (i.e., grass and turf, reclaimed and remediated lands, marginal and abandoned fields). It could also be achieved by deliberate re-plantings (as needed), expanding forested riparian buffers, and curtailing unnecessary tree pruning and removals along transportation, residential utility transmission, and telecommunications lines and infrastructure.

This increase in forest land cover would not require the reforestation of active agricultural fields, except in areas where the priority may be to expand riparian buffers. Reforestation potential is particularly high in Litchfield, Tolland, and Windham Counties and in the urban areas of the Connecticut Valley and northern Fairfield County.[125] Co-benefits of reforestation

include improved water quality, vegetated buffers to forest cores and old growth forest, and enhanced wildlife connectivity between larger areas of forest habitat.

### Short Term (1-5 year) Actions

- Adopt a statewide forest cover goal of "over 60% by 2040" and launch rapid action planning process to determine areas and incentives to target for reforestation efforts.
- Create and fund a Connecticut Youth Conservation Corps, on the model of the Civilian Conservation Corps, to provide jobs and job training to young people that prioritize tree planting and reforestation activities with an emphasis on employment and work in environmental justice communities as defined under section 22a-20a of the CT General Statutes.
- Consider options for amending Public Act 490 to more actively discourage forest conversion in and beyond the current 10-year term.
- Actively discourage conversion of forest, particularly core forest, for industrial solar projects, while increasing incentives for renewable energy projects on the built environment, such as on brownfields or along highway infrastructure.
- Develop educational programs for policy makers and local governments on the climate mitigation benefits of reforesting urban and settled areas, and update existing public information to highlight Connecticut's land-based carbon.
- Greatly reduce clear-cutting of mature forests as a habitat management practice benefiting young forest species.

### Longer Term (5-10 year) Actions

- Establish financial incentives for landowners who allow their lawns or abandoned fields to reforest.
- Invest in scientific monitoring, remote sensing and GIS capacity, by DEEP or its partners in the public and non-profit sectors, to track progress toward increasing overall forest cover using remote sensing and the most current land cover and protected lands data.

### Establish Criteria and Designate Core Forest Natural Area Preserves on State Lands

*Proforestation* (defined as continuous forest growth in natural areas protected from timber harvesting) is the most effective solution to preserve accumulated carbon storage and enable it to continue to increase.[126] Given the accumulated carbon density in the state (ranked first on a per acre basis in the Northeast and the second highest average carbon density/acre of forest of any state in the eastern United States), establishing long-term protection of this carbon storage is an important step the state can take in meeting its climate mitigation goals.

Designating natural areas is consistent with long-standing federal and state policy and existing models. Since 1927, the USDA Forest Service has established over 430 Research Natural Areas (RNAs) across the nation where commercial harvests and salvage logging are excluded and where natural processes predominate.[127] Connecticut has been establishing Natural Area Preserves since 1969 with the statutory purpose of keeping land "in as natural and wild a state as is consistent with the preservation and enhancement of protected resources and educational, scientific, biological, geological, paleontological and scenic purposes."

**Figure 7.** Map of Medium and Large Core Forest Areas in Connecticut produced by Housatonic Valley Association using NLCD Landcover 2016 data with UConn CLEAR Forest Fragmentation Tool 2.0.

Though the Natural Area Preserves program has not been a budget or funding priority for DEEP in recent years, updating the Natural Area Preserves statute could be the basis for rejuvenating this program and establishing Core Forest Natural Area Preserves (CFNAPs) as a new category of Natural Area Preserves with formalized criteria. These CFNAPs would be focused on protecting large core forest areas of greater than 250 contiguous acres that occur (entirely or in part) on State properties.

We suggest there are three urgent reasons to establish criteria and designate CFNAPs on state conservation lands as a critical mitigation strategy:
1. Although proforestation is a new term, it is based upon considerable scientific evidence that continuous forest growth in protected reserves is the most effective immediate solutions to preserve accumulated carbon storage and enable it to continue to increase. On lands already owned by the state, this is a very low cost climate solution, as there is no need to purchase the land in order to take it out of production, but only a need to change management objectives;
2. State lands managed for proforestation would provide a “control” to compare to the outcomes of management prescriptions that are designed to increase the resilience of

Connecticut's forest or to mitigation-focused forest management. In experimental research, the "control" provides the "no change" option that other variables are tested against.[128] Without areas that exclude commercial harvests and salvage logging, there would be no controls to compare with forests subject to various management techniques; and

3. There is uncertainty about how climate change will impact forests because there are so many variables. That necessitates employing various strategies at the same time– avoided conversion, reforestation, mitigation-focused forest management, and Proforestation -- while continuing to follow the emerging science[129] about the role of forests in climate mitigation.

### Short Term (1-5 year) Actions

- DEEP should work with partners to identify core forest areas (>250 acres) occurring on or intersecting with land owned or conserved by the State of Connecticut, and designate areas to be managed as Core Forest Natural Area Preserves with priority on the most carbon-dense forests in Tolland, Litchfield, Fairfield, and New Haven Counties. Recommended is that a multi-disciplinary research group (including academics, nonprofits, forest practitioners, and DEEP personnel) should be formed to study and report on the implications of a potential statewide goal of 104,000 acres (which would protect 70% of large core forest areas on state lands) and produce a feasible and consensus implementation strategy for this or any revised goal stemming from the analysis.
- Include the state's existing old forest management sites that occur in core forest on State lands as part of the 70% goal above.
- Update Connecticut's Natural Area Preserves statute[130] to incorporate the management model of the USDA Research Natural Areas[131] and establish Core Forest Natural Area Preserves to enable this program to be implemented quickly based on important groundwork that has been laid over many decades.

### Longer Term (5-10 year) Actions

- Ensure core forest protection is a top priority considered in current and future additions to state parks, forests and wildlife management areas through the state's Recreation and Natural Heritage Trust Fund.
- Establish financial incentives for private and municipal landowners to maximize carbon storage on their protected forestlands with mechanisms like wild carbon easements[132] and working forest conservation easements.

**Retain Large Trees and Forest Cover in Settled Landscapes (urban and residential)**

Because of higher light levels and reduced competition from other trees, edge forests and residential and urban treescapes typically contain larger trees, on average, and therefore store more carbon per tree or area of forest than do interior forests and trees.[133] Hence their climate mitigation value is disproportionately large and should be reflected in the level of protection that they are afforded.

Residential and urban trees and forests also shade and cool buildings in summer and insulate them in winter, which significantly reduces energy levels of air conditioning and heating fuel and associated carbon emissions.[134] Moreover, large trees reduce airborne pollutants (i.e.,

carbon monoxide, sulfur dioxide, nitrogen dioxide, ozone, and particulate matter) to a much greater extent than do small trees. For example, a large tree ≥30 inches in diameter at breast height (dbh) removes an estimated 60-70 times the pollutants as a small tree <3 inches in dbh.[135]

### Short Term (1-5 year) Actions

- Do not permit aggressive pruning and removals of healthy street trees, and focus (or target) pruning and removals to trees in hazardous poor condition that are imminent threats to people or electric infrastructure. If trees are removed, PURA should require a plan and support funding for utilities to replant trees, especially in EJ communities with higher percentages of impervious surfaces and related heat island impacts.
- Create and promote model municipal ordinances to encourage replacement of and mitigation offsets for non-emergency removals of street trees within the municipal road right-of-way.
- Establish new Connecticut standards for state roads and highways that minimize losses of healthy trees.

## Improve the Management of Connecticut's Working Forests

Improving the forest management that takes place outside of Core Forest Natural Area Preserves, while retaining core forest land and large tree cover in settled landscapes – most notably extending the time between harvests and retaining larger trees – is an important forest solution to reducing emissions and mitigating climate change. Large trees store by far the largest amount of carbon in the forest and therefore contribute disproportionately to climate mitigation.[136]

### Short Term (1-5 year) Actions

- Implement New England Forestry Foundation's 'Exemplary Forestry™' in managed forests to retain more large trees and carbon in the forest.[137] This approach incorporates climate mitigation and adaptation, management for umbrella wildlife species and best management practices for soil and water, in conjunction with improved forestry or silvicultural practices to increase forest growth rates.
- Reduce salvage harvests and establish policies to help retain dead trees in managed forests hit by insects except in areas where they are a public safety hazard (i.e. along roadways and trails). Dead trees provide a significant source of aboveground carbon [138] and exceptional habitat for cavity nesting birds.[139]
- Include assessment in forest management plans and timber harvests of the forested landscape in which the property is situated, together with its contributions to maintaining core forest cover and embedded habitats.[140]
- Increase resources for service foresters to help private landowners practice exemplary forestry. That includes hiring at least three more DEEP service foresters and partnering with organizations like NEFF to help advance the principles of 'Exemplary Forestry.TM'

### Longer Term (5-10 year) Actions

- Support thoughtful reuse of wood products to help reduce waste and demand for new wood products.[141]
- Review indigenous forest and wildlife management practices for ideas on different techniques to achieve more resilient mature forests.[142]

Note to readers: We were unable to provide "track changes" details for this next section. The resulting edits we see have been pasted in a block, and then the original section designated by strikethrough text in as a block following.

## Climate Change Threats to Vulnerable Populations

### Top Priority Actions

Vulnerability to Climate Change is often described as some combination of exposure, sensitivity and ability to respond, or adaptive capacity. It is helpful to think of vulnerability in terms of these component parts, because there are instances in which exposure is greater for some groups over others, while in other circumstances it is ability to respond or adaptive capacity that is the ruling factor. For example, exposure to the urban heat island effect is much greater among urban populations, within whom those without the means to use personal vehicles or run their air conditioning continuously can be considered as having a lesser ability to respond. Those with existing medical conditions, such as hypertension or heart conditions, are also apt to have greater sensitivity to the urban heat island effect, and so it a factor in their vulnerability to an increase in this phenomenon in the course of climate change.

Among the groups generally cited in the United States as most apt to be vulnerable to climate change arecommunities of color, low-income groups, people with limited English proficiency (LEP), and undocumented immigrant groups.[143] These populations are at increased risk of exposure given their higher likelihood of living in risk-prone areas (such as urban heat islands, isolated rural areas, or coastal and other flood-prone areas), areas with older or poorly maintained infrastructure, or areas with an increased burden of air pollution. These groups of people also often have an increased sensitivity to these climate change threats due to relatively greater incidences of chronic medical conditions, such as cardiovascular and kidney disease, diabetes, asthma, and COPD .

Finally, the ability to respond to these threats is often impeded by socioeconomic and educational factors, limited transportation, limited access to health education, and social isolation related to English language deficiencies. Likewise, these populations also may have limited access to medical care and may not be able to afford medications or other treatments. High poverty rates, language and cultural barriers, and citizenship status can each limit access to and use of health care and other social services. Some members of these groups are likely to be hesitant to seek out help out of concern that effort might might cause their immigration status in the United States to become compromised.

Many of these factors are beyond the scope of the Forest Sub-Group to address. However, there are some areas where forests and the role of forests has the potential to be helpful in terms of reducing the vulnerability to climate change. These include

- Through urban forestry, reducing the exposure and providing the means to adapt to those climate change exposures that primarily occur in urban areas. Many of these are heat-related, and include not just the urban heat island effect, but also the exposure to greater amounts of air and water pollution and flooding, due to greater, temperature-influenced exposure to ozone, increased generation of electricity in response to higher temperatures, and more extensive run-off due to more intensive rainstorms.

- Through careful analysis of meaningful economic data, identify ways in which both the urban and rural forests can contribute more to economic development, including jobs, in order to give vulnerable populations greater wherewithal to deal with exposure to increased threats from climate change.
- Through recognition of the importance of being outdoors and of getting outdoors to the sake of health and recreation, provide increased opportunities for all residents of Connecticut to gain access to and feel welcome in all public forests, from city parks to State Parks and Forests. This includes intentional efforts to remove barriers to as access perceived by all vulnerable groups, whether these barriers are perceived to be do to race, transportation, physical access or simple unfamiliarity with the opportunities.

.144,145

In addition, the critical role of rural forests, especially, in terms of decreasing exposure of all populations, including the most vulnerable, to the effects of climate change must be acknowledged. These forests have key role to play in providing the people of Connecticut with clean air and clean water, including clean drinking water from the many surface reservoirs throughout the state. These forests are greatly important in filtering out the air pollutants and in countering some of the heat build-up that come from urbanized society.

- **Assess the social determinants of health inequities** at the individual and community levels that lead to increased vulnerability to the threats from climate change and that can be improved through pro-active forest policies.
- **Support community interest in tree planting, parks, and/or community gardens** in densely populated areas to support climate solutions that could meet multiple needs such as increasing health outcomes, employment, and entrepreneurial opportunities. Youth Conservation Corps could help community-based groups with implementation.
- **Build a market for creative re-use of urban wood waste** to store carbon while simultaneously creating education, employment, and stewardship opportunities.
- **Engage, train, and educate on adaptation planning, resiliency, and risks** from climate change with emphasis on local officials, planners, community organizations, and emergency responders.

**Commented [CD7]:** I am not sure that this paragraph says anything of any specific relevance. Without the inclusion of additional specifics about being a person of color relates to heightened vulnerability beyond what has been already expressed, or without some indication of how these numbers relate to specific demographic numbers relating to climate change, this strikes me as simply padding the report.

As noted earlier in the Status of CT Forests section of this report, 36.4% of the land area of Connecticut is considered by the U.S. Census to be "urban" (1.13 million acres), with 87.7% of the population, nearly 3 million people, living in these urban areas. Despite the high population concentration in these areas, these same lands have a fairly high degree of tree cover, with tree canopy cover estimated at at over 60%. However, there is good evidence that this canopy cover is not equitably distributed, particularly in Connecticut's larger and more densely-populated cities, but potentially also in Connecticut's rural areas. Efforts need to be made to better identify areas of low canopy cover in settled areas throughout Connecticut and how those areas correlate to lower income neighborhoods, communities of color and communities exposed to other environmental threats, such as flooding, increased air pollution or environmentally-related public health concerns.

**Figure 8.** Urban areas like Hartford are hotter than more rural areas during summer. Tree cover can help reduce health and other problems associated with urban heat islands.[146]

## Vulnerability to Climate-Related Health Stressors

.[147]

Race and class are important factors in the vulnerability to climate-related stress. In many situations, it can be difficult to isolate the role of race from other related socioeconomic and geographic factors. Some racial minorities are also members of low-income groups, immigrants, and people with limited English proficiency, and it might be inferred that it is their socioeconomic status (SES) that contributes most directly to their vulnerability to climate change-related stressors.

**Commented [CD8]:** Not sure what the second half of this paragraph is saying – perhaps, 'maybe race is a factor in climate change vulnerability maybe not?' It does not appear to me to be serving any purpose.

However, with regards to race as an independent factor, it is undeniable that it influences behavior, particularly as relates to the use of rural forested areas. In a recent edition of the New Yorker magazine, the naturalist Corrina Newsome is quoted as saying, ""Birding in the marsh is as remote as I will go," she added, quietly. "There's no way I'm going in a remote area, or the woods, without a white person as cover.""[1]

The sorts of racial and cultural stereotypes that infer that people with certain characteristics, whether that be skin color, language, cultural affiliation or other similar feature, do or do not belong in certain areas, need to be addressed directly and pro-actively, to diminish and ultimately eliminate their role in inhibiting the full use of public spaces, including rural public parks and forests.

[1] New Yorker Magazine, Georgia Postcard, June 29, 2020 edition, "Corina Newsome and the Black Birders Movement", article written by Carolyn Kormann

Table 7. Estimated Ecosystem Benefits Provided by Harford's Tree Canopy in 2014

| Hartford Tree Canopy Ecosystem Benefits | Annual Ecosystem Benefits | |
|---|---|---|
| | Quantity | Value |
| Air: CO removed | 5,400 lbs. | $3,600 |
| Air: $NO_2$ removed | 15,260 lbs. | $6,466 |
| Air: $O_3$ removed | 109,020 lbs. | $198,218 |
| Air: $SO_2$ removed | 2,920 lbs. | $369 |
| Air: particulate matter removed | 15,190 lbs | $47,437 |
| Carbon sequestered | 11,264 tons | $225,280 |
| Stormwater: reduction in runoff | 591,022,346 gallons | $4,728,178 |
| Energy: savings from cooling | 3,843,654 kWhs | $277,665 |
| **Total Annual Benefits** | | **$5,487,213** |
| Current stored carbon* | 362, 445 tons | $7,248,900 |
| Property: increase in property values* | - | $11,416,730 |
| **Total** | | **$18,665,630** |

**Current stored carbon and contribution to property value are measures of total contribution, not an annual value.*

Source: https://www.americanforests.org/wp-content/uploads/2015/04/AF-Community-ReLeaf-%E2%80%94-Hartford-UTC-Assessment.pdf page 18

***Extreme heat events.*** Some communities of color and some low-income, homeless, and immigrant populations are more exposed to heat waves as these groups often reside in urban areas affected by heat island effects.

***Other weather extremes.*** As observed during and after Hurricane Katrina and Hurricane/PostTropical Cyclone Sandy, some communities of color and low-income people experienced increased illness or injury, death, or displacement due to poor-quality housing, lack of access to emergency communications, lack of access to transportation, inadequate access to health care services and medications, limited post-disaster employment, and limited or no health and property insurance.

***Degraded air quality.*** Climate change impacts on outdoor air quality will increase exposure in urban areas where large proportions of minority, low-income, homeless, and immigrant populations reside. Fine particulate matter and ozone levels already exceed National Ambient Air Quality Standards in many urban areas.

***Waterborne and vector-borne diseases.*** Climate change is expected to increase exposure to waterborne pathogens that cause a variety of illnesses—most commonly gastrointestinal illness and diarrhea. Health risks increase in crowded shelter conditions following floods or hurricanes, which suggests that some low-income groups living in crowded housing may face increased exposure risk.

***Food safety and security.*** Climate change affects food safety and is projected to reduce the nutrient and protein content of some crops, like wheat and rice. Some communities of color and low-income populations are more likely to be affected because they spend a relatively

larger portion of their household income on food compared to more affluent households.

***Psychological stress.*** Some communities of color, low-income populations, immigrants, and LEP groups are more likely to experience stress-related mental health impacts, particularly during and after extreme events. Other contributing factors include barriers in accessing and affording mental health care, such as counseling in native languages, and the availability and affordability of appropriate medications.

**Improve Community Health and Reduce Health Inequities**

The impacts of climate change on health and health inequities are moderated by individual and community vulnerability and resilience. Interventions that improve the social determinants of health and population health and reduce health inequities can significantly reduce vulnerability and increase resilience to climate change, at the individual and community-levels. Increasing resilience to climate change will require investing significantly in the public sphere, including in social determinants of health and in public health infrastructure.

Many climate actions bring significant health co-benefits, but some may have significant adverse health consequence and/or increase health inequities. Some health interventions also

**Commented [CD9]:** These are all vague and, if previous comments are accepted, redundant. If any of these topics are to be included, I would suggest using Connecticut based examples, such as the air and water pollution reduction numbers generated by the 2007 Hartford UFORE Study or through URI for New Haven. I am including the table from the 2014 American Forests study of Hartford.

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have climate co-benefits. Thoughtful implementation of actions to reduce greenhouse gas emissions and adapt to climate impacts will help maximize co-benefits and minimize co-harms. Urban trees and other natural systems provide a range of physical health benefits. Trees can improve air and water quality, mitigate the heat island effect, and help alleviate noise.[148] Trees can shield people from ultraviolet (UV) radiation, the cause or contributing factor for three types of skin cancer.[149] Urban ecosystems are increasingly recommended by national and State environmental protection agencies to mitigate the harmful impacts of air and water pollutants, harmful emissions, and the negative effects of urban heat and noise.[150] Trees also help reduce flooding by slowing rainwater runoff.

The demands of modern life can often be mentally exhausting. Focusing attention on flows of information and tasks, screening out distractions, and responding to the constant stimuli of commuting, work, school, and family leaves many people feeling drained, with memory loss and reduced capacity for sustained attention.[151] Rachel and Stephen Kaplan's Attention Restoration Theory (ART) suggests that we can use nature to restore depleted cognitive functions and maintain performance.[152]

Access to green spaces also provides other health benefits. Researchers at the University of Exeter surveyed 10,000 urban residents in the United Kingdom, asking how satisfied they were with their lives and whether they had signs of depression, anxiety, or other psychological disorders. After controlling for other factors known to significantly influence well-being such as income, employment, marital status, health, and housing, researchers found a strong correlation between a boost in a feeling of well-being overall and increases in green space within a 2.5-mile radius of residents' homes.[153]

**Figure 9.** Maps showing tree canopy cover and surface temperatures in New Haven help to show the urban heat island effect that trees help to mitigate.[154]

**Support Community Interest in Tree-Planting, Green Spaces, and/or Gardens**

Tree planting in urban areas provides many potential benefits to human health, but it's important to note that the top green priority for a neighborhood may not be tree-planting, and policy-makers should be careful to not approach community green spaces with a "top-down" approach.[155] It is critical to engage the community locally to understand local needs and discuss trees as one potential solution rather than approaching the community with the assumption that tree-planting is the answer. Ongoing stewardship of local investments in green spaces is critical and may be more important than tree-planting depending upon various factors. Ultimately, community support is the foundation for long-term stewardship. As an additional benefit, work done to increase access to community green spaces may also inspire young people of color to consider outdoor employment opportunities, and perhaps this kind of locallydriven effort might provide the first step to a conservation career.

Underrepresented communities are adversely impacted by climate conditions, but historically, these communities have been marginalized, set aside, and not engaged in these discussions. While this report addresses Climate Change Threats to Vulnerable Populations, assessing community needs without their input would further exacerbate the vulnerabilities these communities face. Decisions about others without their input would further perpetuate the effects of climate when leaders are not communicating with the communities they represent. So, it is critical that we connect with leaders within the communities we're identifying as vulnerable populations and learn with them while assisting them.

That said, the existence of trees in areas with limited canopy cover can sometimes literally be the difference between life and death. Neighborhoods with little to no trees can, on average, be 5 to 7 degrees hotter during the day and up to 22 degrees hotter at night than neighborhoods with good tree cover. Treeless neighborhoods also have worse air pollution because trees trap air pollutants and the hotter temperatures in these treeless neighborhoods help cook air pollutants into dangerous smog. That's one of the reasons why health experts project a ten-fold increase in heat-related deaths across America's cities.[156]

Another reason for considering tree planting amongst community options is that some trees in urban areas are in poor condition and need to be removed and/or replaced. For example, Connecticut is currently losing many ash trees due to the emerald ash borer. A recent study suggests suggest that the loss of trees to emerald ash borer is increasing human mortality related to cardiovascular and lower-respiratory-tract illnesses. [157] This finding adds to the growing evidence that the natural environment provides major public health benefits.

The need to maintain and increase urban tree cover (UTC) in Connecticut is not a new issue and is well-documented. Studies of UTC were conducted in New Haven (2009),[158] Hartford (2010),[159] Bridgeport (2012),[160] and the Greater Bridgeport region (2014)[161] to map UTC, show areas where heat islands are a current problem, and suggest areas where UTC could be increased through a combination of plantings or replantings and stewardship of existing trees. There have been follow-up studies and recommendations such as Hartford's Urban Tree Canopy Assessment and Planting Plan (2014).[162]

**Commented [CD10]:** Tree planting is often over-stated as a stand-alone solution to urban forest shortcomings. Renewal of the urban forest is important, of course, but tree planting that does not come from a comprehensive plan and that is not balanced with maintenance program for existing trees can cause more problems than it solves. As just one example, the City of Hartford did an internal assessment how much a planted tree actually costs the city. By the time the tree is fully established, at around 15 years of age, it is likely that a single tree is apt to cost the city $1,000, for water, pruning and mulching, over and above the cost for planting the tree (perhaps $500). Thus, a gift to the city of a tree is apt to be more of an expense than is realized. This expense may come at the cost of necessary maintenance work on older and larger trees.

The City of Hartford, working with the city's Tree Advisory Commission, developed a Hartford Tree Canopy Action Plan (June, 2020)[163] with the following laudable long-term goals:

- Maintain the health of the urban forest.
- Ensure public safety.
- Increase our tree canopy to at least 35% (current tree canopy is ~25%).
- Reduce the urban heat island effect through targeted planting in the urban heat islands.
- Increase tree plantings aimed at energy savings.
- Reduce storm water run-off through target plantings.
- Improve air quality through forest management and careful selection of new trees.
- Design and implement an environmental stewardship program for Hartford schools, City of Hartford employees, and Hartford citizens.
- Become an urban forestry model for cities in the northeast and beyond.

The Hartford Tree Canopy Action Plan calls for the a 5-year goal of planting 3,000+ trees each year to increase its canopy from 25% to 35% over the next 50 years. According to the Tree Plan, planting ~1,500 trees each year is required just to maintain the current tree canopy. Of course, to maintain and increase tree cover in a healthy urban forest requires more than tree planting alone. Hartford and other cities must also make investments to remove dead trees, care for diseased, damaged or aging trees, and have a plan for replacing trees that are lost through storms or other common stressors for trees in cities.

Tree planting programs are more impactful when complemented by local environmental education and green jobs programs at the municipal level. KNOX for example, provides handson environmental education for Hartford students through their Gaia's Guides program which offers a combination of after-school educational opportunities and in-school programming on the benefits of trees to communities. In addition, KNOX offers Green Jobs Apprenticeships that provide job counseling and hand-on experience for out-of-work Hartford residents in the fields of landscaping (which includes tree planting), and horticulture. These kinds of job opportunities build experience for potential careers in landscaping, landscape design, land management, plant and soils science, agriculture, arboriculture/tree care, forestry, and many more fields.

Actively nurturing a broad appreciation of trees at the community level through outreach and education is important because there are ongoing costs associated with maintaining tree health that individual land-owners and community residents should consider. Well-maintained trees can be seen as a community asset and point of pride, but poorly maintained, unhealthy, or dead trees can be viewed as symbols of community neglect.

The plans and goals for Hartford's urban tree canopy are very good. However, due to budget shortfalls and other challenges, Hartford has been losing ground and has only been able to plant a few hundred trees in recent years. In the Tree Plan, it is suggested that Hartford's urban tree cover may have actually decreased by approximately 2% between 2014 and 2018 due to inadequate plantings despite best intentions, strong plans, and an appreciation for trees. Without additional state or federal funding, human resources, and support with technical elements such as GIS mapping of heat islands and potential planting zones, to assist cities like

Hartford and local partners like KNOX, Connecticut's urban areas will continue to struggle just to maintain the status quo for their urban tree canopies. A program like a Youth Conservation Corps could help provide some human resources to complement and extend the capacity of existing community-based organizations such as KNOX (Hartford), Urban Resources Initiative (New Haven), and Groundwork Bridgeport.

A Youth Conservation Corps, funded through a model like the national AmeriCorps program or perhaps a model like the "Greening the Gateway Cities" program being implemented in 13 towns in Massachusetts,[164] could employ high school or recently graduated students to build trust and cultural understanding at the community level around environmental restoration. Work that could be led by this youth corps could include controlling invasive plants or protecting native plants, working on trails connecting green spaces, and cleaning-up/plantingup open spaces in urban and rural environments. This could be a great program for expanding outdoor youth employment and career enrichment opportunities for students of color in fields such as landscaping, horticulture, and land management/conservation, and can bring multiple benefits when students from the local community are employed.

**Investigate Opportunities to Improve the Economic Contributions from both Urban and Rural Forests towards Assisting Vulnerable Populations**

Investigations should be made into ways that forests can better serve vulnerable populations, especially those that are economically distressed, both in the rural and urban context. These could be based on the results of two such economic analyses are under way. Both are being conducted under the auspices of the Northeastern and Midwest State Foresters Alliance.[2] One is being conducted by the NMSFA Forestry Markets and Utilization Committee and is looking at the economic contributions of the forest products industry in the 20 NMSFA states, plus Nebraska. The other is associated with, although not directly being conducted by, the NMSFA Urban and Community Forestry Committee and is looking at the economic contributions of urban forestry in the 20 states, plus Washington DC. Both are being funded through US Forest Service Landscape Scale Restoration grants. The FMUC report is expected by October 2021. The UCF report is likely due in 2022.

It is recommended that a commitment be made to using these economic analyses to better evaluate how the statewide and regionwide forest products industry and also how the urban forest management programs in all of their forms can be used to assist populations vulnerable to climate change in both rural and urban areas.

For example, a program to encourage the local re-use of wood from the urban forest can accomplish multiple goals. Trees in urban areas provide many benefits while trees are growing and healthy, especially if they are well-maintained. However, some trees are not in good condition and need to be removed. In this situation, urban trees can move from being seen as a benefit to becoming a cost for the municipality. If the wood from that tree were re-used, it could reduce costs associated with tree removal and disposal, create job opportunities, partially offset the use of wood products from international forests that can be poorly regulated and leave a larger carbon footprint, and store carbon in long-lived wood products.[165,166]

It's worth noting that some tools and equipment that would support local wood re-use can represent barriers to entry. Some tools and equipment – e.g., a portable sawmill or lathe or chipper or kiln for drying wet wood – may be more apt to be readily accessed if it were available for rent from an equipment rental business or loanable through a local/regional coop. Start-up job incubators that allow for shared used of space and equipment are also helpful. There are significant resources on urban wood re-use to provide models that work.[167]

[2] For further information on NMSFA, visit http://www.northeasternforests.org/

Better use of local or regionally grown wood in construction in densely developed neighborhoods as a substitute for
r more carbon-dense materials (e.g. steel, aluminum, or concrete) can be used as carbon offset benefits.[168,169] Wood products have many important benefits when used as a construction material. New techniques, such as cross-laminated timber and wood fiber insulation, are allowing use of wood in new ways that expand potential beneficial impacts. In a climate context, long-lived wood products have two benefits. First, they can store carbon previously captured by trees; as living forests may potentially experience increasing mortality and associated carbon release due to climate change, this could become an increasingly important benefit.[170,171,172] Greater focus and incentives toward reduced-impact techniques of forest harvest, improved forest management to enhance growth rates, and directing more of the harvest to long-lived products has potential to improve the efficiency of this carbon benefit over past performance.

Energy savings, through the use of trees properly placed so as to provide shade and windbreaks to buildings, along with other building energy-saving approaches, such as the use of wood fiber in insulation[3] and the use of local lumber in home upgrades and repair, can also significantly reduce carbon emissions. A recent study of Hartford's street trees shows that the amount of carbon release avoided due to those street trees exceeded that amount of carbon sequestered by those street trees, at a ratio of 2,167 tons to 1,825 tons of carbon.[4]

[3] https://www.finehomebuilding.com/2019/05/08/284-in-favor-of-wood-fiber-insulation#:~:text=Contributing%20editor%20Michael%20Maines%20describes%20the%20introduction%20of,on%20the%20product%20type%3A%20batt%2C%20board%2C%20or%20blown.

[4] https://hartfordct.treekeepersoftware.com/

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~~**Top Priority Actions**~~

~~In the United States, some communities of color, low-income groups, people with limited English proficiency (LEP), and certain immigrant groups (especially those who are undocumented) live with many of the factors that contribute to their vulnerability to the health impacts of climate change.[143]~~

~~These populations are at increased risk of exposure given their higher likelihood of living in riskprone areas (such as urban heat islands, isolated rural areas, or coastal and other flood-prone areas), areas with older or poorly maintained infrastructure, or areas with an increased burden of air pollution. These groups of people also experience relatively greater incidences of chronic medical conditions, such as cardiovascular and kidney disease, diabetes, asthma, and COPD which can be exacerbated by climate-related health impacts.~~

~~Socioeconomic and educational factors, limited transportation, limited access to health education, and social isolation related to English language deficiencies collectively impede their ability to prepare for, respond to, and cope with climate-related health risks. These populations also may have limited access to medical care and may not be able to afford medications or other treatments. For LEP and undocumented persons, high poverty rates, language and cultural barriers, and citizenship status limit access to and use of health care and other social services and make these groups more hesitant to seek out help that might compromise their immigration status in the United States.~~

~~The number of people of color in the United States who may be affected by heightened vulnerability to climate-related health risks is growing. Currently, Hispanics or Latinos, Blacks or African Americans, American Indians and Alaska Natives, Asian Americans, and Native Hawaiians and Pacific Islanders represent 37% of the total U.S. population and 24.8% of the population in Connecticut. 22.1% of the population in Connecticut speaks some language other than English at home, and 10.4% of the population was born outside the U.S. As a proportion of Connecticut's population, people of color as a group grew by 2.6% from 2010 to 2014.[144,145]~~

- ~~**Improve the social determinants of health and reduce health inequities** at the individual and community levels to reduce vulnerability and increase resilience to climate change.~~
- ~~**Support community interest in tree planting, parks, and/or community gardens** in densely populated areas to support climate solutions that could meet multiple needs such as increasing health outcomes, employment, and entrepreneurial opportunities. Youth Conservation Corps could help community-based groups with implementation.~~
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**Figure 8.** Urban areas like Hartford are hotter than more rural areas during summer. Tree cover can help reduce health and other problems associated with urban heat islands.[146]

### Vulnerability to Climate-Related Health Stressors

Disproportionate climate impacts for some communities of color and low-income, LEP, and immigrant populations include heat waves, other extreme weather events, poor air quality, food safety, infectious diseases, and psychological stressors.[147]

Race and class are important factors in the vulnerability to climate-related stress, but it can be difficult to isolate the role of race from other related socioeconomic and geographic factors. Some racial minorities are also members of low-income groups, immigrants, and people with limited English proficiency, and it is their socioeconomic status (SES) that contributes most directly to their vulnerability to climate change-related stressors. SES is a measure of a person's economic and social status, often defined by income, education, and occupation. Additional factors such as age, gender, pre-existing medical conditions, psychosocial factors, and physical and mental stress are also associated with vulnerability to climate change. Because many of these variables are highly related to one another, statistical models must account for these factors in order to accurately measure the relative importance of various risk factors. For instance, minority race and low SES are jointly linked to increased prevalence of underlying

health conditions that may affect sensitivity to climate change. When adjusted for age, gender, and level of education, the number of potential life-years lost from all causes of death was found to be 35% greater for Blacks than for Whites in the United States, indicating an independent effect of race.

***Extreme heat events.*** Some communities of color and some low-income, homeless, and immigrant populations are more exposed to heat waves as these groups often reside in urban areas affected by heat island effects.

***Other weather extremes.*** As observed during and after Hurricane Katrina and Hurricane/PostTropical Cyclone Sandy, some communities of color and low-income people experienced increased illness or injury, death, or displacement due to poor-quality housing, lack of access to emergency communications, lack of access to transportation, inadequate access to health care services and medications, limited post-disaster employment, and limited or no health and property insurance.

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***Waterborne and vector-borne diseases.*** Climate change is expected to increase exposure to waterborne pathogens that cause a variety of illnesses—most commonly gastrointestinal illness and diarrhea. Health risks increase in crowded shelter conditions following floods or hurricanes, which suggests that some low-income groups living in crowded housing may face increased exposure risk.

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**Improve Community Health and Reduce Health Inequities**

The impacts of climate change on health and health inequities are moderated by individual and community vulnerability and resilience. Interventions that improve the social determinants of health and population health and reduce health inequities can significantly reduce vulnerability and increase resilience to climate change, at the individual and community levels. Increasing resilience to climate change will require investing significantly in the public sphere, including in social determinants of health and in public health infrastructure.

Many climate actions bring significant health co-benefits, but some may have significant adverse health consequence and/or increase health inequities. Some health interventions also

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have climate co-benefits. Thoughtful implementation of actions to reduce greenhouse gas emissions and adapt to climate impacts will help maximize co-benefits and minimize co-harms.

Urban trees and other natural systems provide a range of physical health benefits. Trees can improve air and water quality, mitigate the heat island effect, and help alleviate noise.[148] Trees can shield people from ultraviolet (UV) radiation, the cause or contributing factor for three types of skin cancer.[149] Urban ecosystems are increasingly recommended by national and State environmental protection agencies to mitigate the harmful impacts of air and water pollutants, harmful emissions, and the negative effects of urban heat and noise.[150] Trees also help reduce flooding by slowing rainwater runoff.

The demands of modern life can often be mentally exhausting. Focusing attention on flows of information and tasks, screening out distractions, and responding to the constant stimuli of commuting, work, school, and family leaves many people feeling drained, with memory loss and reduced capacity for sustained attention.[151] Rachel and Stephen Kaplan's Attention Restoration Theory (ART) suggests that we can use nature to restore depleted cognitive functions and maintain performance.[152]

Access to green spaces also provides other health benefits. Researchers at the University of Exeter surveyed 10,000 urban residents in the United Kingdom, asking how satisfied they were with their lives and whether they had signs of depression, anxiety, or other psychological disorders. After controlling for other factors known to significantly influence well-being such as income, employment, marital status, health, and housing, researchers found a strong correlation between a boost in a feeling of well-being overall and increases in green space within a 2.5-mile radius of residents' homes.[153]

**Figure 9.** Maps showing tree canopy cover and surface temperatures in New Haven help to show the urban heat island effect that trees help to mitigate.[154]

**Support Community Interest in Tree-Planting, Green Spaces, and/or Gardens**

Tree planting in urban areas provides many potential benefits to human health, but it's important to note that the top green priority for a neighborhood may not be tree-planting, and policy-makers should be careful to not approach community green spaces with a "top-down" approach.[155] It is critical to engage the community locally to understand local needs and discuss trees as one potential solution rather than approaching the community with the assumption that tree-planting is the answer. Ongoing stewardship of local investments in green spaces is critical and may be more important than tree-planting depending upon various factors. Ultimately, community support is the foundation for long-term stewardship. As an additional benefit, work done to increase access to community green spaces may also inspire young people of color to consider outdoor employment opportunities, and perhaps this kind of locallydriven effort might provide the first step to a conservation career.

Underrepresented communities are adversely impacted by climate conditions, but historically, these communities have been marginalized, set aside, and not engaged in these discussions. While this report addresses Climate Change Threats to Vulnerable Populations, assessing community needs without their input would further exacerbate the vulnerabilities these communities face. Decisions about others without their input would further perpetuate the effects of climate when leaders are not communicating with the communities they represent. So, it is critical that we connect with leaders within the communities we're identifying as vulnerable populations and learn with them while assisting them.

That said, the existence of trees in areas with limited canopy cover can sometimes literally be the difference between life and death. Neighborhoods with little to no trees can, on average, be 5 to 7 degrees hotter during the day and up to 22 degrees hotter at night than neighborhoods with good tree cover. Treeless neighborhoods also have worse air pollution because trees trap air pollutants and the hotter temperatures in these treeless neighborhoods help cook air pollutants into dangerous smog. That's one of the reasons why health experts project a ten-fold increase in heat-related deaths across America's cities.[156]

Another reason for considering tree planting amongst community options is that some trees in urban areas are in poor condition and need to be removed and/or replaced. For example, Connecticut is currently losing many ash trees due to the emerald ash borer. A recent study suggests suggest that the loss of trees to emerald ash borer is increasing human mortality related to cardiovascular and lower respiratory tract illnesses. [157] This finding adds to the growing evidence that the natural environment provides major public health benefits.

The need to maintain and increase urban tree cover (UTC) in Connecticut is not a new issue and is well-documented. Studies of UTC were conducted in New Haven (2009),[158] Hartford (2010),[159] Bridgeport (2012),[160] and the Greater Bridgeport region (2014)[161] to map UTC, show areas where heat islands are a current problem, and suggest areas where UTC could be increased through a combination of plantings or replantings and stewardship of existing trees. There have been follow-up studies and recommendations such as Hartford's Urban Tree Canopy Assessment and Planting Plan (2014).[162]

The City of Hartford, working with the city's Tree Advisory Commission, developed a Hartford Tree Canopy Action Plan (June, 2020)[163] with the following laudable long-term goals:

- Maintain the health of the urban forest.
- Ensure public safety.
- Increase our tree canopy to at least 35% (current tree canopy is ~25%).
- Reduce the urban heat island effect through targeted planting in the urban heat islands.
- Increase tree plantings aimed at energy savings.
- Reduce storm water run-off through target plantings.
- Improve air quality through forest management and careful selection of new trees.
- Design and implement an environmental stewardship program for Hartford schools, City of Hartford employees, and Hartford citizens.
- Become an urban forestry model for cities in the northeast and beyond.

The Hartford Tree Canopy Action Plan calls for the a 5-year goal of planting 3,000+ trees each year to increase its canopy from 25% to 35% over the next 50 years. According to the Tree Plan, planting ~1,500 trees each year is required just to maintain the current tree canopy. Of course, to maintain and increase tree cover in a healthy urban forest requires more than tree planting alone. Hartford and other cities must also make investments to remove dead trees, care for diseased, damaged or aging trees, and have a plan for replacing trees that are lost through storms or other common stressors for trees in cities.

Tree planting programs are more impactful when complemented by local environmental education and green jobs programs at the municipal level. KNOX for example, provides handson environmental education for Hartford students through their Gaia's Guides program which offers a combination of after-school educational opportunities and in-school programming on the benefits of trees to communities. In addition, KNOX offers Green Jobs Apprenticeships that provide job counseling and hand-on experience for out-of-work Hartford residents in the fields of landscaping (which includes tree planting), and horticulture. These kinds of job opportunities build experience for potential careers in landscaping, landscape design, land management, plant and soils science, agriculture, arboriculture/tree care, forestry, and many more fields. Actively nurturing a broad appreciation of trees at the community level through outreach and education is important because there are ongoing costs associated with maintaining tree health that individual land-owners and community residents should consider. Well-maintained trees can be seen as a community asset and point of pride, but poorly maintained, unhealthy, or dead trees can be viewed as symbols of community neglect.

The plans and goals for Hartford's urban tree canopy are very good. However, due to budget shortfalls and other challenges, Hartford has been losing ground and has only been able to plant a few hundred trees in recent years. In the Tree Plan, it is suggested that Hartford's urban tree cover may have actually decreased by approximately 2% between 2014 and 2018 due to inadequate plantings despite best intentions, strong plans, and an appreciation for trees. Without additional state or federal funding, human resources, and support with technical elements such as GIS mapping of heat islands and potential planting zones, to assist cities like

~~Hartford and local partners like KNOX, Connecticut's urban areas will continue to struggle just to maintain the status quo for their urban tree canopies. A program like a Youth Conservation Corps could help provide some human resources to complement and extend the capacity of existing community-based organizations such as KNOX (Hartford), Urban Resources Initiative (New Haven), and Groundwork Bridgeport.~~

~~A Youth Conservation Corps, funded through a model like the national AmeriCorps program or perhaps a model like the "Greening the Gateway Cities" program being implemented in 13 towns in Massachusetts,[164] could employ high school or recently graduated students to build trust and cultural understanding at the community level around environmental restoration. Work that could be led by this youth corps could include controlling invasive plants or protecting native plants, working on trails connecting green spaces, and cleaning up/plantingup open spaces in urban and rural environments. This could be a great program for expanding outdoor youth employment and career enrichment opportunities for students of color in fields such as landscaping, horticulture, and land management/conservation, and can bring multiple benefits when students from the local community are employed.~~

**~~Support Market for Local Wood Re-use~~**

~~A program to encourage the local re-use of wood from the urban forest can accomplish multiple goals. Trees in urban areas provide many benefits while trees are growing and healthy, especially if they are well-maintained. However, some trees are not in good condition and need to be removed. In this situation, urban trees can move from being seen as a benefit to becoming a cost for the municipality. If the wood from that tree were re-used, it could reduce costs associated with tree removal and disposal, create job opportunities, partially offset the use of wood products from international forests that can be poorly regulated and leave a larger carbon footprint, and store carbon in long-lived wood products.[165,166]~~

~~It's worth noting that some tools and equipment that would support local wood re-use can represent barriers to entry. Some tools and equipment – e.g., a portable sawmill or lathe or chipper or kiln for drying wet wood – may be more apt to be readily accessed if it were available for rent from an equipment rental business or loanable through a local/regional coop. There are significant resources on urban wood re-use to provide models that work.[167]~~

~~Construction in densely developed neighborhoods with locally-grown, long-lived wood products substituted for more carbon-dense materials (e.g. steel, aluminum, or concrete) can also have carbon offset benefits.[168,169] Wood products have many important benefits when used as a construction material. New techniques, such as cross-laminated timber and wood fiber insulation, are allowing use of wood in new ways that expand potential beneficial impacts. In a climate context, long-lived wood products have two benefits. First, they can store carbon previously captured by trees; as living forests may potentially experience increasing mortality and associated carbon release due to climate change, this could become an increasingly important benefit.[170,171,172] Greater focus and incentives toward reduced-impact techniques of forest harvest, improved forest management to enhance growth rates, and directing more of the harvest to long-lived products has potential to improve the efficiency of this carbon benefit over past performance.~~

**to here**

## Climate Threats to Vulnerable Forest Types

### Top Priority Actions

Because of the uncertainty of climate change, all types of Connecticut Forest could be considered vulnerable. Unpredictable changes in temperature regimes, precipitation and importantly invasive species, pests and pathogens may mean that forest types thought to have low vulnerability, such as northern hardwood and central hardwood pine, may in fact be more vulnerable than we expect. For the purposes of this section we will focus on forest communities that are most likely to be negatively affected by climate change:[173,174]

- Black spruce bogs
- Lowland mixed conifer
- Beech, birch maple forest
- Freshwater forested wetlands (forested swamps)
- Pitch pine-scrub oak (not called out in the literature, but added because of threat from southern pine beetle)
- Cold water streams and headwaters and the associated shading forests
- Lowland Atlantic white cedar forests
- Floodplain forests, and
- Coastal Forests

The climate-related threats to forests in Connecticut and the northeastern U.S. are welldescribed by Swanston et al. (2018):[175]

"Forests of the Midwest and Northeast significantly define the character, culture, and economy of this large region but face an uncertain future as the climate continues to change. Forests vary widely across the region, and vulnerabilities are strongly influenced by regional differences in climate impacts and adaptive capacity. Not all forests are vulnerable; longer growing seasons

- **Reevaluate Connecticut's Green Plan and open space grant programs** to prioritize acquisition of land and conservation easements for habitats most at risk from climate change.
- **Increase efforts to model and map vulnerable natural communities** and their buffers to increase efficiency of protection efforts to create better and integrated mapping of all natural resources and better inform decisions (e.g., Natural Resource Atlas and Monitoring Project).
- **Increase pace of forest and open space protection** with a focus on vulnerable natural communities and important buffers.
- **Advocate for passage of federal funding programs** such as the Great American Outdoors Act, Recovering America's Wildlife Act, and others that support habitat stewardship and protection.
- **Invest in research and actions supporting adaptive management** for vulnerable natural communities.

and warmer temperatures will increase suitable habitat and biomass for many temperate species. Upland systems dominated by oak species generally have low vulnerability due to greater tolerance of hot and dry conditions, and some oak, hickory, and pine species are expected to become more competitive under hotter and physiologically drier conditions. However, changes in precipitation patterns, disturbance regimes, soil moisture, pest and disease outbreaks, and nonnative invasive species are expected to contribute forest vulnerability across the region. Northern, boreal, and montane forests have the greatest assessed vulnerability as many of their dominant tree species are projected to decline under warmer conditions. Coastal forests have high vulnerability, as sea level rise along the Atlantic coast increases damage from inundation, greater coastal erosion, flooding, and saltwater intrusion. Considering these potential forest vulnerabilities and opportunities is a critical step in making climate-informed decisions in long-term conservation planning."

### Black Spruce Bogs

This is a rare habitat type in Connecticut and we represent the southern terminus of its range and a habitat expected to be adversely affected by climate change in general.[176] As such changes in temperature regimes may decrease suitability for this habitat type in Connecticut.

### Lowland mixed conifer

This forest type is generally uncommon in Connecticut and is considered to be of moderate to high vulnerability in the Northeast (though upland mixed conifer at above 1,000-foot elevation is doing better in Connecticut).[177] Good examples may be found in Norfolk and Eastford. Changes in temperature regimes and increased threat of non-native pests (hemlock woolly adelgid, *Adelges tsugae*) may stress this habitat type in Connecticut, particularly hemlock which is included in this grouping.

### Beech, birch, maple forest

This forest type is considered highly vulnerable in Southern New England because of temperature changes, precipitation changes, change in timing of seasons, Invasive plants and animals, pests and diseases, and is already stressed by development and habitat loss as well as terrestrial connectivity loss (roads and development).[178]

### Freshwater forested wetlands

This forest type is considered highly vulnerable in Connecticut because of temperature changes, precipitation changes, changes in hydrology, changes in winter, Sea level rise, storms and floods, change in timing of seasons, invasive plants and animals, pests and diseases, development as well as habitat loss and terrestrial connectivity loss (roads and development).[179]

### Pitch pine-scrub oak

Generally thought to have low vulnerability,[180] this is already a rare habitat type in Connecticut, threatened by development, invasive plants and insect pests. Climate change is making our habitats more suitable for the southern pine beetle, but restoration projects on old sand plains may offer hope.

### Cold water streams and headwaters and the associated shading forests

It is the cold water streams and headwaters that are the vulnerable community, but associated riparian forests are important for reducing water temperature and creating suitable habitat for Brook Trout and other associated wildlife.[181] It's important to note that in urbanized watersheds, existing riparian forests can be relatively intact, less stressed than roadside forests, and important to protect for carbon storage, habitat, floodwater retention, aesthetic, shade and other community benefits.

### Lowland Atlantic white cedar forests

An already rare habitat type in Connecticut. These forested wetlands are threatened by increased severity and length of droughts in Connecticut.[182] Coastal examples could be threatened with increased saltwater intrusion into groundwater.

### Coastal Forests

Rising sea levels, the associated landward migration of tidal marshes, and increased salinity of ground water, as well as our attempts to protect developed infrastructure threatens the viability and resilience of our coastal forests.[183]

## Funding, Programs, and Resources Needed for Implementation

### Top Priority Actions

**Figure 10.** Connecticut's spending on land conservation -- $2.12 per year per person -- places the state last in combined state and federal per capita public funding among other New England states.[184]

Connecticut must ramp up investments in natural lands protection which is a necessary component of the state's plans to meet its ambitious goals of achieving a 100% net zero-carbon target by 2040.[185] Investments in natural climate solutions are relatively inexpensive compared to the costs of doing nothing or simply responding to magnified impacts of climate change.

**Enhance Existing Funding Programs**

- Bonding
- Community Investment Act
- State Revolving Funds (Water Quality and Drinking Water)
- Regional Greenhouse Gas Initiative

**Establish New Sources of Revenue**

- Include comprehensive forest protection component in a Carbon Tax
- Enable Municipal Funding Option
- Establish Compensatory Mitigation Fund as part of "No Net Loss of Forest" policy

**Provide Tax Incentives for Acquisition and Stewardship**

- Expand existing corporate tax credit to individuals for land donations

### 1. Enhance Existing Land Conservation Programs

**Increase state investments for existing land conservation programs and incorporate more specific climate-related criteria into selection of projects/level of funding (Open Space and Watershed Land Acquisition Grant Program [OSWA]; Recreation and Natural Heritage Trust Program; Recreational Trails Program)**

- Source of funds: State Bonding
- Action required: Legislative
- Note: Typical bond authorizations for these programs have ranged from $3 to $7.5 Million per year, but allocation of those funds has neither been consistent nor adequate to meet project demands. Based upon specific Sub-Group recommendations related to forest protection, annual bond authorizations for OSWA and RNHT should be $25 Million, respectively, and $10 Million for the Recreational Trails Program. In states offering statewide bond referendums, voters have approved the dedication of significantly higher levels of funding for open space conservation.[186] With more specific carbon accounting criteria, the OSWA scoring may be further refined to award projects that provide higher carbon mitigation benefits.

**Increase funding for Community Investment Act (CIA)**

- Source of funds: Increase surcharge on local recording fee (currently $40)
- Action required: Legislative
- Note: The CIA provides dedicated funds to support community-level investments across four sectors: Open Space Conservation, Farmland Preservation, Affordable Housing, and Historic Preservation. The CIA is currently funded through a $40 surcharge on municipal recording fees, which is distributed as follows: $1 remains with the Town Clerk; $3 go to the municipality to pay for local capital improvement projects; $10 supplements the income to dairy farmers; and the remaining $26 is distributed to state agencies to fund matching grants to the four sectors enumerated above. The Forests Sub-Group recommends an increase in the surcharge on recording fees, ranging from $10 to $20, with the additional revenue to the CIA account distributed evenly to the four sectors. A $10 - 20 increase to the recording fee would add an estimated $1.5 - 3.0 million per year for the open space sector of the CIA account. This additional funding could be dedicated to urban forest improvement projects such as tree planting or re-planting and stewardship in underserved areas, as well as support for CT DEEP to administer the program.

**Expand Urban Green and Community Garden Program to include Urban Forest Improvement Projects**

- Source of funds: Community Investment Act
- Action required: Legislative
- Note: CT DEEP's Urban Green and Community Garden Program provides assistance to communities designated as targeted and/or distressed to develop or enhance urban open spaces for public enjoyment and/or environmental education, including the

development of a community garden or reclaiming and enhancing existing open space for the public's use. The Forests Sub-Group recommends expanding this program to specifically include funding for urban forest improvement projects. See also, Urban Forest Carbon Credit Program.

**Utilize Portion of State Revolving Funds for Land Conservation/Green Infrastructure Projects**

- Source of funds: Existing state revolving funds (SRF) for clean water and drinking water
- Action Required: None. Currently up to 10% of SRF may be used to finance green infrastructure projects, which may include street trees, bio-swales, land conservation, etc. However, legislative action would be required to mandate spending on green infrastructure projects. In 2019, S.B. No. 927, **An Act Creating the Environmental Infrastructure Fund Within the Connecticut Green Bank**, proposed expanding the types of projects the Green Bank can promote investment in to include environmental infrastructure, which, under the bill, is structures, facilities, systems, services, and improvement projects related to water, waste and recycling, zero-emission vehicle refueling, climate adaptation and resiliency, agriculture, land conservation, parks and recreations, and other environmental markets.
- Note: This is an opportunity for cross-sector dialogue about tapping into the Green Bank for creative financing for infrastructure projects to leverage co-benefits of land conservation including air pollution reduction, carbon removal, flood protection, food production, avoided costs for healthcare system, etc. See also, Urban Forest Carbon Credit Program.

**Expand Use of Regional Greenhouse Gas Initiative (RGGI) funds to Forest Land Conservation**

- Source of funds: Proceeds from sale of RGGI State Emission Allowances
- Action Required: Legislative
- Note: While RGGI participating states may use afforestation projects to award offset allowances (project-based GHG emission reduction outside of the capped electric power generation sector),[187] this recommendation proposes the state reinvest the proceeds from the CO2 allowance auctions to fund CT DEEP land protection projects, land acquisition staff capacity, due diligence, scientific studies related to forest science (including an assessment of current forest management practices and policies and impacts on climate mitigation goals), development of a state mapping system to identify forests of highest current or future conservation value, and public education and outreach programs promoting the importance of resilient forests, forest stewardship, etc. New Jersey is an example of a RGGI state that has a legislative mandate to spend a portion of RGGI proceeds on land sector activities.[188] At the same time, Connecticut should study forest carbon offset allowances available through compliance and voluntary markets for reforestation, improved forest management, avoided conversion, and proforestation as well as programs that aggregate, evaluate and monitor forest offsets, in order to implement a system of paying landowners for enhanced carbon sequestration and storage with verifiable climate benefits and strict certification standards in place.

### 2. Tax and Other Incentives

**Expand Corporate Tax Credit for Donations/Bargain Sale of Open Space to Individuals for Land that meets certain Climate Mitigation Criteria and/or for Forest Carbon Services**

- Source of Funds: Individual Tax Credit
- Action required: Legislative
- Note: The Forest Sub-Group should include recommendations for climate mitigation criteria to include in the next iteration of the State's Green Plan, which may then be tied into legislation providing for an individual income tax incentive for forestland protection. We may also want to consider transferable tax credits for conservation easement donations as offered in multiple states, allowing landowners with little taxable income to transfer tax credits to another taxpayer and/or carry the credit forward over a number of years. The New York tax credit is unique, offered not at the time of donation, but every year in an amount equivalent to 25% of the property taxes paid on land under easement.[189] Tax credits may also be allocated to landowners engaging in afforestation, reforestation, proforestation, and other forest stewardship and restoration efforts with defined carbon mitigation benefits.[190] Extra incentives may be built in to the program to encourage landowners to pursue other co-benefits.

**Enable Compensatory Mitigation for State and Local Projects**

- Source of Funds: Developers make payments to a mitigation fund if unavoidable conversion of forest and other natural lands occurs.
- Action required: Legislative
- Note: Requiring mitigation for forest loss through the adoption of "no-net-loss of forest" laws would provide an opportunity to generate significant new funding for conservation from developers mitigating their forest impacts.[191] This program should also apply to disturbances on public land, i.e. any project conducted on public land that leads to a loss of forest cover must be compensated for by the state or municipality with an equivalent amount of replanting in another location (e.g., models in New Jersey and Maryland). Any program needs to carefully consider what is deemed "unavoidable conversion," which must be strictly construed (see below).

**Incentivize the Siting of Renewable Energy Infrastructure to Avoid Loss of Forests, Farmland and Other Sensitive Lands**

- Source of Funds: N/A
- Action Required: Legislative/Regulatory
- Note: Incentivize the development of renewable energy infrastructure on areas other than forests and other open lands by loosening regulatory requirements to do so (e.g. requiring only a general permit) and/or disincentivizing development on open lands by developing more stringent siting approval requirements. Require developers to make payments to a mitigation fund if unavoidable conversion occurs.

### 3. Municipal Funding Programs (See also Urban Forest Carbon Credit)

**Enable Municipal Option to Fund Local Land Conservation, Stewardship and Climate Mitigation Strategies**

- Source of Funds: Local Buyer's Conveyance Fee
- Action required: Legislative
- Note: The legislation is enabling, giving municipalities the option, if they so choose, to establish a buyer's conveyance fee program to generate a local source of revenue to implement nature-based climate solutions and other local environmental projects. 2020 draft legislation included specific authorization to use funds for local climate mitigation strategies and to offset loss of tax revenue from land that has been permanently protected. See www.ctconservation.org for case studies and other information.

### 4. Tax Revenue Options

**Sales Tax Increase or a Percentage of Current Sales Tax Devoted to Fund Land Conservation and Related Programs**

- Source of funds: Increase CT General Sales Tax by .125% (from 6.35% – 6.475%)
- Action required: Legislative
- Note: Using the State of Minnesota Clean Water, Land and Legacy Amendment model (funds natural and cultural heritage programs), a sales tax increase of .125% would generate an estimated $78.4 million to fund a variety of climate-related programs, including land conservation. Based upon on overall New England average, this tax increase would cost approximately $47 per family per year.[192] The revenue would not be a substitute for other state conservation funding; rather it would provide an additional source of dedicated funds which may be available to CT DEEP, as well as nonprofits and municipalities through a competitive grant process. An alternative to a tax increase is to allocate a percentage of the existing general sales tax paid on outdoor recreation and related goods and services to fund land conservation and stewardship programs.

**Carbon Tax**

- Source of funds: Tax on power plants, developments, and other uses (including renewable energy infrastructure projects on forest or agricultural lands) responsible for greenhouse gas (GHG) emissions and/or loss of CO2 storage, with revenues to help pay for climate initiatives including forest carbon mitigation programs.
- Action required: Legislative
- Note: Carbon legislation in Washington State is a notable example.[193] If other subgroups are suggesting a carbon tax, then a portion of the revenue should go to investments in natural climate solutions.

### 5. Public – Private Partnership Pilot Programs to Advance Land Conservation

**Connecticut Land Conservation Partnership Program**

- Source of funds: State Bonding
- Action required: Legislative
- Note: This, and other suggested programs funded through bonding, could be packaged as part of a larger green bond program. Using the well-established New York State Conservation Partnership Program as a model, the state would partner with a private non-profit organization to offer competitive matching grants to qualified Connecticut land trusts for organizational capacity building, collaborations, stewardship/resource management, and conservation transaction support. Studies commissioned by the Land Trust Alliance found that stronger, more professional land trusts save more land.[194] Other public-private partnership programs may include DEEP personal services agreements with NGOs to provide direct services to municipalities and other NGOs for grant writing, grant administration, and project administration.

**Urban Forest Carbon Credit Project**

- Source of funds: Urban Forest Carbon Credit[195]
- Action required: None unless the state wants to incentivize partnerships, including (i) enacting enabling legislation for municipalities that want to set up special carbon districts; and/or (ii) using SRF; and/or (iii) expanding Urban Green and Community Garden Program, or other incentives.
- Note: This program would value carbon credit (metric tons of $CO_2$ captured in urban forests), including quantifiable ecosystem and other co-benefits associated with urban trees (stormwater reduction, air quality, energy savings, health and equity benefits, as well as employment); value the carbon revenue; establish a value per year; and sell the carbon credits to garner funding for local preservation, planting, restoration and other projects. Whether or not there is an urban forest carbon credit program established in Connecticut, the state should fund a program for municipalities (especially in underserved/EJ areas) to increase urban tree canopy cover and resilience in plantings and post-establishment treatments/monitoring as well as, in appropriate circumstances, to maintain mature and large trees which provide especially high levels of community benefits services such as cooling, mental health, pollution reduction, and habitat.

## Establishing a Forest Carbon Baseline for Connecticut

### Top Priority Actions

Connecticut relies heavily on the U.S. Environmental Protection Agency's State Inventory Tool (SIT) modules[196] for estimating annual GHG emissions. SIT is an interactive spreadsheet model that calculates sector-by-sector GHG emissions based on numerous state-level data sets. Currently, the Connecticut annual GHG inventory does not use the "land use, land use change, and forestry" (LULCF) SIT module. The SIT LULCF module applies national emission factors to state forest inventories. Data used in this model comes primarily from USDA Forest Service reports,[197] which can have significant sampling errors and inconsistent inventory methodologies over time. For Connecticut, this tool produces results that are not well understood.[198] For example, there are two large unexplained swings in total forest carbon flux (Figure 9). In 1998, a large increase in soil organic carbon and dead wood results in the total carbon flux in LULC changing from a sink to a source. Then in 2006, this trend sharply reverts, and soil organic carbon and litter becomes a large sink for $CO_2$ emissions. There are no changes in forest policy or disturbances that can account for these fluctuations.

**Figure 11.** Annual Connecticut GHG emissions by sector 1990-2017. Sectoral estimates are from EPA SIT modules and state-level data. LULCF module data included in figure but not counted in annual GHG total.


- Develop a usable model to reliably monitor carbon sinks related to working and natural lands, or to utilize models developed by state, academic, and nonprofit partners involved with the U.S. Climate Alliance.
- Report on Connecticut's "forest carbon inventory" over time alongside reported emissions for the building, energy, and transportation sectors.
- Include goals for increasing Connecticut's forest carbon sink (a.k.a. "negative emissions") with the next update to the Global Warming Solutions Act.

In effect, Connecticut does not account for carbon sinks. Connecticut statutes PA-08-98 and PA-18-82 established several future reduction goals below baseline estimates. Baseline estimates are based on 1990 and 2001 annual emission totals, years in which carbon sinks have not been estimated for Connecticut forests. Methods to quantify and assess sources and sinks of carbon in the forestry and land use sectors will help inform Connecticut's policy efforts to meet its statutory emission targets.

**Figure 12.** Annual Connecticut, sector-wide GHG emissions and future emission targets, 1990-2017. Black lines (solid and dashed) are annual emission totals without LULCF carbon sink accounting. Green lines (solid and dashed) are annual emission totals with LULCF carbon sink accounting.

Although the SIT LULCF estimates leave much to be desired in terms of accuracy, it does suggest that the carbon sequestered and stored in forests and related soils accounted for the equivalent of 20% of total emissions in 2017 (Figure 2). If estimates were reliable, the carbon sink from forests and related soils could represent about a decade's worth of emission reductions.

Another way to look at this challenge may be similar to what is currently done in Maryland (see Figure 3 below) where the state estimates that it can reduce emissions by 80% by 2040 using all available tools. However, the remaining 20% of emissions are proposed to be offset by "negative emissions" or carbon sinks from natural climate solutions such as management and protection of additional forest lands with increased carbon capture in mind.

0
10
20
30
40
50
60
1990 1995 2000 2005 2010 2015 2020
MMTCO2e

| | |
|---|---|
| **Annual Emissions** | **Annual Emissions w/ carbon sink** |
| **2030 Target(s)** | |
| **2020 Target(s)** | |
| **2050 Target(s)** | |

**Figure 13.** From presentation by Chris Hoaglund, Climate Change Program Manager with MD Department of the Environment showing the State efforts to both reduce emissions and account for sequestration from natural climate solutions, e.g. forests.

Accounting for carbon sink estimation through forestry is an important potential aspect of Connecticut's GHG emission inventory. Forests can be significant sinks for atmospheric carbon, potentially offsetting GHG emissions. For the New England region, projections show that despite land-use, land cover (LULC) change projected trends, carbon storage will increase.[199,200] Regardless of projected increases in soil respiration due to increased temperatures, the longer growing season and increased $CO_2$ fertilization account for this growth in carbon stock.

In a 2014 study,[201] a method was created to use land cover data for estimating land use, land change, and forestry (LUCF) impacts on GHG inventories. The authors used Stanford's Integrated Valuation of Ecosystem Services and Tradeoffs (InVEST) Carbon Storage and Sequestration model,[202] applied to the University of Connecticut's land cover change data (discussed below) for which carbon pool valuations had been assigned. The study was thus able to account for "foregone carbon sequestration" lost due to decreases in forested land cover over the 25-year period of the land cover dataset. Continuation of this work can inform state and local policy by accounting for $CO_2$ emissions from LUCF impacts while highlighting the potential for carbon sequestration to meet state statutory GHG emission goals.

The data that provided the basis for the Tomasso and Leighton (2014) study is from the University of Connecticut's Center for Land Use Education and Research (CLEAR). CLEAR has a long-running project, Connecticut's Changing Landscape (CCL), that uses remote sensing technology to chart changes in the state's major land cover categories over time. CLEAR developed the CCL project specifically to enable the public to compare multi-temporal land cover data sets, based on 30-meter pixel Landsat imagery.

The data in the CCL viewer dates back to 1985, the first year for which imagery of this resolution was available. CLEAR used cross-correlation analysis, which employs statistical analysis to identify pixels indicating a potential change between images, to produce a consistent land cover dataset for land cover change over time (Hurd et al., 2003[203]). Potentially changed pixels were identified and then merged with the 1985 classification to create the 1990 classification. This process was done for the 1995, 2002, 2006, 2010, and 2015 classifications, resulting in a 30-year record of land cover change for the state with 12 land cover categories. Land cover change data is compiled for the entire state, by town, by watershed, and shown in geographically-specific maps.

Previous work to construct a baseline in forest carbon storage has not yet resulted in a reproducible methodology for annual reporting. It should be a top priority to develop a usable model for reliably charting carbon sinks related to working and natural lands, and/or to utilize models developed by state, academic, and nonprofit partners involved with the U.S. Climate Alliance.

## Review & Rank of 2011 Climate Preparedness Report Recommendations

One of the important charges to the Forests Sub-Group was to review the recommendations made in the 2011 Connecticut Climate Change Preparedness Plan: Adaptation Strategies for Agriculture, Infrastructure, Natural Resources and Public Health Climate Change Vulnerabilities. This important report included recommendations on 15 Best Management Practices, 30 Research, Monitoring, and Education priorities, and 22 Policy, Legislation, Regulation, and Funding priorities. The members of the Forests Sub-Group utilized a survey and voted to determine the highest priority actions for Forests. The top priorities in each category follow:

### Top Priority Actions: Best Management Practices

### Top Priority Actions: Research, Monitoring, and Education

- Identify and conserve ecosystem services vulnerable to climate change.
- Encourage land management behaviors that support ecosystem services.
- Encourage adaptation strategies, including natural habitat conservation, Low Impact Development (LID) Best Management Practices (BMPs), agriculture water BMPs and drinking water treatment standards that will ameliorate the effects of water inundation.
- Apply adaptive management procedures.
- Increase active management of upland forests and reduce non-climatic stressors.
- Consider the public health needs of vulnerable populations in climate change adaptation planning.
- Engage and educate private landowners to manage their lands to minimize risk from climate change.
- Build public consensus for adaptation strategies through education and outreach.
- Develop educational campaigns for climate change adaptation awareness in Connecticut targeted at multiple sectors.
- Advance regional research and modeling to guide conservation efforts.
- Assess future flooding risks to natural and built infrastructure, including agricultural operations and public health and safety.
- Develop Connecticut- specific climate change projections for temperature, precipitation and sea level rise and support monitoring efforts for these climate drivers.
- Include students (future stakeholders) in climate change programs.
- Partner with educational institutions or organizations that conduct research.

### Policy, Legislation, Regulation, and Funding: Top-Ranked Priorities

- Acquire land and conservation easements in riparian areas adjacent to coldwater streams.
- Target headwaters for protection throughout the state.
- Reevaluate Connecticut's Green Plan and open space grant programs to prioritize acquisition of land and conservation easements for habitats most at risk from climate change.
- Collaborate among state agencies, municipalities and non-profits within Connecticut to implement regulations and policies that promote and facilitate the conservation of habitats and species most at risk from climate change.
- Continue to support regional cooperation on climate change adaptation through involvement in regional planning activities.
- Proceeds from RGGI auctions should support climate change adaptation work identified in this report and in accordance with Section 22a-200c(c).
- Implement new or modified policies that would encourage appropriate land use and reduce repetitive losses.
- Acquire land and conservation easements to provide upslope advancement zones adjacent to tidal marshes.

## Synergies with CT Forest Action Plan and Other GC3 Working Groups

The Forests Sub-Group did not develop this report in a vacuum, and tried to stay connected to the efforts of other Working Groups, Sub-Groups, and Subcommittees of the Governor's Council on Climate Change. In addition, we were mindful of the development of the 2020 Forest Action Plan for Connecticut by the Department of Energy and Environmental Protection, and hosted a presentation on this topic. Following are some of the notable synergies with these other efforts.

### 2020 Connecticut Forest Action Plan

Every 10 years, each State and US Territory is required to develop and submit to the USDA Forest Service a statewide comprehensive Forest Action Plan that covers all lands within its jurisdiction; Federal, State, private, municipal, and non-profit. The Plan requires considerable stakeholder input and public outreach ensuring identified strategies are the "State's" priorities but based upon three overarching national priorities 1) Conserving and managing working forest landscapes for multiple values and uses, 2) Protecting forests from threats, 3) Enhancing public benefits from trees and forests. State-based strategies are built upon an in-depth assessment of current forest and tree conditions.

As required in the 2008 Farm Bill, Connecticut developed and submitted its first Forest Action Plan in 2010. This plan was slightly revised in 2015 and by December 31, 2020 a new Forest Action Plan will be submitted to USDA Forest Service. Having a Forest Action Plan allows Connecticut to receive substantial annual federal financial assistance to address the threats and issues we as a State have identified.

### Other GC3 Working Groups and Sub-Groups

As the Forests Sub-Group was holding public meetings and preparing this report, other GC3 Working Groups and Sub-Groups were developing recommendations that at times touched on forests. The following groups deserve special recognition for their partnership and coordination:

- Agriculture/Soils, Rivers, and Wetlands Sub-Groups;
- Equity and Environmental Justice Working Group;
- Science & Technology Working Group; and
- Progress on Mitigation Strategies Working Group.

This report is being shared with those Working Groups and others to solicit additional input and suggestions before presenting an updated report to the full GC3 Council.

## Glossary of Terms & Endnotes

Early in the informational gather phase for the Forests Sub-Group it became apparent the need to define common terms to help working group members understand context of dialog and presentations. On February 27, 2020 GC3 Natural and Working Lands Work Group Forests Subgroup agreed upon the following definitions for the terms provided. While there are many ways to define these terms for the purpose of the Forests Subgroup effort the following definitions were agreed upon to achieve common understandings of ecological terms that relate to climate adaption and mitigation of forests. We are grateful to Mark Ashton, Robert Fahey, and Edward Faison and the following source materials UMASS/UVM (Forest-CarbonBooklet UMass UVM 2020.pdf.), Society of American Foresters, USDA FS R & D.

**Adaptation:** How forests react over time to all impacts including climate, fragmentation, insect disease, and pollution.

**Carbon sequestration:** The process of removing carbon from the atmosphere for use in photosynthesis, resulting in the maintenance and growth of plants and trees. The rate (or amount and speed) at which a forest sequesters carbon changes over time. In the northeastern United States, carbon sequestration [rates] typically peak when forests are young to intermediate in age (around 30–70 years old), but they continue to sequester carbon through their entire life span.

**Carbon storage:** The amount of carbon that is retained in a carbon pool within the forest. Storage levels increase with forest age and typically peak in the northeastern United States when forests are old (>200 years old). Forest-Carbon-Booklet UMass UVM 2020.pdf.

**Competitive hierarchy:** Longer lived species are site restrictive and will dominate specific sites reducing structural diversity and complexity.

**Diversity Theory (a.k.a. "negative density dependence hypothesis"):** Forests have evolved complexity over time including the adaptation and resistance to native insects and disease.

**Forest Health:** A tricky term because it is often used in the "eye of the beholder" and can refer to several different aspects of a forest. Most common use refers to an absence of invasive insects, disease, and related problems for tree survival.

**Intermediate disturbance hypothesis:** Relates to forest succession. How forests adapt and interact to site disturbance and climate. Guided by length in between disturbances and severity of disturbance. Forest diversity simplifies over time to late successional species.

**Mitigation (of forest carbon):** Action taken to alleviate potential adverse effects of climate change by increasing carbon sequestration in forest ecosystems.

**Redundancy:** A form of resilience. Multiple species comprising the same functional role.

**Resilience:** Rate of recovery from a disturbance. The ability of forest to absorb impacts over time. The capacity of an ecosystem to return to its previous pre-disturbance condition.

**Resistance:** Affiliated with resilience. The capacity to absorb disturbance and remain unchanged.

[1] https://portal.ct.gov/-/media/DEEP/climatechange/publications/BuildingaLowCarbonFutureforCTGC3Recommendationspdf.pdf
[2] https://portal.ct.gov/DEEP/Climate-Change/CT-Greenhouse-Gas-Inventory-Reports
[3] The U.S. Climate Alliance Commits to Maintain Lands as a Net Carbon Sink and Develop Pathways to Act by 2020. United States Climate Alliance. August 23, 2018.
[4] U.S. Climate Alliance Natural & Working Lands Challenge: http://www.usclimatealliance.org/nwlchallenge
[5] Valatin, Gregory. 2012. Additionality and climate change mitigation by the UK forest sector. Forestry: An International Journal of Forest Research. Volume 85, Issue 4, 445-462. https://doi.org/10.1093/forestry/cps056
[6] Virgilio, N. and S. Marshall. 2009. Forest Carbon Strategies in Climate Change Mitigation: Confronting Challenges Through On the-Ground Experience, The Nature Conservancy. Arlington, Virginia.
[7] Foster, D et al. 2017 as described in Southern New England Forest Management in an Era of Climate Change: A Position of the Yankee Division of the Society of American Foresters (2020), found at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-2020-agendas-andminutes/GC3_Forests_Yankee_SAF_Position_061820.pdf
[8] As defined by the USDA Forest Service's Forest Inventory and Analysis National Program (FIA) available at https://www.fia.fs.fed.us/
[9] Hochholzer, H. (2015, Revised). Connecticut's Forest Action Plan 2010. 46. Retrieved from https://portal.ct.gov/-/media/DEEP/forestry/assessment_and_strategy/FAP2015pdf.pdf
[10] Arnold, C; Wilson, E; Hurd, J; and Civco, D. (2020) 30 Years of Land Cover Change in Connecticut, USA: A Case Study of Long-Term Research, Dissemination of Results, and Their Use in Land Use Planning and Natural Resource Conservation. Land, P. 12. https://www.mdpi.com/2073-445X/9/8/255?type=check_update&version=2
[11] Chart by 2006 D. Smith (former Connecticut State Forester). Updated to current with data from Forest Inventory and Analysis National Program
[12] Connecticut's Changing Landscape study on forest fragmentation since 1985 by UConn Center for Land Use Education and Research from http://clear.uconn.edu/projects/landscape/v2/index.htm
[13] Ibid. Arnold, C; Wilson, E; Hurd, J; and Civco, D. (2020). P. 16.
[14] USDA Forest Service. 2019. Forests of Connecticut, 2018. Resource Update FS-209. Madison, WI: U.S. Department of Agriculture, Forest Service. 2p. https://doi.org/10.2737/FS-RU-209
[15] Tyrrell, M. report by Yale University's Global Institute of Sustainable Forestry. 2015. Understanding Connecticut Woodland Owners: A Report on the Attitudes, Values and Challenges of Connecticut's Family Woodland Owners.
[16] https://portal.ct.gov/DEEP/Forestry/Management-on-State-Lands/Forest-Management-on-State-Lands
[17] Based on analysis of a 168,960-acre forest stands database by DEEP.
[18] Estimate of average annual active forest management provided by DEEP's State Forester, Christopher Martin.
[19] An assessment of the DEEP property layer was conducted in June 2020 by DEEP Forestry staff, and the Summary of Passive DEEP Land by Category has been produced summarizing the results. In presenting the assessment they noted this analysis is somewhat incomplete since not all DEEP land records have been added to the GIS property layer to date, but efforts are underway by DEEP Land Acquisition and Management staff to capture all holdings.
[20] Jenkins, M. & Schaap, B. (April 2018). Forest Ecosystem Services: Background study prepared for the thirteenth session of the United Nations Forum on Forests. Retrieved June 11, 2020 from https://www.un.org/esa/forests/wp-content/uploads/2018/05/UNFF13_BkgdStudy_ForestsEcoServices.pdf
[21] Hochholzer, H. (2015, Revised). Connecticut's Forest Action Plan 2010. 8. Retrieved from https://portal.ct.gov/-/media/DEEP/forestry/assessment_and_strategy/FAP2015pdf.pdf
[22] U.S. Climate Alliance. NWL Challenge. Retrieved from http://www.usclimatealliance.org/nwlchallenge-faqs
[23] Griscom, B., et al. (2017) Natural Climate Solutions. *Proceedings of the National Academy of Sciences of the United States of America.* https://doi.org/10.1073/pnas.1710465114
[24] McDonald, R., Kroeger, T., Boucher, T., Longzhu, W. & Salem, R. (2016). Planting Healthy Air: A global analysis of the role of urban trees in addressing particulate matter pollution and extreme heat. The Nature Conservancy. Retrieved June 10, 2020 from file:///C:/Users/lhayden/Downloads/20160825_PHA_Report_Final.pdf

[25] Maher, B., Ahmed, I., Davison, B., Karloukovski, V. & Clarke, R. (2013). Impact of Roadside Tree Lines on Indoor Concentrations of Traffic-Derived Particulate Matter. *Environmental Science & Technology. 47* (23), 13737-13744. https://pubs.acs.org/doi/10.1021/es404363m
[26] Yang, J., Y. Chang, and P. Yan. (2015). Ranking the suitability of common urban tree species for controlling PM2.5 pollution. *Atmospheric Pollution Research. 6*(2): 267-277.
[27] Connecticut Department of Public Health. What is a Public Water System? Retrieved June 10, 2020 from https://portal.ct.gov/DPH/Drinking-Water/DWS/Public-Drinking-Water-FAQs
[28] Hochholzer, H. (2015, Revised). Connecticut's Forest Action Plan 2010. 8. Retrieved from https://portal.ct.gov/-/media/DEEP/forestry/assessment_and_strategy/FAP2015pdf.pdf
[29] National Association of Home Builders. Estimate of lumber from http://imi.us.tripod.com/imi/lumber_cost.html
[30] Hunter, M. L., Jr. 1990. Wildlife, forests, and forestry: principles of managing forests for biological diversity. Prentice Hall, Englewood Cliffs, New Jersey, USA.
[31] North East State Foresters Association. (2015) The Economic Importance of Connecticut's Forest Based Economy: https://www.nefainfo.org/uploads/2/7/4/5/27453461/connecticuts_forest_based_economy_4.2.15.pdf
[32] New England Forestry Foundation. New England Forests: The Path to Sustainability. Retrieved June 8, 2020 from https://newenglandforestry.org/wp-content/uploads/2016/04/12._Grow_As_Much_As_We_Use_0613141.pdf
[33] USDA Forest Service. Ethnobotany. Retrieved June 8, 2020: https://www.fs.fed.us/wildflowers/ethnobotany/
[34] Yu, C. P., Lin, C. M., Tsai, M. J., Tsai, Y. C., & Chen, C. Y. (2017). Effects of Short Forest Bathing Program on Autonomic Nervous System Activity and Mood States in Middle-Aged and Elderly Individuals. *International journal of environmental research and public health*, *14*(8), 897. https://doi.org/10.3390/ijerph14080897
[35] Forests Make Us Healthier Toolkit: https://standupforforests.org/amplify-forests-make-us-healthier/
[36] McDonald, R., Kroeger, T., Boucher, T., Longzhu, W. & Salem, R. (2016). Planting Healthy Air: A global analysis of the role of urban trees in addressing particulate matter pollution and extreme heat. The Nature Conservancy. Retrieved June 10, 2020 from file:///C:/Users/lhayden/Downloads/20160825_PHA_Report_Final.pdf
[37] Link to text of MD Forest Preservation Act: http://mgaleg.maryland.gov/2013RS/bills/hb/hb0706T.pdf
[38] Description of the MD Forest Preservation Act of 2013 on the website of the National Association of State Foresters: https://www.stateforesters.org/2013/04/08/maryland-passes-landmark-forestry-legislation/
[39] The text for this session is modeled after recommendations set forth in the "Report on Policies to Achieve No Net Loss of Forests in Maryland" (2011) https://dnr.maryland.gov/forests/Documents/nonetlossfinalreport.pdf
[40] Visit https://www.tpl.org/parkscore to get the data, explore maps of Connecticut communities, and learn how well Connecticut cities are meeting the need for parks.
41 Cain, M.L., Bowman, W.D. and Hacker, S.D., 2014. Ecology, Sinaur Associates, Incorporated, Sunderland, MA. ISBN-13: 978-0878939084.
42 Peterson, G., Allen, C.R. and Holling, C.S., 1998. Ecological resilience, biodiversity, and scale. Ecosystems, 1(1), pp.6-18.
43 Foster, D.R., 1988. Species and stand response to catastrophic wind in central New England, USA. The Journal of Ecology, pp.135-151.
44 Boose, Emery R., Kristen E. Chamberlin, and David R. Foster. "Landscape and Regional Impacts of Hurricanes in New England." Ecological Monographs 71, no. 1 (2001): 27-48.
45 Jactel, H., Brockerhoff, E. and Duelli, P., 2005. A test of the biodiversity-stability theory: meta-analysis of tree species diversity effects on insect pest infestations, and re-examination of responsible factors. In Forest diversity and function (pp. 235-262). Springer, Berlin, Heidelberg.
46 Wright, J.S., 2002. Plant diversity in tropical forests: a review of mechanisms of species coexistence. Oecologia, 130(1), pp.1-14.
47 Canham, C.D., Papaik, M.J., Uriarte, M., McWilliams, W.H., Jenkins, J.C. and Twery, M.J., 2006. Neighborhood analyses of canopy tree competition along environmental gradients in New England forests. Ecological applications, 16(2), pp.540-554.
48 Liptzin, D. and Ashton, P.M.S., 1999. Early-successional dynamics of single-aged mixed hardwood stands in a southern New England forest, USA. Forest ecology and management, 116(1-3), pp.141-150.
49 Kelty, M.J., 1986. Development patterns in two hemlock–hardwood stands in southern New England. Canadian Journal of Forest Research, 16(5), pp.885-891.

Ellum, D.S., Ashton, M.S. and Siccama, T.G., 2010. Spatial pattern in herb diversity and abundance of second growth mixed deciduous-evergreen forest of southern New England, USA. Forest Ecology and Management, 259(8), pp.1416-1426.
51 Panchen, Z.A., Primack, R.B., Nordt, B., Ellwood, E.R., Stevens, A.D., Renner, S.S., Willis, C.G., Fahey, R., Whittemore, A., Du, Y. and Davis, C.C., 2014. Leaf out times of temperate woody plants are related to phylogeny, deciduousness, growth habit and wood anatomy. New Phytologist, 203(4), pp.1208-1219.
52 Lorimer, C.G. and White, A.S., 2003. Scale and frequency of natural disturbances in the northeastern US: implications for early successional forest habitats and regional age distributions. Forest Ecology and Management, 185(1-2), pp.41-64.
53 Burns, R.M., 1990. Silvics of North America: Conifers/Hardwoods (No. 654). US Department of Agriculture, Forest Service. Vols. 1-2.
54 Johnson, D.J., Beaulieu, W.T., Bever, J.D. and Clay, K., 2012. Conspecific negative density dependence and forest diversity. Science, 336(6083), pp.904-907.
55 LaManna, J.A., Mangan, S.A., Alonso, A., Bourg, N.A., Brockelman, W.Y., Bunyavejchewin, S., Chang, L.W., Chiang, J.M., Chuyong, G.B., Clay, K. and Condit, R., 2017. Plant diversity increases with the strength of negative density dependence at the global scale. Science, 356(6345), pp.1389-1392.
56 Cain, M.L., Bowman, W.D. and Hacker, S.D., 2014. Ecology, Sinaur Associates, Incorporated, Sunderland, MA. ISBN-13: 978-0878939084.
57 Ellison, A.M., Bank, M.S., Clinton, B.D., Colburn, E.A., Elliott, K., Ford, C.R., Foster, D.R., Kloeppel, B.D., Knoepp, J.D., Lovett, G.M. and Mohan, J., 2005. Loss of foundation species: consequences for the structure and dynamics of forested ecosystems. Frontiers in Ecology and the Environment, 3(9), pp.479-486.
58 Orwig, D.A., Plotkin, A.A.B., Davidson, E.A., Lux, H., Savage, K.E. and Ellison, A.M., 2013. Foundation species loss affects vegetation structure more than ecosystem function in a northeastern USA forest. PeerJ, 1, p.e41.
59 Case, B.S., Buckley, H.L., Barker-Plotkin, A.A., Orwig, D.A. and Ellison, A.M., 2017. When a foundation crumbles: forecasting forest dynamics following the decline of the foundation species Tsuga canadensis. Ecosphere, 8(7), p.e01893.
60 Bell, M., 1985. The Face of Connecticut: People. Geology and the Land.
61 Foster, D.R., Motzkin, G. and Slater, B., 1998. Land-use history as long-term broad-scale disturbance: regional forest dynamics in central New England. Ecosystems, 1(1), pp.96-119.
62 Hochholzer, H. (2015, Revised). Connecticut's Forest Action Plan 2010. 8. Retrieved from https://portal.ct.gov/-/media/DEEP/forestry/assessment_and_strategy/FAP2015pdf.pdf
63 Messier, C., Puettmann, K.J. and Coates, K.D. eds., 2013. Managing forests as complex adaptive systems: building resilience to the challenge of global change. Routledge.
64 Stuart-Haëntjens, E.J., Curtis, P.S., Fahey, R.T., Vogel, C.S. and Gough, C.M., 2015. Net primary production of a temperate deciduous forest exhibits a threshold response to increasing disturbance severity. Ecology, 96(9), pp.2478-2487.
65 Fahey, R.T., Fotis, A.T. and Woods, K.D., 2015. Quantifying canopy complexity and effects on productivity and resilience in late-successional hemlock-hardwood forests. Ecological applications: 25(3), p.834.
66 Ollinger, S.V., Aber, J.D. and Reich, P.B., 1997. Simulating ozone effects on forest productivity: Interactions among leaf-, canopy-, and stand-level processes. Ecological Applications, 7(4), pp.1237-1251
67 Gandhi, K.J. and Herms, D.A., 2010. Direct and indirect effects of alien insect herbivores on ecological processes and interactions in forests of eastern North America. Biological Invasions, 12(2), pp.389-405.
68 Harper, K.A., Macdonald, S.E., Burton, P.J., Chen, J., Brosofske, K.D., Saunders, S.C., Euskirchen, E.S., Roberts, D.A.R., Jaiteh, M.S. and Esseen, P.A., 2005. Edge influence on forest structure and composition in fragmented landscapes. Conservation biology, 19(3), pp.768-782.
69 Didham, R.K., Ghazoul, J., Stork, N.E. and Davis, A.J., 1996. Insects in fragmented forests: a functional approach. Trends in ecology & evolution, 11(6), pp.255-260
70 Seidl, R., SCHELHAAS, M.J. and Lexer, M.J., 2011. Unraveling the drivers of intensifying forest disturbance regimes in Europe. Global Change Biology, 17(9), pp.2842-2852.

71 Seidl, R., Thom, D., Kautz, M., Martin-Benito, D., Peltoniemi, M., Vacchiano, G., Wild, J., Ascoli, D., Petr, M., Honkaniemi, J. and Lexer, M.J., 2017. Forest disturbances under climate change. Nature climate change, 7(6), pp.395-402.
72 Seidl, R. and Rammer, W., 2017. Climate change amplifies the interactions between wind and bark beetle disturbances in forest landscapes. Landscape Ecology, 32(7), pp.1485-1498.
73 Ma, Z., Peng, C., Zhu, Q., Chen, H., Yu, G., Li, W., Zhou, X., Wang, W. and Zhang, W., 2012. Regional droughtinduced reduction in the biomass carbon sink of Canada's boreal forests. Proceedings of the National Academy of
Sciences, 109(7), pp.2423-2427.
74 Hubau, W., Lewis, S.L., Phillips, O.L., Affum-Baffoe, K., Beeckman, H., Cuní-Sanchez, A., Daniels, A.K., Ewango, C.E., Fauset, S., Mukinzi, J.M. and Sheil, D., 2020. Asynchronous carbon sink saturation in African and Amazonian tropical forests. Nature, 579(7797), pp.80-87.
75 The Nature Conservancy: Staying Connected Initiative (SCI): http://stayingconnectedinitiative.org/
76 Housatonic Valley Association: Follow the Forest: http://followtheforest.org
77 http://maps.tnc.org/resilientland/
78 https://www.adaptivesilviculture.org/
79 https://forestadaptation.org/
80 Messier, C., Puettmann, K. J., & Coates, K. D. (Eds.). (2013). Managing forests as complex adaptive systems: building resilience to the challenge of global change. Routledge.
81 Keeton, W. S. (2006). Managing for late-successional/old-growth characteristics in northern hardwoodconifer forests. Forest Ecology and Management, 235(1-3), 129-142.
82 Mylecraine, K. A., & Zimmerman, G. L. (2000). Atlantic white-cedar: Ecology and best management practices manual. Department of Environmental Protection, Division of Parks and Forestry, New Jersey Forest Service.
83 Conway, T. M., & Yip, V. (2016). Assessing residents' reactions to urban forest disservices: A case study of a major storm event. Landscape and Urban Planning, 153, 1-10.
84 Fargione, J. E., Bassett, S., Boucher, T., Bridgham, S. D., Conant, R. T., Cook-Patton, S. C., ... & Gu, H. (2018). Natural climate solutions for the United States. *Science advances*, *4*(11), eaat1869.
85 Fargione, J. E., Bassett, S., Boucher, T., Bridgham, S. D., Conant, R. T., Cook-Patton, S. C., ... & Gu, H. (2018). Natural climate solutions for the United States. *Science advances*, *4*(11), eaat1869.
86 Fargione, J. E., Bassett, S., Boucher, T., Bridgham, S. D., Conant, R. T., Cook-Patton, S. C., ... & Gu, H. (2018). Natural climate solutions for the United States. *Science advances*, *4*(11), eaat1869
87 Moomaw, W. R., Masino, S. A., & Faison, E. K. (2019). Intact Forests in the United States: Proforestation Mitigates Climate Change and Serves the Greatest Good. *Frontiers in Forests and Global Change*, *2*, 27.
88 Nunery, J. S., & Keeton, W. S. (2010). Forest carbon storage in the northeastern United States: net effects of harvesting frequency, post-harvest retention, and wood products. Forest Ecology and management, 259(8), 1363-1375.
89 Catanzaro, P., & D'Amato, A. (2019). Forest carbon: An essential natural solution for climate change. University of Massachusetts.
90 The 9 Northeastern states include the six New England states, New York, New Jersey, and Pennsylvania. USDA Forest Service, Forest Inventory and Analysis Program, Fri Jun 12 00:38:20 GMT 2020. Forest Inventory EVALIDator web-application Version 1.8.0.01. St. Paul, MN: U.S. Department of Agriculture, Forest Service, Northern Research Station. [Available only on internet: http://apps.fs.usda.gov/Evalidator/evalidator.jsp]
91 Mackey, B., Prentice, I. C., Steffen, W., House, J. I., Lindenmayer, D., Keith, H., & Berry, S. (2013). Untangling the confusion around land carbon science and climate change mitigation policy. *Nature Climate Change*, *3*(6), 552-557.
92 https://apps.fs.usda.gov/Evalidator/evalidator.jsp
93 https://apps.fs.usda.gov/Evalidator/evalidator.jsp
94 Oswalt, Sonja N.; Smith, W. Brad; Miles, Patrick D.; Pugh, Scott A., coords. 2019. Forest Resources of the United States, 2017: a technical document supporting the Forest Service 2020 RPA Assessment. Gen. Tech. Rep. WO-97. Washington, DC: U.S. Department of Agriculture, Forest Service, Washington Office. 223 p. https://doi.org/10.2737/WO-GTR-97.

[95] Curtis, P. S., & Gough, C. M. (2018). Forest aging, disturbance and the carbon cycle. New Phytologist, 219(4), 1188-1193.
[96] Harris, N. L., Hagen, S. C., Saatchi, S. S., Pearson, T. R. H., Woodall, C. W., Domke, G. M., ... & Fore, A. (2016). Attribution of net carbon change by disturbance type across forest lands of the conterminous United States. *Carbon balance and management*, *11*(1), 24.
[97] Gough, C. M., Atkins, J. W., Fahey, R. T., & Hardiman, B. S. (2019). High rates of primary production in structurally complex forests. *Ecology*, *100*(10), e02864. Curtis, P. S., & Gough, C. M. (2018). Forest aging, disturbance and the carbon cycle. *New Phytologist*, *219*(4), 1188-1193.
[98] Domke, G., Williams, C. A., Birdsey, R., Coulston, J., Finzi, A., Gough, C., ... & Kurz, W. A. (2018). Forests. *In Second State of the Carbon Cycle Report (SOCCR2): A Sustained Assessment Report.[Cavallaro, N.; Shrestha, G.; Birdsey, R.; Mayes, MA; Najjar, RG; Reed, SC; Romero-Lankao, P.; Zhu, Z., eds. Washington, DC, USA: US Global Change Research Program.*, 365-398.
[99] Tyrrell, Mary. Understanding Connecticut Woodland Owners: A Report on the Attitudes, Values and Challenges of Connecticut6s Family Woodland Owners. 2015.
[100] Catanzaro, P., & D'Amato, A. (2019). Forest carbon: An essential natural solution for climate change. *University of Massachusetts*.
[101] McGarvey, J. C., Thompson, J. R., Epstein, H. E., & Shugart Jr, H. H. (2015). Carbon storage in old-growth forests of the Mid-Atlantic: toward better understanding the eastern forest carbon sink. Ecology, 96(2), 311-317.
[102] Keeton, W. S., Whitman, A. A., McGee, G. C., & Goodale, C. L. (2011). Late-successional biomass development in northern hardwood-conifer forests of the northeastern United States. Forest Science, 57(6), 489-505.
[103] Adams, J. M., Faure, H. F. D. L., Faure-Denard, L., McGlade, J. M., & Woodward, F. I. (1990). Increases in terrestrial carbon storage from the Last Glacial Maximum to the present. *Nature*, *348*(6303), 711-714. McGarvey, J. C., Thompson, J. R., Epstein, H. E., & Shugart Jr, H. H. (2015). Carbon storage in old-growth forests of the Mid-Atlantic: toward better understanding the eastern forest carbon sink. *Ecology*, *96*(2), 311-317.
[104] Stuart-Haëntjens, E. J., Curtis, P. S., Fahey, R. T., Vogel, C. S., & Gough, C. M. (2015). Net primary production of a temperate deciduous forest exhibits a threshold response to increasing disturbance severity. Ecology, 96(9), 2478-2487.
[105] Oswalt, Sonja N.; Smith, W. Brad; Miles, Patrick D.; Pugh, Scott A., coords. 2019. Forest Resources of the United States, 2017: a technical document supporting the Forest Service 2020 RPA Assessment. Gen. Tech. Rep. WO-97. Washington, DC: U.S. Department of Agriculture, Forest Service, Washington Office. 223 p.
National Land Cover Database (NLCD) 2016.
[106] Defined using the University of Connecticut's Center Forest Land Use & Education (CLEAR) Forest Fragmentation Model 1 as an area of forest land cover at least 300 feet from a non-forest edge.
http://clear.uconn.edu/projects/landscape/CT/stats/change7dates.htm#top
[107] Oswalt, Sonja N.; Smith, W. Brad; Miles, Patrick D.; Pugh, Scott A., coords. 2019. Forest Resources of the United States, 2017: a technical document supporting the Forest Service 2020 RPA Assessment. Gen. Tech. Rep. WO-97. Washington, DC: U.S. Department of Agriculture, Forest Service, Washington Office. 223 p.
https://doi.org/10.2737/WO-GTR-97
[108] UConn/CLEAR Forest Fragmentation Analysis Project. Found at
http://clear.uconn.edu/projects/landscape/v2/forestfrag/index.htm
[109] Oswalt, Sonja N.; Smith, W. Brad; Miles, Patrick D.; Pugh, Scott A., coords. 2019. Forest Resources of the United States, 2017: a technical document supporting the Forest Service 2020 RPA Assessment. Gen. Tech. Rep. WO-97. Washington, DC: U.S. Department of Agriculture, Forest Service, Washington Office. 223 p.
https://doi.org/10.2737/WO-GTR-97.
[110] UConn/CLEAR Forest Fragmentation Analysis Project. Found at
http://clear.uconn.edu/projects/landscape/v2/forestfrag/index.htm
[111] Ibid.
[112] Reinmann, A. B., & Hutyra, L. R. (2017). Edge effects enhance carbon uptake and its vulnerability to climate change in temperate broadleaf forests. *Proceedings of the National Academy of Sciences*, *114*(1), 107-112.
Nowak, D.J., Crane, D.E., 2002. Carbon storage and sequestration by urban trees in the USA. Environmental Pollution 116 (3), 381e389

[113] https://www.itreetools.org/
[114] Nowak, D.J., 1994. Air pollution removal by Chicago's urban forest. In: McPherson, E.G., Nowak, D.J., Rowntree, R.A. (Eds.), Chicago's Urban Forest Ecosystem: Results of the Chicago Urban Forest Climate Project. USDA Forest Service General Technical Report NE- 186, Radnor, PA, pp. 63-81
[115] https://apps.fs.usda.gov/Evalidator/evalidator.jsp
[116] Canham, C. D. (2020). *Forests Adrift-Currents Shaping the Future of Northeastern Trees*. Yale University Press.
[117] Fargione, J. E., Bassett, S., Boucher, T., Bridgham, S. D., Conant, R. T., Cook-Patton, S. C., ... & Gu, H. (2018). Natural climate solutions for the United States. *Science advances*, *4*(11), eaat1869.
[118] Defined using the University of Connecticut's Center Forest Land Use & Education (CLEAR) Forest Fragmentation Model 1 as an area of forest land cover at least 300 feet from a non-forest edge.
[119] Medium core forests comprise 250-500 acres and Large core forests comprise >500 acres.
[120] Section 23-8 of the General Statutes
[121] Connecticut has 830,679 acres of core forest >250 acres [190,471 acres classified as medium size core forest of 250-499 acres, and 640,208 acres of large cores >500 acres]. Protected lands used in this analysis were calculated using POSM and Litchfield Hills Greenprint datasets. According to these data, 33.53% of these medium and large cores is permanently protected [42,324 acres or 22.22% of medium cores and 236,230 acres or 36.89% of large cores].
[122] Based on the National Land Cover Database (NLCD) 2016.
[123] USDA Forest Service, Forest Inventory and Analysis Program, Fri Jun 12 00:38:20 GMT 2020. Forest Inventory EVALIDator web-application Version 1.8.0.01. St. Paul, MN: U.S. Department of Agriculture, Forest Service, Northern Research Station. [Available only on internet: http://apps.fs.usda.gov/Evalidator/evalidator.jsp]
[124] Fargione, J. E., Bassett, S., Boucher, T., Bridgham, S. D., Conant, R. T., Cook-Patton, S. C., ... & Gu, H. (2018). Natural climate solutions for the United States. *Science advances*, *4*(11), eaat1869.
[125] Connecticut's Changing Landscape study on forest fragmentation since 1985 by UConn Center for Land Use Education and Research from http://clear.uconn.edu/projects/landscape/v2/index.htm
[126] Moomaw, W. R., Masino, S. A., & Faison, E. K. (2019). Intact Forests in the United States: Proforestation Mitigates Climate Change and Serves the Greatest Good. *Frontiers in Forests and Global Change*, *2*, 27.
[127] https://www.nrs.fs.fed.us/rna/
[128] https://en.wikipedia.org/wiki/Scientific_control
[129] Sohngen, B. (2020). Climate Change and Forests. Annual Review of Resource Economics. 12(17), 1–17. https://doi.org/10.1146/annurev-resource-110419-010208
[130] Natural Area Preserve statute Section 23-5a - i: https://www.cga.ct.gov/current/pub/chap_447.htm#sec_23-5a
[131] Example of Research Natural Area Management Plan from the Routt National Forest in Colorado: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5166048.pdf
[132] The Northeast Wilderness Trust offers a Wild Carbon option for landowners found at https://newildernesstrust.org/wilderness-conservation/climate-change/
[133] Reinmann, A. B., & Hutyra, L. R. (2017). Edge effects enhance carbon uptake and its vulnerability to climate change in temperate broadleaf forests. *Proceedings of the National Academy of Sciences*, *114*(1), 107-112. Nowak, D.J., Crane, D.E., 2002. Carbon storage and sequestration by urban trees in the USA. Environmental Pollution 116 (3), 381e389
[134] https://www.itreetools.org/
[135] Nowak, D.J., 1994. Air pollution removal by Chicago's urban forest. In: McPherson, E.G., Nowak, D.J., Rowntree, R.A. (Eds.), Chicago's Urban Forest Ecosystem: Results of the Chicago Urban Forest Climate Project. USDA Forest Service General Technical Report NE- 186, Radnor, PA, pp. 63-81
[136] Lutz, J. A., Furniss, T. J., Johnson, D. J., Davies, S. J., Allen, D., Alonso, A., ... & Blomdahl, E. M. (2018). Global importance of large-diameter trees. *Global Ecology and Biogeography*, *27*(7), 849-864.
[137] https://newenglandforestry.org/2019/02/11/what-is-exemplary-forestry/
[138] Krebs, J., Pontius, J., & Schaberg, P. G. (2017). Modeling the impacts of hemlock woolly adelgid infestation and presalvage harvesting on carbon stocks in northern hemlock forests. *Canadian Journal of Forest Research*, *47*(6), 727-734.

[139] Gutzat, F., & Dormann, C. F. (2018). Decaying trees improve nesting opportunities for cavity-nesting birds in temperate and boreal forests: A meta-analysis and implications for retention forestry. *Ecology and evolution*, *8*(16), 8616-8626.
[140] North East Association of State Foresters: Landscape stewardship guide (NA–IN–06–11). 2011. Found at https://www.fs.usda.gov/naspf/sites/default/files/publications/landscape_stewardship_guide_11_screen_1.pdf
[141] Donnelly, C. and Doria, G. The Use of Wood from Urban and Municipal Trees. CT DEEP Division of Forestry publication. June 2014. Found at https://portal.ct.gov/-/media/DEEP/forestry/urban_forestry/Biomassfinal62914pdf.pdf
[142] Waller, D. M., and N. J. Reo. 2018. First stewards: ecological outcomes of forest and wildlife stewardship by indigenous peoples of Wisconsin, USA. Ecology and Society 23(1):45. https://doi.org/10.5751/ES-09865-230145
[143] U.S. Global Change Research Program, Section 9.2
[144] U.S. Census Bureau Profile of Connecticut: https://data.census.gov/cedsci/profile?q=Connecticut&g=0400000US09
[145] Governing: A State-by-State Look at Growing Minority Populations. 2015. https://www.governing.com/topics/urban/gov-majority-minority-populations-in-states.html
[146] Graphic of urban heat island effect in Hartford on Climate Central website: https://www.climatecentral.org/news/urban-heat-islands-threaten-us-health-17919
[147] https://health2016.globalchange.gov/populations-concern
[148] Nowak, David & Dwyer, John. (2010). Understanding the Benefits and Costs of Urban Forest Ecosystems. 10.1007/978-1-4020-4289-8_2.
149 Nowak, D. and Heisler, G. Air Quality Effects of Urban Trees and Parks. National Recreation and Parks Association Research Series. 2010.
150 Wolf, K. L., & Robbins, A. S. (2015). Metro nature, environmental health, and economic value. Environmental health perspectives, 123(5), 390–398. https://doi.org/10.1289/ehp.1408216
[151] Berto R., Baroni M.R., Zainaghi A., Bettella S. An exploratory study of the effect of high and low fascination environments on attentional fatigue. J. Environ. Psychol. 2010;30:494–500. doi: 10.1016/j.jenvp.2009.12.002.
[152] Kaplan, S. The restorative benefits of nature: Toward an integrative framework. Journal of Environmental Psychology. Volume 15, Issue 3, September 1995, Pages 169-182.
[153] White, MP; Alcock, I; Wheeler, BW; et al. Coastal proximity, health and well-being: results from a longitudinal panel survey. Health Place Journal. 2015.
[154] Landsat-8 satellite imagery provided by Jarlath O'Neil-Dunne at the University of Vermont Spatial Analysis Laboratory as part of 2014 study on urban tree cover in New Haven.
[155] Mock, B. CityLab Article. "Why Detroit residents pushed back against tree planting." https://getpocket.com/explore/item/why-detroit-residents-pushed-back-against-tree-planting
[156] American Forests Magazine. Tree Equity Issue. Winter/Spring 2020. Found at https://www.ctwoodlands.org/sites/default/files//AmericanForests%20Magazine%20Tree%20Equity%20Issue%202.11.20.pdf
[157] American Journal of Preventative Medicine (2013); 44(2):139 –145.
[158] Study of urban tree cover in New Haven (2009): https://portal.ct.gov/-/media/DEEP/forestry/urban_forestry/UTCReportNewHavenpdf.pdf
[159] Study of urban tree cover in Hartford (2010): https://portal.ct.gov/-/media/DEEP/forestry/urban_forestry/TreeCanopyReportHartfordpdf.pdf
[160] Study of urban tree cover in Bridgeport (2012): https://portal.ct.gov/-/media/DEEP/forestry/urban_forestry/TreeCanopyReportBridgeportpdfpdf.pdf
[161] Study of urban tree cover in Greater Bridgeport region (2014): https://portal.ct.gov/-/media/DEEP/forestry/urban_forestry/GreaterBridgeportTreeCanopyReportpdf.pdf
[162] City of Hartford Urban Tree Canopy Assessment and Planting Plan (2014): https://www.americanforests.org/wp-content/uploads/2015/04/AF-Community-ReLeaf-%e2%80%94-HartfordUTC-Assessment.pdf

[163] City of Hartford Tree Canopy Action Plan (June 2020): https://hartfordgovmy.sharepoint.com/:b:/g/personal/yig001_hartford_gov/EWf4RrmpvSxHrB8f4LP8QU8BN8o8gHUfvI89QN4EJzi82g?e=kUV41m

[164] https://www.mass.gov/service-details/greening-the-gateway-cities-program

[165] Donnelly, C. and Doria, G. The Use of Wood from Urban and Municipal Trees. CT DEEP Division of Forestry publication. June 2014. Found at https://portal.ct.gov/-/media/DEEP/forestry/urban_forestry/Biomassfinal62914pdf.pdf

[166] Sherrill, S. and Bratkovich, S. (2018) Estimates of Carbon Dioxide withheld from the Atmosphere by Urban Hardwood Products. https://www.researchgate.net/publication/324687399_ESTIMATES_OF_CARBON_DIOXIDE_WITHHELD_FROM_THE_ATMOSPHERE_BY_URBAN_HARDWOOD_PRODUCTS

[167] USDA Forest Service. Wood Education Resource Center/Urban Wood Utilization resources: https://www.fs.usda.gov/naspf/programs/wood-education-and-resource-center/urban-wood-utilization

[168] Oliver, C., Nassar, N., Lippke, B., & McCarter J. (2014). Carbon, Fossil Fuel, and Biodiversity Mitigation with Wood and Forests. *Journal of Sustainable Forestry. 33*(3), 248-275.

[169] Forest Management & Greenhouse Gas Mitigation Opportunities. Information Sheet #7. Peter Woodbury & Jenifer Wightman (2017).

[170] McDowell, N.G., Allen, C.D., Anderson-Teixeira, K., Aukema, B.H., Bond-Lamberty, B., Chini, L., Clark, J.S., … Xu, C. (2020.) Pervasive shifts in forest dynamics in a changing world. Science. 368 (6494). DOI: 10.1126/science.aaz9463

[171] Brodribb, T.J., Powers, J., Cochard, H. and Choat, B. (2020) Hanging by a thread? Forests and drought. Science. 68, 261–266.

[172] Anderegg, W.R.L., Trugman, A.T., Badgley, G., Anderson, C.M., Bartuska, A., Ciais, P., Cullenward, D., … Randerson,J.T. (2020) Climate-driven risks to the climate mitigation potential of forests. Science 368, 1327.

[173] Janowiak, Maria K. et al. 2018. *New England and northern New York forest ecosystem vulnerability assessment and synthesis*: a report from the New England Climate Change Response Framework project. Gen. Tech. Rep. NRS-173. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 234 p. https://doi.org/10.2737/NRS-GTR-173

[174] Swanston, C., Brandt, L.A., Janowiak, M.K. *et al.* Vulnerability of forests of the Midwest and Northeast United States to climate change. *Climatic Change* **146,** 103–116 (2018). https://doi.org/10.1007/s10584-017-2065-2

[175] Ibid.

[176] Joyce, Dennis G., and Gerald E. Rehfeldt, Management strategies for black spruce (*Picea mariana* (Mill.) B.S.P.) in the face of climate change: climatic niche, clines, climatypes, and seed transfer, *Forestry: An International Journal of Forest Research*, Volume 90, Issue 4, October 2017, Pages 594–610, https://doi.org/10.1093/forestry/cpx018

[177] Janowiak, Maria K. et al. 2018. *New England and northern New York forest ecosystem vulnerability assessment and synthesis*: a report from the New England Climate Change Response Framework project. Gen. Tech. Rep. NRS-173. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 234 p. https://doi.org/10.2737/NRS-GTR-173

[178] Manomet Center for Conservation Science (Manomet) and Massachusetts Division of Fisheries and Wildlife (MA DFW). 2010. Climate change and Massachusetts fish and wildlife: Volume 2 habitat and species vulnerability. Massachusetts Division of Fisheries and Wildlife, Westborough, MA. https://climateactiontool.org/

[179] Ibid.

[180] Ibid, Janowiak, Maria K. et al. 2018.

[181] Adaptation Subcommittee to the Governor's Steering Committee on Climate Change (ASGSCCC). 2010. The impacts of climate change on Connecticut agriculture, infrastructure, natural resources and public health. Available at: http://www.ct.gov/deep/lib/deep/climatechange/impactsofclimatechange.pdf

[182] Climate Change Atlas https://www.fs.fed.us/nrs/atlas/tree/43 U.S. Department of Agriculture, Forest Service.

[183] Moore Myers, Jennifer, Coastal Forests Face Rising Sea Levels, Increased Salinity, SRS Science Communications, November 7, 2019: U.S. Department of Agriculture, Forest Service. https://www.srs.fs.usda.gov/compass/2019/11/07/coastal-forests-face-rising-sea-levels-increased-salinity/

[184] Wildlands and Woodlands, "Public Conservation Funding in New England: Recent Trends in Government Spending on Land Conservation."
https://www.wildlandsandwoodlands.org/sites/default/files/Public%20Funding%20LR.pdf
[185] From powerpoint presentation by Chris Hoagland, Climate Change Program Manager, Maryland Department of the Environment on May 18, 2020.
[186] U.S. Climate Alliance Natural and Working Lands Learning Lab, July 9-11, 2018
[187] https://www.rggi.org/allowance-tracking/offsets/offset-categories/forestry-afforestation
[188] U.S. Climate Alliance Natural and Working Lands Learning Lab, July 9-11, 2018
[189] https://www.landtrustalliance.org/topics/taxes/income-tax-incentives-land-conservation
[190] U.S. Climate Alliance Natural and Working Lands Learning Lab, July 9-11, 2018
[191] Highstead, "New England Conservation Pathways Report", pp 73-80
https://www.wildlandsandwoodlands.org/sites/default/files/Highstead_Pathways_Report.pdf
[192] Id., pp. 52-58
[193] U.S. Climate Alliance Natural and Working Lands Learning Lab, July 9-11, 2018
[194] Land Trust Alliance, Studies by Peter Szabo, Bloomington Management Advisors
[195] https://www.cityforestcredits.org/
[196] https://www.epa.gov/statelocalenergy/state-inventory-and-projection-tool
[197] Butler, B. (2018). Forests of Connecticut, 2017. Resource Update FS-159. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 3 p. https://doi.org/10.2737/FS-RU-159.
[198] Tomasso, L., and M. Leighton (2014). The impact of land use change for greenhouse gas inventories and statelevel climate mediation policy: A GIS methodology applied to Connecticut. Journal of Environmental Protection, 5:
1572-1587. http://dx.doi.org/10.4236/jep.2014.517149
[199] Brown, M., Canham, C., Murphy, L., and T. Donovan (2018). Timber harvest as the predominant disturbance regime in northeastern U.S. forests: effects of harvest intensification. Ecosphere 9, e02062.
[200] Duveneck, M., and J. Thompson (2019). Social and biophysical determinants of future forest conditions in New England: Effects of a modern land-use regime. Global Environmental Change, 55: 115-129.
https://doi.org/10.1016/j.gloenvcha.2019.01.009
[201] Tomasso, L., and M. Leighton (2014). The impact of land use change for greenhouse gas inventories and statelevel climate mediation policy: A GIS methodology applied to Connecticut. Journal of Environmental Protection, 5:
1572-1587. http://dx.doi.org/10.4236/jep.2014.517149
[202] Sharp, R., H. Tallis, T. Ricketts, A. Guerry, S. Wood, R. Chaplin-Krame, E. Nelson, D. Ennaanay, S. Wolny, N. Olwero, K. Vigerstol, D. Pennington, G. Mendoza, J. Aukema, J. Foster, J.Forrest, D. Cameron, K. Arkema, E. Lonsdorf, C. Kennedy, G. Verutes, C. Kim, G. Guannel, M. Papenfus, J. Toft, M. Marsik, J. Bernhardt, R. Griffin, K. Glowinski, N. Chaumont, A. Perelman, M. Lacayo, L. Mandle, P. Hamel, A. Vogl, L. Rogers, W. Bierbower, D. Denu, and J. Douglass (2018). InVEST 3.6.0 User's Guide. The Natural Capital Project, Stanford University, University of Minnesota, The Nature Conservancy, and World Wildlife Fund.
[203] Hurd, J., E. Wilson, D. Civco, S. Prisloe, and C. Arnold (2003). Temporal Characterization of Connecticut's Landscape: Methods, Results and Applications. In Proc 2003 ASPRS Annual Convention, Anchorage, AK 12 p.

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DRAFT 9.10.2020 for Public Comment

Forests Sub-Group
Working and Natural Lands Working Group
9/10/2020

NOTES: Edits and comments from various colleagues were compiled by Mike Ferrucci and are placed within a word version of the draft report. This compilation was done in an attempt to help streamline the process used by the subcommittee to review our comments, and then hopefully incorporate them.

The edits can be readily seen if the "Markup" text is shown, by selecting "All Markup" under "Track Changes" in MS Word. There are also many substantive comments.

Please contact Mike Ferrucci (mferrucci@iforest.com) if it would be helpful to provide these comments in a different format or alternative version of MS Word.

There are two separate word documents because I couldn't combine these two documents effectively:

A. GC3 Forest SubGroup Comments.DEEP.Urban.Vulnerable Populations COMPILED by FERRUCCI A
B. **GC3 Forest Draft Report Comments.COMPILED by FERRUCCI B (this document)**

## Acknowledgements

Over the course of 5 months, the Forests Sub-Group held 9 public meetings, organized 20 presentations from experts on various issues related to forests and climate change, built a resource catalog of over 40 peer-reviewed journal articles, and kept up an enthusiastic pace thanks to the wisdom, expertise, and commitment of its members.

The following members of the Forests Sub-Group who all contributed to this report are listed below with their organizational affiliations:

- Tim Abbott, Housatonic Valley Association
- Mark Ashton, Yale School of Forestry & Environmental Studies
- Patrick Comins, Connecticut Audubon Society
- Thomas Easley, Yale School of Forestry & Environmental Studies
- Robert Fahey, University of Connecticut, Natural Resources and the Environment
- Edward Faison, Highstead
- David Gumbart, The Nature Conservancy – CT Chapter
- Eric Hammerling, Connecticut Forest & Park Association, Chair
- Lisa Hayden, New England Forestry Foundation
- Charles Leigus, Supreme Forest Products, Inc.
- Amy Paterson, Connecticut Land Conservation Council
- Herb Virgo, Keney Park Sustainability Project

The CT Department of Energy and Environmental Protection also deserves enormous credit for supporting the efforts of this Sub-Group in addition to their "day jobs." In particular, the SubGroup wants to thank Commissioner Katie Dykes for enabling Rick Jacobson, Chris Martin, Cary Lynch, and Jaimeson Sinclair to be so engaged and helpful throughout this process.

We also want to recognize the other Sub-Groups of the Working and Natural Lands Working Group – Agriculture/Soils, Rivers, Wetlands – as well as the Equity and Environmental Justice Working Group, the Science & Technology Working Group, and the Progress on Mitigation Strategies Working Group for their partnership on forest issues and to make our Sub-group and process as inclusive as it should be.

Lastly, we thank Governor Lamont for re-energizing the Governor's Council on Climate Change through Executive Order #3 which gave our Sub-Group its overall charge to create this report.

In the following report, the Forests Sub-Group endeavors to give you a better understanding of Connecticut's forests and the important role they play in helping Connecticut to adapt, become more resilient, and mitigate the many challenges we face due to climate change.

## Contents

## Executive Summary

### Background

In its 2018 report, Building a Low Carbon Future for Connecticut: Achieving a 45% GHG Reduction by 2030,[1] the Governor's Council on Climate Change (GC3) recognized natural and working lands as important carbon sinks that could help mitigate emissions from the electricity generation, transportation, and building sectors which together produce almost 60% of Connecticut's greenhouse gas (GHG) emissions.[2]

The GC3 recommended that Connecticut continue to work with non-governmental organizations like the U.S. Climate Alliance in efforts to regionally develop carbon sequestration and storage practices.[3] The council also recommended that "DEEP should work with land trusts, forest owners, and working lands managers to help adopt carbon accounting methodologies that further support sustainable land-use practices."

In 2018, Connecticut joined with over 25 states in accepting the U.S. Climate Alliance's Natural and Working Lands Challenge[4] with a commitment to the following actions:

- Improve inventory methods for land-based carbon flux;
- Identify best practices to reduce GHG emissions and increase resilient carbon sequestration;
- Advance programs, policies, and incentives to reduce GHG emissions and enhance resilient carbon sequestration;
- Undertake actions that will support a collective, Alliance-wide goal to maintain natural and working lands as a net sink of carbon and protect and increase carbon storage capacity, while balancing near- and long-term sequestration objectives; and
- Integrate priority actions and pathways into state GHG mitigation plans within two years of joining this challenge.

Although none of these actions are "completed" at this time, Connecticut continues to work toward these goals both individually and in partnership with neighboring states, academia, and nonprofit organizations as well as the private sector. Many of the recommendations in this report are tied to furthering the commitments Connecticut made in 2018.

**Commented [OJ1]:** This implies that working lands are not natural. This is not the case. I suggest removing the "and"

### Summary of Report

Climate change is an enormous threat to Connecticut's forests and people, and we must respond boldly with urgent action.

This report recommends policy, funding, conservation, research, and stewardship actions which would both make forests more resilient and enhance their potential for sequestering and storing carbon as a significant and growing offset for GHG emissions from other sectors.

Following is a summary of the major recommendations and findings in this report:

***We are all forest dwellers.*** Connecticut's dominant land type is "forest" which covers approximately 59% of the state. Go here for more on the Status of Connecticut's forests.

***Resilient forests provide many benefits to people and nature***, such as reducing heat stress and lowering energy bills by providing shade and firewood; improving air quality and providing physical and mental health benefits; supporting local forest based economies, jobs, and economic benefits; sustaining wildlife habitats and more livable communities for people; storing and sequestering carbon; and much more. Go here for the benefits forests provide to Connecticut. NOTE: "Go here for…" statements are from original report. They contained hyperlinks which were lost in the editing process used by this commenter. I did not intend to suggest removing these.

***Forest resiliency is threatened by various factors***. Although forests are an important carbon sink in Connecticut, our forests may become less resilient and effective at adapting to and mitigating climate change due to a mix of factors (invasive plants and forest pests; over-browse by deer impacting forest regeneration; forest conversion to other uses creating more vulnerable forest edges; air pollution; more intense weather events; etc.). Go here for threats to forest resiliency.

***Connecticut's forests are valuable for carbon storage***. Connecticut's forests are the most "carbon dense" (most above-ground carbon stored/acre), oldest (~16% of our forests are 100+ years old), and have the highest annual net growth in forest biomass in the Northeast (net growth exceeds net removals from timber harvests or salvage operations by more than 500%). In addition, significant amounts of carbon are stored in forest products
Go here for forests as mitigation to climate change.

***Keep forests as forests***. Protecting healthy forests from conversion to non-forest and preventing the conversion of forestland
to other uses are likely the most important things we can do to allow forests to both adapt to and mitigate climate change. Recommendations in the report include setting a goal for increasing Connecticut's forest cover, increasing resources available to manage Connecticut's State Forests, protecting and connecting core forests, and dedicating
more resources to work with private landowners (who own ~71% of Connecticut's forestland). Go here for recommendations on forest adaptation/resiliency, and go here for recommendations on mitigation.

***Retain large trees in forests and residential areas***. Large trees store a significant amount of the carbon and other benefits that trees provide in both urban/residential and rural settings. Retaining large trees and forest cover when and where it makes sense should be actively encouraged. Go here for recommendations on large trees.

***Climate change is impacting vulnerable people the hardest, and there are significant inequities*** both in the locations where trees are, and are not, currently providing benefits to people. These inequities are most apparent in our cities and in regions of the world where communities with the highest poverty rates and health inequities tend to also have the lowest tree canopy cover and direct connections to green spaces. Using wood from Connecticut-grown trees helps reduce negative impacts from harvesting trees in other, less-priveledged parts of the world Go here for impacts of climate change on vulnerable populations.

***Energize a Youth Conservation Corps*** for another "tree planting and forest stewardship army" like the original Civilian
Conservation Corps (CCC) to provide outdoor jobs, build trust and cultural understanding of green spaces at the community level, clean-up/plant-up open spaces to benefit both urban and



**Deleted:** wood products

**Commented [OJ2]:** Do we know this for sure at this given point in time? We have significant mortality and decay from a recent gypsy moth outbreak and EAB as well. Forests could be an important carbon sink, not sure if they currently are

**Commented [OJ3]:** This section needs to highlight the importance of forest products for storing carbon

**Commented [MF4R3]:** Sentence added. Carbon storage in forest products is not sufficiently covered in this report. We ask that the next version include considerably more information on this topic. Carbon in forest products is truly a "low hanging fruit" if our state is going to balance our carbon budget!

**Commented [OJ5]:** How are you calculating the age of the forest, by the age of the oldest trees or when the forest was reforested post-agriculture?

**Commented [OJ6]:** Net growth should not be calculated by simply comparing total growth with harvest removals. It must also include losses due to disturbance.

**Commented [OJ7]:** MUST ALSO INCLUDE more resources for the DEEP Division of Forestry! They have seen their resources reduced by upwards of 50% in the last decade, not to mention the last 50 years. If you want healthy public lands then we need people with resources to maintain those lands.

**Deleted:** often provide

**Commented [OJ8]:** They provide an amount of carbon? What? You mean they store an amount of carbon? What's large? This is very ambiguous. Perhaps you mean legacy trees?

**Commented [OJ9]:** Not whenever possible, but when and where it makes sense

**Deleted:** whenever possible

**Commented [OJ10]:** Why tree planting army? Why not call it forest stewardship? Planting is a one-time thing, stewardship is a lifetime of care.

**Commented [OJ11]:** I hope jobs in the forest products and forestry sectors are considered in this

rural environments, and at the same time encourage conservation career opportunities for people of color. Go here for supporting community interest in trees and green spaces.

***Vulnerable forest types require focused protection and management.*** There are a number of specialized forest types (freshwater forested wetlands, pitch pine-scrub oak, riparian forests alongside cold-water streams and headwaters, lowland Atlantic white cedar, and other forest types) that should be priorities for protection and management as appropriate. Go here for the impacts of climate change on special forest types.

***Establish forest carbon baseline and goals for Connecticut***. Under the Global Warming Solutions Act (GWSA), Connecticut has established significant goals for reducing emissions from the transportation, energy, and building sectors to combat climate change. Connecticut should add similar goals to the GWSA for carbon storage, including storage of carbon in forest products, and ongoing "negative emissions" (carbon and other greenhouse gas sinks) that forests, wetlands, soils, and other natural climate solutions can provide. However, before such quantative goals can be determined the state must establish quantitative scientific studies on carbon dynamics related to forests. Go here for the need for Connecticut's forest carbon baseline and goals.

***Commitments to funding, programs, and resources are critical.*** Enhancing existing funding programs, funding long-term research initiatives, establishing new sources of revenue, and providing tax incentives for acquisition and stewardship must be priorities. The DEEP Forestry Division should be allocated the resources and staffing it needs to develop management plans and steward the 100,000 acres of CT State Forests which are being neglected right now due to staffing cuts over many decades.

Go here for recommended funding, programs, and resources.

***Adopt a "No Net Loss of Forest" policy for Connecticut*** to support all of the recommendations above by:
(1) Keeping forests as forests to retain the multiple benefits of carbon storage, biodiversity, public health, green infrastructure, etc.
(2) Steward healthy forests and maintain continuity of forestland. Planned, active forest management can address inevitable impacts upon forests, sensitive habitats, and Other forest resources and benefits from invasive plants, insects, and fungi and from high deer populations.
(3) Offsetting all planned or permitted forest losses through a combination of compensatory mitigation requirements and other tools.
(4) Providing financial incentives for stewardship, forest retention, and forest resiliency on privately-owned forestlands;
(5) Using active state forestland management as a model for private landowners to learn from and
(6) Protecting urban forests, building more parks, and planting more trees and gardens to maximize the benefits to people of trees and green spaces. Go here for more on a "No Net Loss of Forest" policy for Connecticut.
There are many factors to consider simultaneously with forests which makes any single recommendation on their future insufficient. It will likely require a full suite of conservation strategies working together to manage for a variety of values and uses on a long-term timescale using peer-reviewed science and a holistic understanding of forest systems.
In addition, any comprehensive climate policy solutions for forests should strive to address the



**Commented [OJ12]:** Some will be lost if fully preserved. Keep in mind that some of what is listed in this paragraph exists because of fire and likely was prominent in CT because of traditional use of fire.

**Commented [OJ13]:** You need to establish quantitative scientific studies before you can have honest goals for these amounts.

**Deleted:** ensure that

**Deleted:** natural climate solutions are considered at every level of planning…

**Commented [OJ14]:** What about unplanned ones, or ones that do not need a permit? Why not incentivize private landowners to steward their forests and provide support for working forest conservation easements? The State receives federal funding for farmland conservation but it could also support forestland conservation easements.

**Commented [OJ15]:** Such as…?

**Deleted:** 5

challenges of 1) the *longevity* of the approach, 2) *additionality* (that the action would not have taken place anyway), 3) *leakage* (that the mitigation action is not pushing the activity elsewhere where it may cause more damage), and 4) *substitution*, the carbon implications of using one material instead of another compared to keeping carbon stored in the forest.[5,6] This kind of approach can help ensure that southern New England forests continue to capture and store carbon, maintain ecosystem functions and services, and decrease global deforestation.[7]

## Status of Connecticut's Forests

Connecticut's forests and trees add immensely to the quality of life for the people of the state. They filter the air that is breathed, safeguard private and public drinking water sources, produce locally grown forest products, provide essential habitat for wildlife, and moderate summer and winter temperatures near homes and businesses. They also have the potential to absorb and store atmospheric carbon which is currently increasing beyond historic and naturally occurring levels.

### Carbon Storage in Connecticut's Forests

The most recent national Forest Carbon Inventory published by the USDA Forest Service documents 191 million metric tons (MMT) of Carbon in Connecticut's forests in 2019, which has increased by ~9 MMT over the past decade. Of note, these Forest Service figures do not include individual trees or groups of trees that may not fit the standard definition of "forest." The Forest Service's definition of forest land is at least one continuous acre of forest canopy cover.[8] A different type of carbon pool exists in the urban forest. Connecticut is a heavily urbanized state. According to Forest Service analysis, 36.4% of the land area of the state is urban (1.13 million acres), with 87.7% of the population, nearly 3 million people, living in these urban areas (FIA). Despite the high population concentration in these areas, these same lands have a fairly high degree of tree cover, with tree canopy cover estimated at nearly 50%. These urban trees are storing about 22.5 million tons of carbon and continue to sequester carbon at the rate of about 744 thousand tons per year (FIA). The importance of urban trees is magnified by their proximity to people and co-benefits for health, energy savings, flood retention, and more.[9]

### Forest Quantity is Good but Highest Quality Forests are Getting Fragmented

Approximately 59% of Connecticut is "forested" and this percentage has remained relatively flat since 2010.[10]

**Figure 1.** Historic Forest Cover in Connecticut.[11]

Connecticut's forests have made a remarkable comeback after being cleared, primarily for agriculture, starting in the 1700's. At the low point in ~1860, only 30% of Connecticut's forests remained (approximately half of the forest cover we enjoy today). As the forests grew back they were repeatedly cut for charcoal fuel that fed the industrial age until about 1920 when coal and petroleum replaced wood-based fuel.

Of the 59% forested area, preliminary findings show ~53% of Connecticut's forest are core forest, larger blocks of forest that are generally more important for wildlife habitat, drinking water supply protection, ecological resilience, and a sustainable supply of lumber, homeowner firewood, and other forest products.

**Larger core forests of 500+ acres have been the fastest declining forest type losing approximately 120,000 acres over 30 years from 1985 to 2015**.[12] In fact, 1985 to 2015, Connecticut lost about 465 km2 of forest cover to development—about 5.8% of the forest that existed in 1985. Loss of core forest during that period was about 719 km2, a relative change of 15.7% from 1985 levels. In fact, core forest was lost at a pace (24 km2 per year) more than 1.5 times the pace of the loss of total forest (15 km2 per year).[13]

**Figure 2.** Forest fragmentation by forest category. Source: 2015 CT Forest Action Plan. **Note that Connecticut's 2020 Forest Action Plan is due to be published at the end of 2020.

### Dominant Forest Types and Age Structure

Oak/Hickory is the most common forest type with red maple being the most common tree. Regarding tree age and forest demographics, Connecticut's forests are growing older with less age diversity. Despite significant tree mortality between 2013 and 2018 due to Gypsy moth and Emerald ash borer infestations, net annual growth in aboveground forest biomass continued to exceed annual removals by more than five times.[14]

The following figures provide a quick snapshot of Connecticut's forest types and age structure:
**Figure 3.** Percentage of forest cover in Connecticut by forest type. Source: 2015 CT Forest Action Plan.
**Figure 4.** Forest cover in Connecticut grouped by age classes. Source: 2015 CT Forest Action Plan.

### Who Owns the Woods?

Of Connecticut's approximate 1.8 million acres of woodlands, 71% is owned by private individuals, corporate landholders (including private water companies), and land trusts. The remaining forestland is owned by the state (17%), municipalities (11%), and minimal federal lands (1%).

**Figure 5.** Forestland in Connecticut with percentage of ownership. Private includes individuals/families, land trusts, private water companies, and corporate landowners. Source: USDA Forest Service FIA Program (2018).

Likely contributing to an aging forest is the low interest in active forest management by most individual forest landowners. A 2015 Connecticut Woodland Owners (CWO) Survey report documented that the primary ownership objectives tend to be beauty/scenery, privacy, wildlife viewing, and nature protection, with only 21% having cut trees at some time during their ownership. 59% of these landowners have cut trees for their personal home heating purposes. Many woodland owners believe that "hands off, let nature take its course" is the best approach.[15]

The 2015 CWO Survey also showed these owners believe conserving their woodlands is extremely important - they almost unanimously say they would like their land to stay wooded (95%). Hence there exists considerable opportunity to retain Connecticut existing forests as forest. However, most woodland owners would require financial compensation to permanently protect their forest values through a conservation easement.

These same woodland owners are also discouraged and deeply concerned with invasive plants and insects which are disrupting their woodlands. Fortunately, the USDA Natural Resources Conservation Service has invested millions of dollars in Connecticut annually for several years through federal assistance programs such as the Environmental Quality Incentives Program and Regional Conservation Partnerships Programs. These USDA Farm Bill-funded programs encourage property owners to engage and invest in the health, diversity and sustainability of



their woodlands. DEEP's Cooperative Forestry Program also offers technical assistance to these woodland owners supported by the USDA Forest Service. DEEP Service Foresters direct woodland owners to these resources and qualified professional foresters and wildlife biologists to make informed decisions. The more programs and professionals that engage with landowners on stewardship of their woods, the more likely these landowners will continue as long-term, dedicated stewards of their woodlands.

**Because the vast majority of Connecticut's forests are privately owned, engaging family forest landowners, corporate landholders, and land trusts is critical to maintain and increase resilient sequestration and storage of forest carbon in Connecticut.**

## Management of Forests on DEEP Properties

All forested land held by the CT Department of Energy & Environmental Protection (DEEP) can be classified as either "actively managed" or "passively managed." Actively managed lands may support periodic forest, or wildlife habitat management through commercial sales of forest products or other tree and vegetation removal treatments. Passive management lands are generally reserved from commercial forest product harvesting, and left to grow without designed professional intervention.

### Forest Management Plan Status

State Forests are managed based upon Forest Management Plans developed by professional state land foresters at DEEP. These Forest Management Plans, which receive input from interested parties (which varies based upon location) as well as DEEP resource managers in the Wildlife and other divisions, are due to be updated every 10 years. It has been difficult for DEEP to keep its Forest Management Plans up-to-date due to inadequate staff resources to stay on top of this ongoing planning need. All currently active Forest Management Plans are posted

online by DEEP.[16]
**Figure 6.** Status of Forest Management Plans with acres and percentages as of June, 2020. Source: DEEP Forestry.
9

### Active and Passive Management on DEEP Properties

State Forests and Wildlife Management Areas (WMAs) are subject to periodic forest and wildlife habitat management with the goals of improving forest health and augmenting conditions for wildlife.

#### State Forests

32 State Forests cover approximately 170,000-acres and include a mix of active and passive management.[17] On average, DEEP is conducting active management on an average of 1,000 – 1,500 acres/year (less than 1% of all State Forest lands annually) based upon forest management plan prescriptions.[18] Current program-specific planning guidelines allow for designed passive management, or forest reserve areas within and throughout the State Forest landscape. Old Forest Land Management Sites (OFLMS) are selected to grow and evolve naturally in an attempt to reach advanced stages of vegetative succession and develop as forests subject to the forces of nature with minimal or no human intervention.

There are 36,429 acres -- ~21.4% of all State Forest lands – that today are considered to be under passive management (this figure does not include 104,000+ acres of State Forest lands that do not have active Forest Management Plans). These passive management forest lands fall into the following three categories:

- **Old Forest Management Sites** (planned Forest Reserves): **14,077 acres**
- **Inoperable Sites** (land perpetually passively managed due to site conditions, such as abundant surface stones, excessive soil moisture, steep slopes, etc.): **16,864 acres**
- **Inaccessible Sites** (land which cannot currently be accessed to be managed): **5,488 acres**

#### Wildlife Management Areas

Of the 34,000 acres of Wildlife Management Areas, 19,812 acres are considered to be forest land using GIS analysis and CT Land Cover Assessment data.

State WMA's are managed to provide habitat for both common and uncommon wildlife and to provide for wildlife based recreation (hunting, fishing, trapping and wildlife viewing) in support of the Division's overall mission of conserving the state's wildlife resources for the use and appreciation of the public. The vast majority of the funding to manage these lands comes from the U.S. Fish and Wildlife Service Wildlife and Sport Fish Restoration (WSFR) program. WSFR funding is provided to restore, conserve, manage and enhance wildlife habitat and to provide wildlife based recreation. Activities, uses or encumbrances which interfere with the purpose of the WSFR funding are not allowed.

The need for old forest management areas would be determined at the site specific level and would take into consideration existing physical and biological natural resource conditions and the management objectives for the property. Opportunities to designate no management or reserve areas to function as old forest management areas would vary widely, due to the diversity of habitat types found on our WMAs. If it was determined that a particular wildlife species required it and/or it would enhance overall biological diversity, the Wildlife Division would consider passive management (or even active management) to set the stage for well–

developed old forest management areas. Ideally old forest management areas would either provide for or be able to grow into areas characterized with large trees, a diversity of tree species and complex multi-layered structure, canopy gaps, standing dead trees, fallen trees and trees with cavities. At this time, no passive management in WMAs for forests is shown.

### Passive Forest Management Acreage by DEEP Land Classifications

The DEEP Land Classifications on the following chart generally receive no planned forest management. The forested-acreage numbers attributed to each classification are derived based on Land Cover analysis. Any forest activity implemented on these lands would be in response to an immediate public safety issue or large scale forest health concern.[19]

**Table 1.** Passive Forest Management Acreage on DEEP-held lands shown by DEEP Land Classification.

| **Passive Forest Management Acreage by DEEP Land Classification** | **Total Acres Classified (acres)** | **Passive Forest Management Acres** | **Percentage of Total by DEEP Land Class Category** |
|---|---|---|---|
| State Forest | 168,960 | 36,429 | 21% |
| Wildlife Management Area | 34,000 | 0 | 0% |
| State Park | 34,115 | 27,167 | 79% |
| Fish Hatchery | 744 | 393 | 52% |
| Flood Control | 4,434 | 2,627 | 59% |
| Natural Area Preserve | 2,508 | 2,452 | 97% |
| Other | 1,498 | 1,063 | 71% |
| Water Access | 1,588 | 900 | 57% |
| Wildlife Sanctuary | 1,500 | 1,280 | 85% |
| DEEP Water Body | 5,708 | 0 | 0 |
| **Total** | **221,055** | **72,311** | **33%** |

## Benefits of Forests to Ecosystems and Society

Forests are one of nature's most powerful solutions to human-caused climate change. Whether we live near a forest or not, our human communities are intricately connected with the services they provide. These natural benefits include homes and food for wildlife, pumping oxygen into the air we breathe, filtering runoff that helps clean the water we drink, and delivering nutrients to the soil when leaves and branches decompose.[20]

### Forests benefit wildlife

Healthy forest landscapes often include a variety of tree species of varying age classes. Tall, canopy-layer trees grow above smaller sub-canopy trees, with a shrub layer and diverse plants on the forest floor. This suite of vegetation supports wildlife, from bear and moose to resident and migratory birds. Butterflies and insect pollinators help ensure that same vegetation produces the next generation of life-supporting trees. Many of Connecticut's wildlife species rely on forest habitats. With greater biodiversity comes forest resilience and a greater ability to adapt to changing conditions related to climate change.

### Forests mitigate climate change and clean the air

By doing what they naturally do, the trees in Connecticut's forests – covering an estimated 1.8 million acres, about 59% of the state's land cover[21] – provide innumerable benefits to people, including removing heat-trapping carbon emissions our activities release into the atmosphere. The U.S. Climate Alliance estimates that "within Alliance states [including Connecticut], natural and working lands offset 16% of the GHG emissions from energy, transportation, and other sources in 2016."[22]

The ability of trees to take in or sequester and store carbon dioxide, turning it to wood and other forest components including soil, provides significant potential to mitigate climate change by retaining existing forests and improved forest management. A study in the Proceedings of the National Academy of Sciences finds that "natural climate solutions" could reduce landbased emissions and store additional carbon equivalent to more than a third (37%) of needed emissions reductions to keep global temperatures at or below 2 degrees Celsius through 2030, although benefits decrease beyond that date due to saturation of natural systems among other factors. Among the strategies found to deliver the most benefit, according to the paper, are "reforestation" (conversion of non-forest to forest) and "avoided forest conversion" that along with "natural forest management," represent easily available and effective solutions. [23]

Trees are also effective air filters, removing pollution and particulate matter through their respiration, with studies showing significant reduction of asthma and improved respiratory health in urban areas with more tree cover.[24] Roadside trees could reduce nearby air pollution by more than 50%,[25] but the potential for air pollution reduction varies among species and as a function of tree size and landscape position.[26]

### Forests protect water resources

Forests are also indispensable in production of our drinking water. Approximately 85% of Connecticut residents get their drinking water from public water systems.[27] Forests that

surround public water supply reservoirs and private wells improve water quality and can greatly reduce costs for treatment by filtering surface water and maintaining groundwater reserves, ensuring this vital natural resource is not degraded. Forested wetlands and floodplains along rivers retain and slow the movement of vast quantities of water during storm events, protecting nearby municipalities from flooding and reducing stormwater runoff.

### Forests provide wood products and economic benefits

In Connecticut, the Land of Steady Habits, generations of families have harvested trees from their land to heat their homes, to build the post and beam barns on their farms and perhaps sell some timber to generate income. The vistas of forested hills and fields along country roads, and tree-lined suburban streets are part of our New England cultural identity.

Trees are a renewable resource – and in New England, where conditions usually allow seeds to take root and regenerate, working forests can also supply a local source of wood products. Connecticut consumes an estimated 80.4 million board feet of roundwood or about 22.77 board feet per person each year.[28] For a relative measure, building a typical 2,000 square foot home would require about 16,000 board feet of roundwood.[29]

Depending on the goals and desired outcomes of private or public owners of forests, cutting some trees according to a variety of silvicultural practices or prescriptions, can enhance the health and vigor of remaining trees, generate income from the sale of timber to produce wood products for human needs, and silviculture can be employed to create a wide variety of habitat conditions and specific habitat features to benefit various wildlife species.[30]

Harvesting timber grown sustainably in our own region can help to reduce transport emissions and global deforestation by avoiding a shift of pressure to harvest primary forests in other nations with less stringent environmental policies. In its 2015 report, the North East State Foresters Association estimated Connecticut's forest products and forest recreation industries produce an annual gross output of $3.38 billion and almost 13,000 jobs (figure below).[31]

Long-lived wood products – from your grandmother's antique desk to the cabinets in your renovated kitchen – also lock up and store carbon until the wood decomposes. From paper to plywood and barrels to baseball bats, some wood products are well known; other forest products such as rayon, mulch, medicines, fiber, gums, resins and tannins (such as witch hazel)

are less obvious.[32,33] Lumber can also be reclaimed from old structures and recycled into new uses for furniture or building materials, keeping carbon out of the atmosphere longer.

### Forests support recreation and health

Connecticut's forests provide recreational settings for people to get outside to exercise and enjoy nature through countless activities, such as hiking, mountain biking, horse riding, bird watching, camping, hunting and fishing, and serve as attractions that support tourism and natural resource-related businesses that generate economic benefits to Connecticut.

Forests also offer solace and spiritual renewal to people seeking to unplug from hours of "screen time" spent for work and entertainment. Particularly during the 2020 pandemic, forest trails and open space available for public access has provided physical and mental health benefits. One study on the Japanese practice of forest bathing (shinrin-yoku), found that pulse rate, systolic and diastolic blood pressure were significantly lower among a group of 128 people (ages 45-86) after a two-hour program in the forest which indicated physiological benefits from stress recovery.[34] A recent "Forests Make Us Healthier" campaign by the Northeast Forest Network provides a toolkit with much more information on the important connection between forests and mental and physical health.[35]

### Forests provide shade and make communities more livable

By releasing water vapor through transpiration, street trees can help alleviate the urban "heat island effect" that has caused deaths in some cities during heat waves, which may become more common with higher extreme temperatures.[36] An improved tree canopy can cool residential neighborhoods and reduce energy use, while potentially making communities more attractive, livable and safe.

Connecticut should balance public safety with the health benefits of urban and suburban street trees in reviewing policies for tree planting in residential areas and hazard tree removal implemented by utility companies or municipalities.

By maintaining Connecticut's existing forests, and significantly increasing the acreage of permanently protected forest land, we can help ensure our state's natural and human communities can continue to thrive in the face of climate change.

## Adopt Statewide "No-Net-Loss of Forest" Policy

**Top Priority Action**

The Forests Sub-Group recommends an overarching "no-net-loss of forest" (NNLF) policy for Connecticut. This policy would support the top priority recommendation in both the Adaptation/Resilience and Mitigation sections of this report which is to KEEP FORESTS AS FORESTS.

To achieve this NNLF policy goal will take concerted actions at the local, regional, and statewide levels. Fortunately, the state of Maryland has been working on implementing its "no-net-loss of forest" policy which was adopted in in 2013 with passage of the MD Forest Preservation Act.[37] This landmark legislation accomplished four goals:[38]

- Establishing no-net-loss of forest as the policy of the State of Maryland.
- Encouraging the retention of family-owned forests by doubling the income tax credit for forest management activities and expanding the range of activities to include the planting of streamside forests, removing invasive species, and improving wildlife habitat.
- Broadening the State Reforestation Law to support tree planting and forest health management on family-owned forests.
- Ensuring that local fees under the Forest Conservation Act of 1991 are used for tree planting and conservation.

The NNLF policy has helped establish several mechanisms at the statewide and county levels to slow the rate of forest losses in Maryland. This policy should be adapted to work for Connecticut, and the climate crisis makes this an urgent priority. The following recommendations are based on those proposed for Maryland to implement its NNLF policy:[39]

(1) **Avoid Forest Conversion** – protect existing public- and privately-owned forestland from conversion to non-forest purposes to retain the benefits of increased carbon storage, biodiversity, public health, green infrastructure, etc. (see benefits in previous chapter);

(2) **Protect Healthy, Intact Forests** – ensure that impacts upon forests, sensitive habitats, and other natural climate solutions and priorities (wetlands, soils, rivers, farmland, etc.) are considered at every level of planning – urban, suburban, and rural – and across all landscapes;

(3) **Offset All Planned or Permitted Forest Losses** – it is not practical to protect all forested areas from conversion and periodic natural disturbances may also result in temporary forest losses. However, it is essential to offset all planned or permitted forest losses through a combination of compensatory mitigation requirements and tools such as compensatory reforestation, replanting programs, and acquiring local or regional forest mitigation banks;

(4) **Provide Incentives for Stewardship, Forest Retention, and Forest Resiliency** – since 71% of the state's woodlands are privately owned by individuals/families, corporate landholders, and land trusts, a no-net-loss policy must include financial and technical assistance measures to

- **Adopt a statewide "No-Net-Loss of Forest" policy** in the CT General Assembly.

engage private landowners in maintaining and increasing sequestration and storage of forest carbon as well as incentives for critical ecosystem services that their forests provide. For example, as a participating state in the Regional Greenhouse Gas Initiative or RGGI, Connecticut should study forest carbon offset allowances available through compliance and voluntary markets for reforestation, improved forest management, avoided conversion, and proforestation as well as programs that aggregate, evaluate and monitor forest offsets, in order to implement a system of paying landowners for enhanced carbon sequestration and storage with verifiable climate benefits and strict certification standards in place; and

(5) **Protect Urban Forests, Build More Parks, and Plant More Trees** – planting, re-planting, and caring for trees and establishing neighborhood parks in Connecticut's cities not only provides improved health, reduced energy costs, and other co-benefits, but also often provides more equitable access to parks and the outdoors for people of color and other vulnerable communities disproportionately impacted by climate change. If this is implemented with appropriate community engagement rather than as a top-down program, this can result in more healthy, equitable, and resilient communities.[40]

## Adaptation and Resilience Considerations for Connecticut's Forests

Resilience is the fundamental ecological ability of a forest to change and adapt to stressors and provide the functions and values that society demands.[41,42]

Following are the primary components of resilience and their relevance for Connecticut's forests:

1. Forests and their native species (especially trees) have an inherent ability to endure and selforganize after disturbances with which they have co-evolved.

In Connecticut, the predominant oak-hardwood forest type has co-evolved with disturbances that are mostly episodic (e.g. hurricanes, microbursts, tornadoes, droughts) – rather than frequent and chronic (e.g. small canopy wind events).[43,44] The historic frequency and intensity of storms may be different in the future as climate changes occur.

2. Greater tree species diversity confers greater stability, in the form of resistance to change in forest stands (and landscapes) related to disturbance and stress.[45,46]

The primary environmental drivers of our forest diversity follow (in general order of importance for forests in Connecticut):

a) The ability of plant species to specialize in relation to each other on different soils and topographies (a.k.a. niche partitioning);[47]

b) The ability of different plant species (trees) to have different growth habits and forms such as herbs, shrubs, small trees and canopy trees which is closely tied to precipitation and soil moisture (a.k.a. crown stratification);[48,49,50,51]

c) The ability of different tree species to grow and live for different lengths of time as a forest grows back after an episodic disturbance such as tornadoes, microbursts and hurricanes (a.k.a. successional development);[52,53]and

d) Ability for various species to "hide" amongst unrelated neighbors to avoid insects and diseases specific to that species. This process in and of itself promotes diversity (a.k.a. negative density dependence).[54,55]

Connecticut's forest diversity is relatively young, since these drivers have been dynamically interacting over the past 20,000 years (since the peak of the last glaciation) with human-related land uses, climate, and other stressors (mostly human-related) and disturbances. Its current diversity is largely controlled by three diversity drivers: a) niche partitioning - because of Connecticut's inherent soil and topographic variability; b) crown stratification - promoted by moist soils from the relatively high rainfall Connecticut receives; and c) succession - disturbances that are punctuated by periods of recovery long-enough to promote sun-loving long-lived canopy trees (ash, oak, hickory and pine) to grow as canopy dominants with longerlived shade tolerant species (beech, hemlock, maple) more characteristic of northern New England Forests.

3. Redundancy is a form of resilience where multiple species have the same roles or functions in a developing forest.[56]

Generally speaking, Connecticut's forest redundancy is high meaning that there are multiple species and multiple unrelated genera. For example, oak, hickory, and maple trees all have multiple species found across the state that can inhabit the same space and function in a forest. Hence, the elimination of one species through insects, disease, or other stressors would not limit the ability of a forest to recover and retain its basic structure and composition. Of course, the removal of multiple species will reduce or eliminate redundancy and will have a dramatic impact in a forest's resilience. Evidence suggests this is beginning to happen, for example with the functional elimination of chestnut, elm and ash and the decline in beech, hemlock, and oak. There are other drivers of Connecticut's forest resiliency that are not covered in this report, such as "driver" and "passenger" species relationships[57,58,59] and biogeographic effects.[60]

### The Resilience of Connecticut's Forests is currently Threatened and Declining

There are multiple factors and stressors that have combined to threaten the resilience of our forests:

1. Forest Age Classes and Structure are Not Diverse – Legacies of Connecticut's agriculture, chronic selective logging, and development history has left a relatively age- and structuresimplified second growth forest across most of our state.[61,62]
2. Most Forests Are Mature and Getting Older – The pattern of a large proportion of forests in the landscape simultaneously reaching maturity has the potential to reduce resilience as maturing forests are more susceptible to multiple stressors (e.g. insects, disease, pollutants, and drought).[63] Old growth forests have enormous ecological and social value, are rare in the modern landscape, and can have substantial resilience to disturbance. Also disturbances in mature forests can promote the age and structural diversity missing from the forest landscape, but novel stressors described below may affect these values and outcomes.[64,65]
3. Most stressors are human caused but beyond our immediate control – Abiotic stressors to trees such as ozone and NOx[66] can be significant, as can biotic stressors such as invasive insects, plants, and diseases. Both have been impacting the development of the Connecticut forest for over a century and will continue to impact future forest composition and structure.[67,68]
4. Fragmented forests with permanent "edge" are more prone to degradation -- Permanent edge exists because of persistent and continuous disturbance from: i) farming and agricultural activities; ii) development and suburban expansion through roads, lawns, and lots; and iii) through continuous activities in the forest such as recreation (e.g. trails), frequent rather than episodic timber harvesting, and the chronic imbalance of predator-prey in wildlife populations (e.g. deer).[69]
5. Climate Change is Increasing Disturbances – Climate change is exacerbating chronic issues for forests such as incremental mean increases in temperature resulting in increased respiration stresses and decomposition processes. Climate change also heightens episodic stresses such as periods of drought during the growing season, extra-normal rainfall and snowfall events, and increased abnormal and high severity disturbance events such as ice storms, tornadoes, hurricanes, and microbursts.[70,71]

6. Climate Change Can Reduce Forest Carbon Sink Potential -- Climate change is producing, facilitating, and reinforcing negative impacts from stressors already present in low-resilience forests. This can cause a degradation spiral which further simplifies forest composition and structure, increases dominance of non-native species, may reduce standing biomass, increases decomposition processes, and lowers soil carbon.[72,73,74]

**The bottom line is that forests will not be impactful to mitigate climate and carbon if they are not resilient.**

## Actions to Increase Adaptation and Resilience of Connecticut's Forests

### Top Priority Actions

### Short Term (1-5 year) Recommendations

#### Monitoring, Evaluation, and Planning

- Create a monitoring network to evaluate forest ecosystem conditions in naturally regenerating forests (i.e., not mowed or maintained ground cover) across the rural to urban gradient throughout Connecticut at a more refined scale than the National FIA and that complements other existing programs such as the Breeding Bird Survey. Incorporate or establish additional network for "maintained trees" across the state.
  - Include a wide diversity of measurements beyond forest growth and change in composition: such as breeding bird census, invasive plant monitoring, insects and diseases, disturbance characterization from a variety of sources (timber harvest, wind, insects, pathogens, and fire) and periodic measures of soil carbon.
  - Ensure that data are accessible and usable by stakeholders through an open access data portal and that the importance and utility of the data are communicated to potential users.
- **KEEP FORESTS AS FORESTS** with mechanisms to encourage private landowners to protect forestland through easements, tax incentives, ecosystem payment mechanisms, and strong markets for local forest products.
- **Create forest monitoring network** to evaluate forest ecosystem conditions in naturally regenerating forests across the rural to urban gradient, various land ownerships, and including trees in more developed areas.
- **Sponsor research on active and passive ways to create greater resiliency in forests** through alteration or natural development of structure, function, and diversity. Encourage financial incentives to apply the results of this research on public and private lands by stakeholders to promote more resilient forests.
- **Ensure statewide, regional, and local actions align to maintain un-fragmented forests** (both reserves and actively managed) within and across political boundaries with emphasis on connections to waterways and wetlands, core forests, and wildlife habitat linkages.

- Create a citizen science program where trained and mentored individuals (from across life stages – including students and adults) conduct some of the monitoring – e.g., bird census on a specific series of days at the sampling points, camera trap monitoring for mammals, or amphibian surveys. If well planned, this could be systematic part of the design for the monitoring program carried out by or alongside professionals. This could be developed as a component of a college or high school curricula.

- Identify areas that are especially important to landscape-level resilience through partnerships with TNC's Staying Connected Initiative,[75] HVA's Follow the Forest Initiative,[76] and other climate corridor proponents to identify and prioritize the protection and enhancement of climate and habitat corridors in Connecticut. TNC's Resilient Lands Mapping Tool[77] can also be used for site assessments in Connecticut to measure the capacity of different lands to withstand climate change.
  - Identify areas where wildlife movement between core forests becomes constrained by roads, culverts and bridges, and design mitigation efforts to improve wildlife passage.

### Experimentation

- Sponsor experimental studies to investigate both active and passive ways of creating greater resiliency in forests through management-promoted or natural development of structure, function, and diversity. Use these studies as baselines for adaptive management of forests in different contexts. Initiate studies across the rural-urban gradient, ownership and land use types, and in both maintained and naturally regenerating forest systems.
  - Promote and expand on existing examples such as Adaptive Silviculture for Climate Change program at UConn[78] and many efforts of USFS Northern Institute of Applied Climate Science.[79] Create a state-wide list/portal of existing and newly created projects where their outcomes can be communicated.
  - Explore funding streams through USFS and other agencies for expanded efforts.

### Forest Management Approaches

- Increase the reserve (passive management) acreage in the state to promote local and landscape/regional resilience (e.g., as buffers against extinction/extirpation[2]) and to provide controls to assess the outcomes of experimental manipulations.
  - Reserves should be representative of the entire landscape in order to provide suitable controls (i.e., similar environments) for actively managed areas.
- Implement active forest management approaches that can increase structural, age class, and species diversity in low-diversity second-growth forests.[80][81]
  - Promote silviculturally-informed, resilience-focused management approaches across ownership categories and especially on private lands.
- Respond to ongoing elevated tree mortality (related to gypsy moth, drought, emerald ash borer, etc.) across the urban to rural gradient with hazard tree removals, limited

salvage harvesting where appropriate (e.g., not in reserves and to a very limited extent on public lands where public safety including wildfire risk is not increased), and tree additions (seedling/sapling planting) where needed based on regeneration monitoring.
- Coordinate and share information on tree mortality patterns and safety concerns.
- Set up specialized monitoring program to assess tree regeneration patterns across affected and unaffected stands.
- Re-vitalize the State Tree Nursery to promote seedling availability.
- Retain snags and deadwood to promote wildlife habitat and carbon storage wherever feasible based on hazards and economic considerations.

● Respond to ongoing invasive pests and pathogens and prepare for future introductions.
- Adopt and promote biocontrol methods where possible and work with partners from the federal level to test and apply these methods.
- Continue and expand monitoring programs and early warning systems.
- Continue and fund firewood and horticulture regulations to limit new introduction.

● Promote regeneration of native and future-adapted tree species (especially oaks and hickories) across forest types, stand conditions, and ownership types.
- Develop and promote herbivore population control measures where appropriate and based on monitoring of regeneration and herbivore populations.
- Include regeneration as a primary focus of monitoring and experimentation plans outlined above.
- Implement forest management approaches and planting initiatives to promote regeneration of mid-tolerant and intolerant species such as oaks and hickories where needed and appropriate (based on monitoring or protected status).

### Education and Outreach

● Continue and expand education and outreach/training efforts focused on promoting the importance of resilient forests, and forest management approaches (both passive and active) that promote resilience, as linchpins of state climate adaptation and mitigation strategies.
- Create and fund a Connecticut Youth Conservation Corps, on the model of the Civilian Conservation Corps, to provide jobs and paid job training to young people that prioritize tree planting and reforestation activities with an emphasis on explicitly creating employment opportunities for young people from Environmental Justice communities (as defined under section 22a-20a of the CT General Statutes) to carry out planting and reforestation activities in EJ communities.

**Longer Term (5-10 year) Recommendations**

## Forest Protection Strategies

● KEEP FORESTS AS FORESTS with "no-net-loss of forest" policies and financial incentives to encourage private landowners to protect forestland through easements, tax incentives, ecosystem sustaining payments, and strong markets for forest products.
● Develop active outreach programs to connect and engage private woodland owners with conservation-based estate planning resources, such as tax benefits of conservation, family facilitation in succession planning, and guidance about options to sell carbon credits as market opportunities emerge.
● Ensure statewide, regional, and local actions align to maintain un-fragmented forests (both reserves and actively managed) within and across political boundaries with emphasis on connections to waterways and wetlands, core forests, and wildlife habitat linkages.
○ Reduce fragmentation, protect sensitive soils and waterways, and create a forest structure and composition that is a buffer to edge, diverse in composition and structure - making it resilient to both acute (hurricanes) and chronic (pollutants) disturbances.
● Keep wetlands as wetlands, wooded wetlands and riparian forests (floodplains), and enact amplified land protection strategies to avoid wetland and riparian forest conversion.
○ Promote restoration of forested wetlands to more diverse species composition, including coniferous component where appropriate.[82]
● Protect the most significant forest cores and wildlife habitat linkages and actively restore connections where wildlife movement (terrestrial and aquatic) is constrained by roads, culverts, dams, and bridges.

## Forest Restoration and Acquisition Strategies

● Acquire riparian lands for rehabilitation and restoration back into forest.
● Look for appropriate opportunities to reforest currently non-forested lands that would have historically supported forest vegetation and are not currently or likely in the near term to be utilized for agriculture, to provide additional habitat for early successional species.
● Sponsor and develop a network of forest resilience nurseries developed and managed by landowners to propagate plant species of ecological concern for out-planting in forests and regions of Connecticut with extirpated populations (with appropriate oversight).

## Implementing Forest Resiliency

● Encourage financial incentives to implement what we learn from adaptive experimentation and monitoring (above) on public and private lands by stakeholders to promote more resilient forests in structure, function and diversity.

● Create a funded program for municipalities (especially in underserved/EJ areas) to increase urban tree canopy cover and resilience in plantings and post-establishment treatments/monitoring as well as in appropriate circumstances to maintain mature and large trees which provide especially high levels of ecosystem services such as cooling, pollution reduction, and habitat.
● Fund strategic state programs to control important emerging invasive insects, plants, and diseases.
● Develop and promote programs to increase resiliency of trees and forests in proximity to human (gray) infrastructure and reduce tree-infrastructure conflicts.

### Education and Outreach

● Create a funded educational program for forest landowners and interested citizens around what a resilient forest is and how promoting a resilient forest benefits society.
● Enhance outreach and education efforts focused on promoting the importance of tree and forest cover to human health and well-being to constituents.
● Develop programs and outreach/education materials that educate citizens, stakeholder institutions (e.g., highway departments and utilities), and policy-makers about the exceptional ecosystem services of maintaining large trees in gray infrastructure areas, but also balance with the "right tree, right place" message to avoid disbenefits[83] and work with communities to determine local priorities rather than a cookie-cutter, topdown approach.

### Changing Laws and Regulations

● Enact and enforce tougher firewood and horticultural State laws around invasives, fuelwood, and packaging across state lines – including a well-funded enforcement program.
● Very carefully regulate hunting of top predators to encourage development of intact top-down trophic food webs and to remediate the current imbalance regarding herbivory.

### Creating Strong Markets for Products and Services with Multiple Benefits

● Strengthen local markets for long-lived forest products to promote a local rural economy so that treatments to create more resilient forests are not paid for by the taxpayer but come “free.”
○ Include “Build with Wood” programs and market local timber products (e.g., Connecticut Grown wood) with certifications and requirements for implementation of resilience-focused forest management approaches to incentivize construction in wood and mass timber technologies and discourage more carbon-intensive building materials.
○ Incentivize local production and marketing of Connecticut Grown non-timber forest products (e.g., forest gardening of non-timber forest foods – maple syrup,

ramps, mushrooms, herbs, and berries as well as understory spices and medicinals).

● Create a fund to strengthen local markets and provide payments or services to promote social and economic resilience for landowners - particularly for rural economically disadvantaged and small-acreage landholders who are currently incentivized to sell or develop.

- Watershed services payments for private landowners.
- Recreational trail payments to landowners for public access on private lands.
- Payments for enhanced sequestration and/or storage of carbon through reforestation, improved forest management, or avoided conversion, with strict standards in place through programs that aggregate verified carbon credits from private lands in order to sell carbon offsets in voluntary or compliance markets.

## Mitigation Considerations for Connecticut's Forests

Climate mitigation involves both reducing the emissions of fossilized carbon dioxide ($CO_2$) and other greenhouse gases, and increasing the removal of $CO_2$ and other GHG's - e.g. methane, nitrous oxides, and ozone - from the atmosphere to reduce potential adverse effects of climate change. Natural ecosystems (grasslands, wetlands, forests) are, on balance, the best and most effective climate solutions available both for the uptake ("sequestration") and long-term storage of carbon, whereas human-made carbon capture technologies are still in their infancy.[84] Of these natural systems, forests sequester and store the most carbon and likely have the largest potential to remove additional $CO_2$ from the atmosphere.[85]

### Available climate mitigation solutions in forests

- A*voided conversion of forest* to non-forest sustains the mitigation value of forests and is a prerequisite for *improved forest management*.[86]
- [87,88,89]
- *Mitigation-focused forest management* – (e.g., extending rotation periods and retaining more and larger trees) has important potential to retain carbon storage on managed lands, while providing long-lived wood products and fossil fuel alternatives such as local firewood.
- *Reforestation* (conversion from non-forest to forest) generally has the highest potential rate of carbon dioxide sequestration among these three solutions.

### Connecticut's Forest Carbon Storage

Connecticut's forests are, on average, the most carbon dense – in aboveground carbon stored per acre – of the nine Northeastern US states[90] and therefore have extraordinary mitigation value for this region in terms of their accumulated carbon stocks. A combination of *avoided conversion*, *and mitigation-focused forest management* is critical to maintain these carbon stocks.[91]

### Connecticut's Forest Carbon Sequestration and Future Role in Climate Mitigation

Approximately 16% of Connecticut's forests are estimated to be >100 years of age, the highest percentage in the Northeast.[92] Annual net growth of Connecticut's forests is also estimated to be the highest in the region,[93] indicating that forest age is not currently constraining forest growth. In fact, Connecticut's forests have increased their rate of growth and standing biomass significantly over the past 10 years.[94] These increases have occurred despite, and perhaps in part because of, an increase in tree mortality resulting from insect outbreaks and windstorms over this time period.[95] Connecticut's forest resilience in the face of increased tree mortality can likely be attributed to the following:

- Professional forest management
- [96]
- Temperate deciduous forests typically develop structural complexity naturally as they age and are exposed to moderate severity disturbances; this complexity can lead to greater carbon sequestration that helps maintain carbon storage in mature forests well beyond the 100-year mark.[97] [98]



**Commented [OJ16]:** You have cited this paper 3 times. It does NOT mention proforestation nor does it suggest no management of forests as a strategy. It suggests forest management with carbon and forest products in mind.

**Deleted:** both *proforestation* and

**Commented [OJ17]:** Remove this. It is not valid nor is it supported by science. Two of the citations here actually warn against it.

**Deleted:** *Proforestation* (natural forest growth in areas protected from timber harvesting) is likely¶ ... [1]

**Commented [OJ18]:** Above you called this "improved forest management" stay consistent.

**Commented [OJ19]:** You should state what rotation periods… CT already has long rotation periods.

**Commented [OJ20]:** Larger than what? This is ambiguous. More than what? If you want diversity than there will be some cases where retaining "more" "large" trees will result in a regeneration failure.

**Commented [OJ21]:** Great, but suggest where this should occur… agricultural lands? Urban areas? Both make sense, but be specific on the potential

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**Commented [OJ22]:** REMOVE proforestation. It is NOT backed by modern forest carbon science.

**Deleted:** *proforestation*

**Commented [OJ23]:** These claims are citing an FIA data calculator and not any summary of what the claim is.

**Commented [OJ24]:** You cannot use age to suggest that carbon sequestration is highest.

**Commented [OJ25]:** This is a wild claim based on poor assumptions. Forest age is not the only thing that affects forest growth. Also, you're making the assumption that site and local climate is the same across the Northeast. That's an absurd claim as CT likely has better site fertility (since we have had more soil development since glaciation than up north) AND we have a warmer climate with a longer growing season. Lastly, how do you know that the growth of an older forest is not benefiting from being thinned? FIA data do not account for management.

Remove this section.

**Commented [OJ26]:**

**Commented [OJ27]:** NOT supported by the citation provided. The document provided shows an increase in standing growing stock but does not provide anything about an increase in rate of growth. Remove the rate of growth claim

**Commented [OJ28]:** Again, not supported by the citation provided. This suggests that tree mortality from invasives is increasing the standing biomass over the last 10 years? If that is true, than cutting trees should also increase the standing biomass over a 10 year period. Which could be true in some instances where the best trees are favored and the worst growing are removed – however that typically occurs with management. Whereas with EAB and gypsy moth it is often the most dominate trees that succumb ... [2]

**Commented [OJ29]:** Over what time period? Hurricane of 1938? Chestnut blight? Gypsy moth outbreaks? Historic fires? ... [4]

**Deleted:** Natural disturbance events have resulted in relatively small fluctuations in carbon across¶ ... [3]

- Recent surveys of private forestland owners suggest a relatively low interest in timber harvests on their land with their top reasons for owning their woodlands being to enjoy the beauty and scenery, followed by privacy, home, and protecting wildlife habitat, nature, and biological diversity. That said, landowner attitudes can certainly change over time and it is difficult to generalize across this group.[99]

Though growth rates and carbon uptake rate will eventually slow as Connecticut's forests enter late successional and old growth stages, most of these forests will continue to accumulate carbon in live tree biomass, down and dead trees, and soils well past 200 years of age.[100,101,102] In fact, Connecticut's forests have the potential to almost double their carbon storage.[103] Natural disturbances, predicted with climate change to increase in both frequency and intensity, will generally sustain carbon sequestration levels up to a relatively high disturbance severity threshold, beyond which sequestration tends to decline.[104]

### Forest Conversion threats

Connecticut's forests cover ~59% of the state's land area,[105] and 53% of these forested areas is considered to be "core forest" as defined by UConn CLEAR in its landmark forest fragmentation study.[106] Over the past 10 years, Connecticut's forest area has changed little, ranging from a net loss of 400 acres per year to a net gain of 1,400 acres per year, depending on the calculation.[107] However, large core forest has declined sharply (see Figure 2 on page 4). The biggest ongoing and future threats from forest conversion and fragmentation occur in the Connecticut River valley and northern Fairfield, New London and Windham counties.[108]

### Reforestation Potential in Connecticut

Four hundred years ago, Connecticut was almost entirely forested.[109] Moderate mitigation potential exists for reforestation on lands that were once forested and are not currently being used for agriculture (i.e., lawns, vacant lots, barren lands and other non-agricultural fields in rural, suburban, and urban areas).[110] In Connecticut, the reforestation potential is highest in the rural areas of Litchfield county and in the settled areas of the Connecticut River valley and Fairfield County.[111]

### The Settled Treescape

Because of increased light, trees and forests that grow near edges, along roads and in settled areas are generally larger and store more carbon than trees in forest interiors.[112] Settled treescapes also cool buildings in summer and insulate them in winter, reducing $CO_2$ emissions from heating and air conditioning.[113] Large trees provide the largest cooling/insulation benefits and airborne pollution reduction compared to small trees.[114] ~~Because of these significant benefits, removals and aggressive pruning of large trees by utility companies and highway departments can result in disproportionately large effects on climate mitigation and should be limited to trees in poor condition that are imminent threats to people or electric infrastructure.~~

REPLACE WITH: The carbon-storage impacts of programs to maintain and remove trees near highways and powerlines requires more study.

### Timber harvesting in Connecticut

Connecticut's forests are currently harvested at a relatively low intensity – 17% of the state's annual forest growth in volume is being cut each year.[115] However, there is some concern that some of

**Commented [OJ30]:** How does this relate to the above claim about resilience?

**Commented [OJ31]:** This is NOT what the paper claims. You are assuming that the forests in this state will double in carbon storage because they have doubled in carbon storage since the last glacial maximum. What a ridiculous thing to assume terrestrial carbon storage will continue to double in time. If that were the case than all of the carbon in the atmosphere would have been sequestered by forests millions of years ago. The reality is that carbon saturation occurs and disturbance occurs leading to consistent carbon storage with time.

This is another example of this section needing to be completely rewritten by a team who understands forest development.

**Commented [OJ32]:** Correct, but in the sentence above the writer claims that Connecticut's forests will double in their carbon storage. This is counter to the point made here. Be consistent.

**Commented [OJ33]:** Core forest is defined as forest at least 300 feet from non-forested edge? This could exist on any parcel greater than 2 acres in size! 300'x300'

**Commented [OJ34]:** Define large

**Commented [OJ35]:** You cite FIA

**Commented [OJ36]:** First off, this document does not provide data from 400 years ago! Remove this. Also, is 400 years ago the mark we should go by? What about Indigenous land management? There are areas today which are forest that 400 years ago were documented as grassland – I'm writing this comment from one of those places.

**Commented [OJ37]:** The citation here is "Ibid" – that is not a proper citation. If you are going to make this claim please cite the source.

**Commented [OJ38]:** Should we then assume that we need less core forest so we have more edges? What's the point of this claim?

**Commented [OJ39]:** Of deciduous trees. Conifers still cool houses in the winter

**Commented [OJ40]:** The iTree tool is not a proper citation for this claim

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**Commented [OJ41]:** You cannot make this claim without comparing the carbon released from 1 million homes in CT running generators whenever we get a tropical storm. It probably is a net benefit to have these trees but generators are a terrible source of fossilized carbon. Pruning of roadside trees and managing for trees of smaller stature near powerlines might not be that large of an effect. IF you cannot cite some data on this do not make the claim, just make the suggestion that it should be studied.

Connecticut's forests are being high-graded (i.e., only the largest and most valuable trees are being harvested.[116] *Mitigation-focused forest management* combined with incentives for landowners could help ensure that forests continue to be present and contribute to carbon uptake. Forest science continues to provide research-based recommendations which increasingly guide forestry decisions. Citation: "Southern New England Forest Management in an Era of Climate Change. A Position of the Yankee Division of the Society of American Foresters. July 2020. 11 pages.

## Actions to Increase Mitigation of GHG from Connecticut's Forests

### Top Priority Actions

Forests offer the single most effective land-based solution for removing carbon dioxide from the atmosphere and storing it long-term to limit some of the worst impacts of climate change.[117] From the deep "core forest"[118] to the individual, mature trees that shade our streets, all of our treescapes are essential to meeting the state's carbon emission reduction goals. As a co-benefit, forests sustain the health and well-being of the state's residents and the broad diversity of plant and animal life that comprise Connecticut's natural heritage. Forests also sustain our best renewable resource and fossil fuel alternatives through forest products. The protection of forests from conversion, science-based management of forests, and the expansion of forests are central to an effective and equitable approach to climate mitigation that Connecticut requires and deserves. The following recommendations are bold and necessary to address the enormous threats associated with climate change.

**Permanently Protect from Conversion to Non-Forest at least 50% of Core Forests >250 acres Statewide by 2040**

*Avoided conversion* of forest to non-forest is a critical climate mitigation strategy. Connecticut's Forest Action Plan already recognizes core forest protection as a conservation priority**.** Public Act 17-218 further requires that the Commissioner of DEEP consider the environmental impacts to core forests from proposed solar projects and certify to the Connecticut Siting Council that such projects will not materially impact the status of core forests. Because of the many benefits core forests provide in addition to climate mitigation, Connecticut should ensure that loss of core forest cover does not occur, or is offset by core expansion. Permanently protecting from conversion to non-forest 50% or more of the state's medium and large[119] core forests by 2040 should be a conservation goal with the same statutory authority as the State's current 21% overall land conservation goal.[120]

### Short Term (1-5 year) Actions

- Adopt statewide core forest permanent protection from conversion to non-forestgoal (cores >250 acres) of 50% by 2040, an increase of about 137,000 acres from 33.5%.[121] This goal would have the same statutory authority as the existing 21% overall conservation goal.
- KEEP FORESTS AS FORESTS and set statewide goal to permanently protect at least 50% of medium (>250 ac.) and large (>500 ac.) core forests by 2040.
- Develop Action Plan to Increase statewide forest cover from 59% to over 60% by 2040.
- ~~Establish Criteria and Designate Core Forest Natural Area Preserves on state conservation lands.~~
- Retain large trees and forest cover in urban and residential areas to reduce carbon emissions from buildings and retain health and other co-benefits.



**Commented [OJ42]:** You should not generalize in this way. High-grading is a threat but also highlight that we have a professional forester program that actively engages in preventing high grading. Supporting professional foresters will help reduce high grading on private land. Also, there is NO evidence of high grading on state forest lands and this should be explicitly stated because high grading is not a concern with the DEEP Forestry Division foresters.

Lastly, high grading is not defined properly here. It is not that the largest and most valuable trees are being harvested. High grading is harvesting ONLY the most merchantable trees and leaving the lowest values trees. In some cases high grading can actually leave the largest trees if those trees are species or growth forms of low value (still not a good thing for forest health).

**Commented [OJ43]:** You still have not defined this.

**Commented [OJ44]:** Again, you're making the assumption that more large trees will lead to better forests. It is a good thing to have large trees but all of this commentary is very ambiguous.

**Deleted:** retain more of the state's larger trees and their carbon on managed forestlands

**Commented [OJ45]:** Again, not defined or cited well

**Commented [OJ46]:** From what? Conversion right, not management. State conversion to be specific

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**Commented [OJ47]:** While large tracts of forest are surely important, it is a stretch to suggest that these are critical to carbon sequestration. Wouldn't ten 40 acre forests sequester the same amount of carbon as one 400 acre forest, all else being equal?

**Commented [OJ48]:** This is not a citation! It is a definition… and based on what?

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**Commented [OJ49]:** Recognize that while this is a noble conservation goal, it probably doesn't make much of a carbon difference per unit of forest area

**Commented [OJ50]:** That's it? 1%? Seems like a low goal.

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**Commented [OJ51]:** Remove this. It is not a carbon goal and could turn into a carbon liability by not producing wood products and when those preserves are disturbed by unnatural invasive species and/or climate change events.

The state already has many preserve areas. These are called State Parks.

- Improve forestry practices in Connecticut's working forests by encouraging private landowners to work with professional foresters and by supporting continuing education for Connecticut's forestry and forest products professionals.
  - Realign all state land protection program and funding sources in the Green Plan to reward and incentivize land protection that protects core forest land >250 acres in size.
  - Actively discourage loss of forest by incompatible land-uses through required mitigation, financial disincentives, and strong policies to avoid land-use conversion.
  - Increase land protection funding from all available sources, including funds to increase capacity of DEEP land protection and stewardship staff necessary to sustain a fivefold increase in acres protected from conversion to non-forest ~~saved~~ and tripling the number of conservation transactions (including private working lands) accomplished each year. This should include annual bond authorizations of at least $25 million for DEEP's Recreation and Natural Heritage Trust Fund and $25 million for the Open Space and Watershed Land Acquisition (OSWA) program, and funding for working land conservation easements.

### Longer Term (5-10 year) Actions

- Continue to work to protect private forestland from conversion to non-forest through funding of working forest conservation easements.
- Dedicate significant resources toward educating landowners about the value of keeping their forests as forests
- Ensure Forest Management Plans for state conservation lands include managing state land for forest resilience and for forest products.
- Incorporate training on recognizing core forest areas into resources available for all state licensed forest practitioners.
- Ensure water utilities are made aware of medium and large core forest areas on their properties, and are incentivized to discourage activities that would fragment these valuable lands.
- Require an individual permit for any petition before the Connecticut Siting Council that would affect core forest.
- Consider increasing financial incentives such as PILOT payments to municipalities that exceed the statewide average of protected core forest.

## Develop Action Plan to Increase Forest cover from 59% to over 60% by 2040

Approximately 59% of Connecticut is forested.[122] Although of varied size and uneven distribution, these forests already have significant aboveground carbon storage (averaging from 31.5 to 39 metric tons/acre),[123] especially compared to other states in the northeastern U.S. Using a no-net-loss policy in Connecticut to avoid deforestation and building upon it to increase forest cover to safely above 60% of the state's land area with *reforestation* (defined here as conversion of land from non-forest to forest) will expand carbon storage capacity, and increase the rate of carbon uptake ("sequestration"). In fact, reforestation is the single most effective forest-based solution to increase the sequestration rate on a per-acre basis in Connecticut.[124] This increase in forest land cover could be achieved through natural forest succession on currently unforested land in residential, rural, and urban areas (i.e., grass and turf, reclaimed and remediated lands, marginal and abandoned fields). It could also be achieved by deliberate re-plantings (as needed), expanding forested riparian buffers, and curtailing unnecessary tree pruning and removals along transportation, residential utility transmission, and telecommunications lines and infrastructure.

This increase in forest land cover would not require the reforestation of active agricultural fields, except in areas where the priority may be to expand riparian buffers. Reforestation



**Deleted:** extending harvest¶ ... [5]

**Commented [OJ52]:** Again, not likely a carbon sequestration mechanism…

**Deleted:** core

**Commented [OJ53]:** Why have "core" in here? If carbon is the goal than just state forest. Discourage loss of all forest, not just core forests.

Another way to keep forests as forests is to help landowners retain them as assets through sustainable economies related to management

**Commented [OJ54]:** If the goal here is conservation easements than just state that. Staff is only needed if there is funding… we need working land conservation easement funding.

**Commented [MF55]:** How much is protected now? The reader needs to know what the base number is that is to be increased five-fold.

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**Deleted:** prioritization of¶ ... [6]

**Commented [OJ56]:** This has nothing to do with carbon or climate. Every forest 300' from an edge needs people to be trained in identifying? What will recognizing accomplish? Forest practitioners are not the ones who are causing core forest to be developed into house lots. Why not educate local town P&Z boards in this instead?

**Commented [OJ57]:** Just like state lands, these water companies are not likely to sell their land. So discourage what activities?

**Commented [OJ58]:** So any private landowner who does anything to "affect" a core forest would need a permit after a petition? Consider that most core forests are comprised of many smaller ownerships. This would be a serious taking of private property rights by the state. Suggest instead: that the state puts resources toward educating landowners about the value of keeping their forests as forests.

**Commented [OJ59]:** These numbers do not account for all forests in Connecticut. Again, poor data with an improper citation. Should we assume that all forests in the state average within that range of carbon storage?

**Commented [OJ60]:** Can you provide some information on how much unnecessary removals are occurring? The people of CT seemed to think that not enough removals were done after experiencing the wind-storm this summer.

**Commented [OJ61]:** Why shouldn't it? Agroforestry has significant potential in this regard

potential is particularly high in Litchfield, Tolland, and Windham Counties and in the urban areas of the Connecticut Valley and northern Fairfield County.[125] Co-benefits of reforestation

**Commented [OJ62]:** State why. What makes these regions have so much potential?

include improved water quality, vegetated buffers to forest cores and old growth forest, and enhanced wildlife connectivity between larger areas of forest habitat.

Commented [OJ63]: We have extremely little old growth in CT. Why state this here?

### Short Term (1-5 year) Actions

- Adopt a statewide forest cover goal of "over 60% by 2040" and launch rapid action planning process to determine areas and incentives to target for reforestation efforts.
- Create and fund a Connecticut Youth Conservation Corps, on the model of the Civilian Conservation Corps, to provide jobs and job training to young people that prioritize tree Planting, forest stewardship, and reforestation activities with an emphasis on employment and work in environmental justice communities as defined under section 22a-20a of the CT General Statutes.
- Consider options for amending Public Act 490 to more actively discourage forest conversion in and beyond the current 10-year term.
- Actively discourage conversion of forest, particularly core forest, for industrial solar projects, while increasing incentives for renewable energy projects on the built environment, such as on brownfields or along highway infrastructure and for using forest products to increase carbon storage in wood buildings.
- Develop educational programs for policy makers and local governments on the climate mitigation benefits of reforesting urban and settled areas, and update existing public information to highlight Connecticut's land-based carbon and renewable forest products.
- ~~Greatly reduce clear-cutting of mature forests as a habitat management practice benefiting young forest species.~~ Delete for the reasons given in the comment.

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Commented [OJ64]: This is not happening very often, cite how much if you are going to call for a reduction. Also, it would mean extirpation of some endangered species – New England Cottontail for one. Are you really calling for that?

### Longer Term (5-10 year) Actions

- Establish financial incentives for landowners who allow their lawns or abandoned fields to reforest.

Commented [OJ65]: Or active fields in the sense of agroforestry

- Invest in scientific monitoring, remote sensing and GIS capacity, by DEEP or its partners in the public and non-profit sectors, to track progress toward increasing overall forest cover using remote sensing and the most current land cover and protected lands data.

**Establish Criteria and Designate Core Forest Natural Area Preserves on State Lands**

**This idea has limited merit, and perhaps can be suggested for study. If these areas are supposed to be off-limits for active management then they are as-likely to be carbon sources, as carbon sinks. The science is just not sufficient to justify this approach. Delete the preserve idea.**

*Proforestation* (defined as continuous forest growth in natural areas protected from timber harvesting) is the most effective solution to preserve accumulated carbon storage and enable it to continue to increase.[126] Given the accumulated carbon density in the state (ranked first on a per acre basis in the Northeast and the second highest average carbon density/acre of forest of any state in the eastern United States), establishing long-term protection of this carbon storage is an important step the state can take in meeting its climate mitigation goals.

Designating natural areas is consistent with long-standing federal and state policy and existing models. Since 1927, the USDA Forest Service has established over 430 Research Natural Areas (RNAs) across the nation where commercial harvests and salvage logging are excluded and where natural processes predominate.[127] Connecticut has been establishing Natural Area Preserves since 1969 with the statutory purpose of keeping land "in as natural and wild a state as is consistent with the preservation and enhancement of protected resources and educational, scientific, biological, geological, paleontological and scenic purposes."

**Figure 7.** Map of Medium and Large Core Forest Areas in Connecticut produced by Housatonic Valley Association using NLCD Landcover 2016 data with UConn CLEAR Forest Fragmentation Tool 2.0.

Though the Natural Area Preserves program has not been a budget or funding priority for DEEP in recent years, updating the Natural Area Preserves statute could be the basis for rejuvenating this program and establishing Core Forest Natural Area Preserves (CFNAPs) as a new category of Natural Area Preserves with formalized criteria. These CFNAPs would be focused on protecting large core forest areas of greater than 250 contiguous acres that occur (entirely or in part) on State properties.

We suggest there are three urgent reasons to establish criteria and designate CFNAPs on state conservation lands as a critical mitigation strategy:

1. Although proforestation is a new term, it is based upon considerable scientific evidence that continuous forest growth in protected reserves is the most effective immediate solutions to preserve accumulated carbon storage and enable it to continue to increase. On lands already owned by the state, this is a very low cost climate solution, as there is no need to purchase the land in order to take it out of production, but only a need to change management objectives;
2. State lands managed for proforestation would provide a "control" to compare to the outcomes of management prescriptions that are designed to increase the resilience of

**Commented [OJ66]:** There are literally thousands of acres of no-management control areas on pubic and private research forests in Connecticut. We do not need more controls. Suggest including wording to state: Support research into the carbon dynamics of Connecticut's forests as they relate to management and forest products.

Connecticut's forest or to mitigation-focused forest management. In experimental research, the "control" provides the "no change" option that other variables are tested against.[128] Without areas that exclude commercial harvests and salvage logging, there would be no controls to compare with forests subject to various management techniques; and

3. There is uncertainty about how climate change will impact forests because there are so many variables. That necessitates employing various strategies at the same time– avoided conversion, reforestation, mitigation-focused forest management, and Proforestation -- while continuing to follow the emerging science[129] about the role of forests in climate mitigation.

### Short Term (1-5 year) Actions

- DEEP should work with partners to identify core forest areas (>250 acres) occurring on or intersecting with land owned or conserved by the State of Connecticut, and designate areas to be managed as Core Forest Natural Area Preserves with priority on the most carbon-dense forests in Tolland, Litchfield, Fairfield, and New Haven Counties. Recommended is that a multi-disciplinary research group (including academics, nonprofits, forest practitioners, and DEEP personnel) should be formed to study and report on the implications of a potential statewide goal of 104,000 acres (which would protect 70% of large core forest areas on state lands) and produce a feasible and consensus implementation strategy for this or any revised goal stemming from the analysis.
- Include the state's existing old forest management sites that occur in core forest on State lands as part of the 70% goal above.
- Update Connecticut's Natural Area Preserves statute[130] to incorporate the management model of the USDA Research Natural Areas[131] and establish Core Forest Natural Area Preserves to enable this program to be implemented quickly based on important groundwork that has been laid over many decades.

### Longer Term (5-10 year) Actions

- Ensure core forest protection is a top priority considered in current and future additions to state parks, forests and wildlife management areas through the state's Recreation and Natural Heritage Trust Fund.
- Establish financial incentives for private and municipal landowners to maximize carbon storage on their protected forestlands with mechanisms like wild carbon easements[132] and working forest conservation easements.

**Retain Large Trees and Forest Cover in Settled Landscapes (urban and residential)**

Because of higher light levels and reduced competition from other trees, edge forests and residential and urban treescapes typically contain larger trees, on average, and therefore store more carbon per tree or area of forest than do interior forests and trees.[133] Hence their climate mitigation value is disproportionately large and should be reflected in the level of protection that they are afforded.

Residential and urban trees and forests also shade and cool buildings in summer and insulate them in winter, which significantly reduces energy levels of air conditioning and heating fuel and associated carbon emissions.[134] Moreover, large trees reduce airborne pollutants (i.e.,

**Commented [OJ67]:** There are literally thousands of acres of no-management control areas on pubic and private research forests in Connecticut. We do not need more controls. Suggest including wording to state: Support research into the carbon dynamics of Connecticut's forests as they relate to management and forest products.

**Commented [OJ68]:** Remove this entire section. It is not backed by current science. Replace with a section on the importance of forest products to serve as fossil fuel reduction mechanisms and carbon storage in long-lived forest products.

**Commented [OJ69]:** Delete these. Core forests are not critical to carbon storage. Plus, you have not suggested if these include management or not. The "Preserves" language implies not management which is bad for carbon.

**Commented [OJ70]:** You already stated this above

**Commented [OJ71]:** See comments from previous section when you already stated all of this

carbon monoxide, sulfur dioxide, nitrogen dioxide, ozone, and particulate matter) to a much greater extent than do small trees. For example, a large tree ≥30 inches in diameter at breast height (dbh) removes an estimated 60-70 times the pollutants as a small tree <3 inches in dbh.[135]

### Short Term (1-5 year) Actions

- Do not permit aggressive pruning and removals of healthy street trees, and focus (or target) pruning and removals to trees in hazardous poor condition that are imminent threats to people or electric infrastructure. If trees are removed, PURA should require a plan and support funding for utilities to replant trees, especially in EJ communities with higher percentages of impervious surfaces and related heat island impacts.
- Create and promote model municipal ordinances to encourage replacement of and mitigation offsets for non-emergency removals of street trees within the municipal road right-of-way.
- Establish new Connecticut standards for state roads and highways that minimize losses of healthy trees.

## Improve the Management of Connecticut's Working Forests

Encourage the active management of Connecticut's forests following scientific principles, including the emerging body of knowledge as to how to manage forests for resilience and to store carbon.

Improving the forest management that takes place outside of Core Forest Natural Area Preserves, while retaining core forest land and large tree cover in settled landscapes – most notably extending the time between harvests and retaining larger trees – is an important forest solution to reducing emissions and mitigating climate change. Large trees store by far the largest amount of carbon in the forest and therefore contribute disproportionately to climate mitigation.[136]

### Short Term (1-5 year) Actions

- Provide support, including funding, for the prevention of new invasive species and for reducing and managing the ones that are here, with an initial focus on those that affect regeneration.
- Implement New England Forestry Foundation's 'Exemplary Forestry™' in managed forests to retain more large trees and carbon in the forest.[137] This approach incorporates climate mitigation and adaptation, management for umbrella wildlife species and best management practices for soil and water, in conjunction with improved forestry or silvicultural practices to increase forest growth rates.
- ~~Reduce salvage harvests and~~ establish policies to help retain dead trees in managed forests hit by insects except in areas where they are a public safety hazard (i.e. along roadways and trails). Dead trees provide a significant source of aboveground carbon [138] and exceptional habitat for cavity nesting birds.[139]
- Increase funding for forest management planning. Forest certification standards include criteria for management planning which can expand the planning framework in forest management plans and timber harvest planning. This would include assessment of the forested landscape in which the property is situated, together with its contributions to maintaining core forest cover and embedded habitats.[140]
- Increase resources for service foresters to help private landowners practice exemplary forestry. That includes hiring at least three more DEEP service foresters and partnering with organizations like NEFF to help advance the principles of 'Exemplary Forestry.TM'

### Longer Term (5-10 year) Actions

- Support the use of forest products, including firewood, from local forests.
- Support thoughtful reuse of wood products to help reduce waste and demand for new wood products.[141]



**Commented [OJ72]:** You need to rethink this argument. People need electricity. EJ communities may be the hardest hit when the next hurricane of 1938 rolls through. Keeping all but the poor condition trees will mean the disaster will last longer. While there's a carbon benefit to having a tree, there are some areas where a large tree does not make sense and a small tree should be favored. Plant fruit trees in urban areas – that way they will not get too large and also provide people with food. If shade is needed consider pruning for health trees.

**Commented [OJ73]:** So you are suggesting that natural area preserves do not include management. Remove this. Natural area preserves are NOT a proven carbon mitigation strategy.

**Commented [OJ74]:** You have never stated in this what the current time between harvests is. How can you suggest extending it when you don't know what is current?

**Commented [OJ75]:** So do long-lived products from those trees

**Commented [OJ76]:** Who would implement this? You would force private landowners to do this? Why not suggest work with the professional foresters to continue to improve forestry in CT?

**Commented [OJ77]:** Why? The carbon will last longer in forest products. Remove this. Dead trees are carbon sources to the atmosphere. They are valuable to wildlife but that is irrelevant to carbon.

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**Commented [OJ78]:** This citation is absurd.

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**Commented [OJ79]:** There is no standard for a forest management plan in Connecticut. How can you include anything if there is no standard?

Most foresters already include an assessment of how the property fits into the broader landscape.

**Commented [OJ80]:** AND to hire more state land foresters to manage state forests so they can serve as an exemplary model.

- Review indigenous forest and wildlife management practices for ideas on different techniques to achieve more resilient mature forests.142

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**Commented [OJ81]:** Review or study? Fire…?

**Commented [OJ82]:** Were historic forests more resilient or just under less stressors?

## Climate Change Threats to Vulnerable Populations

### Top Priority Actions

In the United States, some communities of color, low-income groups, people with limited English proficiency (LEP), and certain immigrant groups (especially those who are undocumented) live with many of the factors that contribute to their vulnerability to the health impacts of climate change.[143]

These populations are at increased risk of exposure given their higher likelihood of living in riskprone areas (such as urban heat islands, isolated rural areas, or coastal and other flood-prone areas), areas with older or poorly maintained infrastructure, or areas with an increased burden of air pollution. These groups of people also experience relatively greater incidences of chronic medical conditions, such as cardiovascular and kidney disease, diabetes, asthma, and COPD which can be exacerbated by climate-related health impacts.

Socioeconomic and educational factors, limited transportation, limited access to health education, and social isolation related to English language deficiencies collectively impede their ability to prepare for, respond to, and cope with climate-related health risks. These populations also may have limited access to medical care and may not be able to afford medications or other treatments. For LEP and undocumented persons, high poverty rates, language and cultural barriers, and citizenship status limit access to and use of health care and other social services and make these groups more hesitant to seek out help that might compromise their immigration status in the United States.

The number of people of color in the United States who may be affected by heightened vulnerability to climate-related health risks is growing. Currently, Hispanics or Latinos, Blacks or African Americans, American Indians and Alaska Natives, Asian Americans, and Native Hawaiians and Pacific Islanders represent 37% of the total U.S. population and 24.8% of the population in Connecticut. 22.1% of the population in Connecticut speaks some language other than English at home, and 10.4% of the population was born outside the U.S. As a proportion of Connecticut's population, people of color as a group grew by 2.6% from 2010 to 2014.[144,145]

- **Improve the social determinants of health and reduce health inequities** at the individual and community levels to reduce vulnerability and increase resilience to climate change.
- **Support community interest in tree planting, parks, and/or community gardens** in densely populated areas to support climate solutions that could meet multiple needs such as increasing health outcomes, employment, and entrepreneurial opportunities. Youth Conservation Corps could help community-based groups with implementation.
- **Build a market for creative re-use of urban wood waste** to store carbon while simultaneously creating education, employment, and stewardship opportunities.
- **Engage, train, and educate on adaptation planning, resiliency, and risks** from climate change with emphasis on local officials, planners, community organizations, and emergency responders.

As noted earlier in the Status of CT Forests section of this report, 36.4% of the land area of Connecticut is considered by the U.S. Census to be "urban" (1.13 million acres), with 87.7% of the population, nearly 3 million people, living in these urban areas. Despite the high population concentration in these areas, these same lands have a fairly high degree of tree cover, with tree canopy cover estimated at nearly 50%. Despite this encouraging canopy cover statistic statewide, there continues to be a strong correlation between lower-income neighborhoods, communities of color, and a distinct lack of tree cover.

**Figure 8.** Urban areas like Hartford are hotter than more rural areas during summer. Tree cover can help reduce health and other problems associated with urban heat islands.[146]

### Vulnerability to Climate-Related Health Stressors

Disproportionate climate impacts for some communities of color and low-income, LEP, and immigrant populations include heat waves, other extreme weather events, poor air quality, food safety, infectious diseases, and psychological stressors.[147]

Race and class are important factors in the vulnerability to climate-related stress, but it can be difficult to isolate the role of race from other related socioeconomic and geographic factors. Some racial minorities are also members of low-income groups, immigrants, and people with limited English proficiency, and it is their socioeconomic status (SES) that contributes most directly to their vulnerability to climate change-related stressors. SES is a measure of a person's economic and social status, often defined by income, education, and occupation. Additional factors such as age, gender, pre-existing medical conditions, psychosocial factors, and physical and mental stress are also associated with vulnerability to climate change. Because many of these variables are highly related to one another, statistical models must account for these factors in order to accurately measure the relative importance of various risk factors. For instance, minority race and low SES are jointly linked to increased prevalence of underlying

health conditions that may affect sensitivity to climate change. When adjusted for age, gender, and level of education, the number of potential life-years lost from all causes of death was found to be 35% greater for Blacks than for Whites in the United States, indicating an independent effect of race.

***Extreme heat events.*** Some communities of color and some low-income, homeless, and immigrant populations are more exposed to heat waves as these groups often reside in urban areas affected by heat island effects.

***Other weather extremes.*** As observed during and after Hurricane Katrina and Hurricane/PostTropical Cyclone Sandy, some communities of color and low-income people experienced increased illness or injury, death, or displacement due to poor-quality housing, lack of access to emergency communications, lack of access to transportation, inadequate access to health care services and medications, limited post-disaster employment, and limited or no health and property insurance.

***Degraded air quality.*** Climate change impacts on outdoor air quality will increase exposure in urban areas where large proportions of minority, low-income, homeless, and immigrant populations reside. Fine particulate matter and ozone levels already exceed National Ambient Air Quality Standards in many urban areas.

***Waterborne and vector-borne diseases.*** Climate change is expected to increase exposure to waterborne pathogens that cause a variety of illnesses—most commonly gastrointestinal illness and diarrhea. Health risks increase in crowded shelter conditions following floods or hurricanes, which suggests that some low-income groups living in crowded housing may face increased exposure risk.

***Food safety and security.*** Climate change affects food safety and is projected to reduce the nutrient and protein content of some crops, like wheat and rice. Some communities of color and low-income populations are more likely to be affected because they spend a relatively larger portion of their household income on food compared to more affluent households.

***Psychological stress.*** Some communities of color, low-income populations, immigrants, and LEP groups are more likely to experience stress-related mental health impacts, particularly during and after extreme events. Other contributing factors include barriers in accessing and affording mental health care, such as counseling in native languages, and the availability and affordability of appropriate medications.

### Improve Community Health and Reduce Health Inequities

The impacts of climate change on health and health inequities are moderated by individual and community vulnerability and resilience. Interventions that improve the social determinants of health and population health and reduce health inequities can significantly reduce vulnerability and increase resilience to climate change, at the individual and community-levels. Increasing resilience to climate change will require investing significantly in the public sphere, including in social determinants of health and in public health infrastructure.

Many climate actions bring significant health co-benefits, but some may have significant adverse health consequence and/or increase health inequities. Some health interventions also

have climate co-benefits. Thoughtful implementation of actions to reduce greenhouse gas emissions and adapt to climate impacts will help maximize co-benefits and minimize co-harms.

Urban trees and other natural systems provide a range of physical health benefits. Trees can improve air and water quality, mitigate the heat island effect, and help alleviate noise.[148] Trees can shield people from ultraviolet (UV) radiation, the cause or contributing factor for three types of skin cancer.[149] Urban ecosystems are increasingly recommended by national and State environmental protection agencies to mitigate the harmful impacts of air and water pollutants, harmful emissions, and the negative effects of urban heat and noise.[150] Trees also help reduce flooding by slowing rainwater runoff.

The demands of modern life can often be mentally exhausting. Focusing attention on flows of information and tasks, screening out distractions, and responding to the constant stimuli of commuting, work, school, and family leaves many people feeling drained, with memory loss and reduced capacity for sustained attention.[151] Rachel and Stephen Kaplan's Attention Restoration Theory (ART) suggests that we can use nature to restore depleted cognitive functions and maintain performance.[152]

Access to green spaces also provides other health benefits. Researchers at the University of Exeter surveyed 10,000 urban residents in the United Kingdom, asking how satisfied they were with their lives and whether they had signs of depression, anxiety, or other psychological disorders. After controlling for other factors known to significantly influence well-being such as income, employment, marital status, health, and housing, researchers found a strong correlation between a boost in a feeling of well-being overall and increases in green space within a 2.5-mile radius of residents' homes.[153]

**Figure 9.** Maps showing tree canopy cover and surface temperatures in New Haven help to show the urban heat island effect that trees help to mitigate.[154]

### Support Community Interest in Tree-Planting, Green Spaces, and/or Gardens

Tree planting in urban areas provides many potential benefits to human health, but it's important to note that the top green priority for a neighborhood may not be tree-planting, and policy-makers should be careful to not approach community green spaces with a "top-down" approach.[155] It is critical to engage the community locally to understand local needs and discuss trees as one potential solution rather than approaching the community with the assumption that tree-planting is the answer. Ongoing stewardship of local investments in green spaces is critical and may be more important than tree-planting depending upon various factors. Ultimately, community support is the foundation for long-term stewardship. As an additional benefit, work done to increase access to community green spaces may also inspire young people of color to consider outdoor employment opportunities, and perhaps this kind of locallydriven effort might provide the first step to a conservation career.

Underrepresented communities are adversely impacted by climate conditions, but historically, these communities have been marginalized, set aside, and not engaged in these discussions. While this report addresses Climate Change Threats to Vulnerable Populations, assessing community needs without their input would further exacerbate the vulnerabilities these communities face. Decisions about others without their input would further perpetuate the effects of climate when leaders are not communicating with the communities they represent. So, it is critical that we connect with leaders within the communities we're identifying as vulnerable populations and learn with them while assisting them.

That said, the existence of trees in areas with limited canopy cover can sometimes literally be the difference between life and death. Neighborhoods with little to no trees can, on average, be 5 to 7 degrees hotter during the day and up to 22 degrees hotter at night than neighborhoods with good tree cover. Treeless neighborhoods also have worse air pollution because trees trap air pollutants and the hotter temperatures in these treeless neighborhoods help cook air pollutants into dangerous smog. That's one of the reasons why health experts project a ten-fold increase in heat-related deaths across America's cities.[156]

Another reason for considering tree planting amongst community options is that some trees in urban areas are in poor condition and need to be removed and/or replaced. For example, Connecticut is currently losing many ash trees due to the emerald ash borer. A recent study suggests suggest that the loss of trees to emerald ash borer is increasing human mortality related to cardiovascular and lower-respiratory-tract illnesses. [157] This finding adds to the growing evidence that the natural environment provides major public health benefits.

The need to maintain and increase urban tree cover (UTC) in Connecticut is not a new issue and is well-documented. Studies of UTC were conducted in New Haven (2009),[158] Hartford (2010),[159] Bridgeport (2012),[160] and the Greater Bridgeport region (2014)[161] to map UTC, show areas where heat islands are a current problem, and suggest areas where UTC could be increased through a combination of plantings or replantings and stewardship of existing trees. There have been follow-up studies and recommendations such as Hartford's Urban Tree Canopy Assessment and Planting Plan (2014).[162]

The City of Hartford, working with the city's Tree Advisory Commission, developed a Hartford Tree Canopy Action Plan (June, 2020)[163] with the following laudable long-term goals:

- Maintain the health of the urban forest.
- Ensure public safety.
- Increase our tree canopy to at least 35% (current tree canopy is ~25%).
- Reduce the urban heat island effect through targeted planting in the urban heat islands.
- Increase tree plantings aimed at energy savings.
- Reduce storm water run-off through target plantings.
- Improve air quality through forest management and careful selection of new trees.
- Design and implement an environmental stewardship program for Hartford schools, City of Hartford employees, and Hartford citizens.
- Become an urban forestry model for cities in the northeast and beyond.

The Hartford Tree Canopy Action Plan calls for the a 5-year goal of planting 3,000+ trees each year to increase its canopy from 25% to 35% over the next 50 years. According to the Tree Plan, planting ~1,500 trees each year is required just to maintain the current tree canopy. Of course, to maintain and increase tree cover in a healthy urban forest requires more than tree planting alone. Hartford and other cities must also make investments to remove dead trees, care for diseased, damaged or aging trees, and have a plan for replacing trees that are lost through storms or other common stressors for trees in cities.

Tree planting programs are more impactful when complemented by local environmental education and green jobs programs at the municipal level. KNOX for example, provides handson environmental education for Hartford students through their Gaia's Guides program which offers a combination of after-school educational opportunities and in-school programming on the benefits of trees to communities. In addition, KNOX offers Green Jobs Apprenticeships that provide job counseling and hand-on experience for out-of-work Hartford residents in the fields of landscaping (which includes tree planting), and horticulture. These kinds of job opportunities build experience for potential careers in landscaping, landscape design, land management, plant and soils science, agriculture, arboriculture/tree care, forestry, and many more fields. Actively nurturing a broad appreciation of trees at the community level through outreach and education is important because there are ongoing costs associated with maintaining tree health that individual land-owners and community residents should consider. Well-maintained trees can be seen as a community asset and point of pride, but poorly maintained, unhealthy, or dead trees can be viewed as symbols of community neglect.

The plans and goals for Hartford's urban tree canopy are very good. However, due to budget shortfalls and other challenges, Hartford has been losing ground and has only been able to plant a few hundred trees in recent years. In the Tree Plan, it is suggested that Hartford's urban tree cover may have actually decreased by approximately 2% between 2014 and 2018 due to inadequate plantings despite best intentions, strong plans, and an appreciation for trees. Without additional state or federal funding, human resources, and support with technical elements such as GIS mapping of heat islands and potential planting zones, to assist cities like

Hartford and local partners like KNOX, Connecticut's urban areas will continue to struggle just to maintain the status quo for their urban tree canopies. A program like a Youth Conservation Corps could help provide some human resources to complement and extend the capacity of existing community-based organizations such as KNOX (Hartford), Urban Resources Initiative (New Haven), and Groundwork Bridgeport.

A Youth Conservation Corps, funded through a model like the national AmeriCorps program or perhaps a model like the "Greening the Gateway Cities" program being implemented in 13 towns in Massachusetts,[164] could employ high school or recently graduated students to build trust and cultural understanding at the community level around environmental restoration. Work that could be led by this youth corps could include controlling invasive plants or protecting native plants, working on trails connecting green spaces, and cleaning-up/plantingup open spaces in urban and rural environments. This could be a great program for expanding outdoor youth employment and career enrichment opportunities for students of color in fields such as landscaping, horticulture, and land management/conservation, and can bring multiple benefits when students from the local community are employed.

### Support Market for Local Wood Re-use

A program to encourage the local re-use of wood from the urban forest can accomplish multiple goals. Trees in urban areas provide many benefits while trees are growing and healthy, especially if they are well-maintained. However, some trees are not in good condition and need to be removed. In this situation, urban trees can move from being seen as a benefit to becoming a cost for the municipality. If the wood from that tree were re-used, it could reduce costs associated with tree removal and disposal, create job opportunities, partially offset the use of wood products from international forests that can be poorly regulated and leave a larger carbon footprint, and store carbon in long-lived wood products.[165,166]

It's worth noting that some tools and equipment that would support local wood re-use can represent barriers to entry. Some tools and equipment – e.g., a portable sawmill or lathe or chipper or kiln for drying wet wood – may be more apt to be readily accessed if it were available for rent from an equipment rental business or loanable through a local/regional coop. There are significant resources on urban wood re-use to provide models that work.[167]

Construction in densely developed neighborhoods with locally-grown, long-lived wood products substituted for more carbon-dense materials (e.g. steel, aluminum, or concrete) can also have carbon offset benefits.[168,169] Wood products have many important benefits when used as a construction material. New techniques, such as cross-laminated timber and wood fiber insulation, are allowing use of wood in new ways that expand potential beneficial impacts. In a climate context, long-lived wood products have two benefits. First, they can store carbon previously captured by trees; as living forests may potentially experience increasing mortality and associated carbon release due to climate change, this could become an increasingly important benefit.[170,171,172] Greater focus and incentives toward reduced-impact techniques of forest harvest, improved forest management to enhance growth rates, and directing more of the harvest to long-lived products has potential to improve the efficiency of this carbon benefit over past performance.

## Climate Threats to Vulnerable Forest Types

### Top Priority Actions

Because of the uncertainty of climate change, all types of Connecticut Forest could be considered vulnerable. Unpredictable changes in temperature regimes, precipitation and importantly invasive species, pests and pathogens may mean that forest types thought to have low vulnerability, such as northern hardwood and central hardwood pine, may in fact be more vulnerable than we expect. For the purposes of this section we will focus on forest communities that are most likely to be negatively affected by climate change:[173,174]

- Black spruce bogs
- Lowland mixed conifer
- Beech, birch maple forest
- Freshwater forested wetlands (forested swamps)
- Pitch pine-scrub oak (not called out in the literature, but added because of threat from southern pine beetle)
- Cold water streams and headwaters and the associated shading forests
- Lowland Atlantic white cedar forests
- Floodplain forests, and
- Coastal Forests

The climate-related threats to forests in Connecticut and the northeastern U.S. are welldescribed by Swanston et al. (2018):[175]

“Forests of the Midwest and Northeast significantly define the character, culture, and economy of this large region but face an uncertain future as the climate continues to change. Forests vary widely across the region, and vulnerabilities are strongly influenced by regional differences in climate impacts and adaptive capacity. Not all forests are vulnerable; longer growing seasons

- **Reevaluate Connecticut's Green Plan and open space grant programs** to prioritize acquisition of land and conservation easements for habitats most at risk from climate change.
- **Increase efforts to model and map vulnerable natural communities** and their buffers to increase efficiency of protection efforts to create better and integrated mapping of all natural resources and better inform decisions (e.g., Natural Resource Atlas and Monitoring Project).
- **Increase pace of forest and open space protection** with a focus on vulnerable natural communities and important buffers.
- **Advocate for passage of federal funding programs** such as the Great American Outdoors Act, Recovering America's Wildlife Act, and others that support habitat stewardship and protection.
- **Invest in research and actions supporting adaptive management** for vulnerable natural communities.

and warmer temperatures will increase suitable habitat and biomass for many temperate species. Upland systems dominated by oak species generally have low vulnerability due to greater tolerance of hot and dry conditions, and some oak, hickory, and pine species are expected to become more competitive under hotter and physiologically drier conditions. However, changes in precipitation patterns, disturbance regimes, soil moisture, pest and disease outbreaks, and nonnative invasive species are expected to contribute forest vulnerability across the region. Northern, boreal, and montane forests have the greatest assessed vulnerability as many of their dominant tree species are projected to decline under warmer conditions. Coastal forests have high vulnerability, as sea level rise along the Atlantic coast increases damage from inundation, greater coastal erosion, flooding, and saltwater intrusion. Considering these potential forest vulnerabilities and opportunities is a critical step in making climate-informed decisions in long-term conservation planning."

### Black Spruce Bogs

This is a rare habitat type in Connecticut and we represent the southern terminus of its range and a habitat expected to be adversely affected by climate change in general.[176] As such changes in temperature regimes may decrease suitability for this habitat type in Connecticut.

### Lowland mixed conifer

This forest type is generally uncommon in Connecticut and is considered to be of moderate to high vulnerability in the Northeast (though upland mixed conifer at above 1,000-foot elevation is doing better in Connecticut).[177] Good examples may be found in Norfolk and Eastford. Changes in temperature regimes and increased threat of non-native pests (hemlock woolly adelgid, *Adelges tsugae*) may stress this habitat type in Connecticut, particularly hemlock which is included in this grouping.

### Beech, birch, maple forest

This forest type is considered highly vulnerable in Southern New England because of temperature changes, precipitation changes, change in timing of seasons, Invasive plants and animals, pests and diseases, and is already stressed by development and habitat loss as well as terrestrial connectivity loss (roads and development).[178]

### Freshwater forested wetlands

This forest type is considered highly vulnerable in Connecticut because of temperature changes, precipitation changes, changes in hydrology, changes in winter, Sea level rise, storms and floods, change in timing of seasons, invasive plants and animals, pests and diseases, development as well as habitat loss and terrestrial connectivity loss (roads and development).[179]

### Pitch pine-scrub oak

Generally thought to have low vulnerability,[180] this is already a rare habitat type in Connecticut, threatened by development, invasive plants and insect pests. Climate change is making our habitats more suitable for the southern pine beetle, but restoration projects on old sand plains may offer hope.

### Cold water streams and headwaters and the associated shading forests

It is the cold water streams and headwaters that are the vulnerable community, but associated riparian forests are important for reducing water temperature and creating suitable habitat for Brook Trout and other associated wildlife.[181] It's important to note that in urbanized watersheds, existing riparian forests can be relatively intact, less stressed than roadside forests, and important to protect for carbon storage, habitat, floodwater retention, aesthetic, shade and other community benefits.

### Lowland Atlantic white cedar forests

An already rare habitat type in Connecticut. These forested wetlands are threatened by increased severity and length of droughts in Connecticut.[182] Coastal examples could be threatened with increased saltwater intrusion into groundwater.

### Coastal Forests

Rising sea levels, the associated landward migration of tidal marshes, and increased salinity of ground water, as well as our attempts to protect developed infrastructure threatens the viability and resilience of our coastal forests.[183]

## Funding, Programs, and Resources Needed for Implementation

### Top Priority Actions

**Figure 10.** Connecticut's spending on land conservation -- $2.12 per year per person -- places the state last in combined state and federal per capita public funding among other New England states.[184]

Connecticut must ramp up investments in natural lands protection which is a necessary component of the state's plans to meet its ambitious goals of achieving a 100% net zero-carbon target by 2040.[185] Investments in natural climate solutions are relatively inexpensive compared to the costs of doing nothing or simply responding to magnified impacts of climate change.

**Enhance Existing Funding Programs**

- Bonding
- Community Investment Act
- State Revolving Funds (Water Quality and Drinking Water)
- Regional Greenhouse Gas Initiative

**Establish New Sources of Revenue**

- Include comprehensive forest protection component in a Carbon Tax
- Enable Municipal Funding Option
- Establish Compensatory Mitigation Fund as part of "No Net Loss of Forest" policy

**Provide Tax Incentives for Acquisition and Stewardship**

- Expand existing corporate tax credit to individuals for land donations

### 1. Enhance Existing Land Conservation Programs

**Increase state investments for existing land conservation programs and incorporate more specific climate-related criteria into selection of projects/level of funding (Open Space and Watershed Land Acquisition Grant Program [OSWA]; Recreation and Natural Heritage Trust Program; Recreational Trails Program)**

- Source of funds: State Bonding
- Action required: Legislative
- Note: Typical bond authorizations for these programs have ranged from $3 to $7.5 Million per year, but allocation of those funds has neither been consistent nor adequate to meet project demands. Based upon specific Sub-Group recommendations related to forest protection, annual bond authorizations for OSWA and RNHT should be $25 Million, respectively, and $10 Million for the Recreational Trails Program. In states offering statewide bond referendums, voters have approved the dedication of significantly higher levels of funding for open space conservation.[186] With more specific carbon accounting criteria, the OSWA scoring may be further refined to award projects that provide higher carbon mitigation benefits.

**Increase funding for Community Investment Act (CIA)**

- Source of funds: Increase surcharge on local recording fee (currently $40)
- Action required: Legislative
- Note: The CIA provides dedicated funds to support community-level investments across four sectors: Open Space Conservation, Farmland Preservation, Affordable Housing, and Historic Preservation. The CIA is currently funded through a $40 surcharge on municipal recording fees, which is distributed as follows: $1 remains with the Town Clerk; $3 go to the municipality to pay for local capital improvement projects; $10 supplements the income to dairy farmers; and the remaining $26 is distributed to state agencies to fund matching grants to the four sectors enumerated above. The Forests Sub-Group recommends an increase in the surcharge on recording fees, ranging from $10 to $20, with the additional revenue to the CIA account distributed evenly to the four sectors. A $10 - 20 increase to the recording fee would add an estimated $1.5 - 3.0 million per year for the open space sector of the CIA account. This additional funding could be dedicated to urban forest improvement projects such as tree planting or re-planting and stewardship in underserved areas, as well as support for CT DEEP to administer the program.

**Expand Urban Green and Community Garden Program to include Urban Forest Improvement Projects**

- Source of funds: Community Investment Act
- Action required: Legislative
- Note: CT DEEP's Urban Green and Community Garden Program provides assistance to communities designated as targeted and/or distressed to develop or enhance urban open spaces for public enjoyment and/or environmental education, including the

development of a community garden or reclaiming and enhancing existing open space for the public's use. The Forests Sub-Group recommends expanding this program to specifically include funding for urban forest improvement projects. See also, Urban Forest Carbon Credit Program.

**Utilize Portion of State Revolving Funds for Land Conservation/Green Infrastructure Projects**

- Source of funds: Existing state revolving funds (SRF) for clean water and drinking water
- Action Required: None. Currently up to 10% of SRF may be used to finance green infrastructure projects, which may include street trees, bio-swales, land conservation, etc. However, legislative action would be required to mandate spending on green infrastructure projects. In 2019, S.B. No. 927, **An Act Creating the Environmental Infrastructure Fund Within the Connecticut Green Bank**, proposed expanding the types of projects the Green Bank can promote investment in to include environmental infrastructure, which, under the bill, is structures, facilities, systems, services, and improvement projects related to water, waste and recycling, zero-emission vehicle refueling, climate adaptation and resiliency, agriculture, land conservation, parks and recreations, and other environmental markets.
- Note: This is an opportunity for cross-sector dialogue about tapping into the Green Bank for creative financing for infrastructure projects to leverage co-benefits of land conservation including air pollution reduction, carbon removal, flood protection, food production, avoided costs for healthcare system, etc. See also, Urban Forest Carbon Credit Program.

**Expand Use of Regional Greenhouse Gas Initiative (RGGI) funds to Forest Land Conservation**

- Source of funds: Proceeds from sale of RGGI State Emission Allowances
- Action Required: Legislative
- Note: While RGGI participating states may use afforestation projects to award offset allowances (project-based GHG emission reduction outside of the capped electric power generation sector),[187] this recommendation proposes the state reinvest the proceeds from the CO2 allowance auctions to fund CT DEEP land protection projects, land acquisition staff capacity, due diligence, scientific studies related to forest science (including an assessment of current forest management practices and policies and impacts on climate mitigation goals), development of a state mapping system to identify forests of highest current or future conservation value, and public education and outreach programs promoting the importance of resilient forests, forest stewardship, etc. New Jersey is an example of a RGGI state that has a legislative mandate to spend a portion of RGGI proceeds on land sector activities.[188] At the same time, Connecticut should study forest carbon offset allowances available through compliance and voluntary markets for reforestation, improved forest management, avoided conversion, and proforestation as well as programs that aggregate, evaluate and monitor forest offsets, in order to implement a system of paying landowners for enhanced carbon sequestration and storage with verifiable climate benefits and strict certification standards in place.

### 2. Tax and Other Incentives

**Expand Corporate Tax Credit for Donations/Bargain Sale of Open Space to Individuals for Land that meets certain Climate Mitigation Criteria and/or for Forest Carbon Services**

- Source of Funds: Individual Tax Credit
- Action required: Legislative
- Note: The Forest Sub-Group should include recommendations for climate mitigation criteria to include in the next iteration of the State's Green Plan, which may then be tied into legislation providing for an individual income tax incentive for forestland protection. We may also want to consider transferable tax credits for conservation easement donations as offered in multiple states, allowing landowners with little taxable income to transfer tax credits to another taxpayer and/or carry the credit forward over a number of years. The New York tax credit is unique, offered not at the time of donation, but every year in an amount equivalent to 25% of the property taxes paid on land under easement.[189] Tax credits may also be allocated to landowners engaging in afforestation, reforestation, proforestation, and other forest stewardship and restoration efforts with defined carbon mitigation benefits.[190] Extra incentives may be built in to the program to encourage landowners to pursue other co-benefits.

**Enable Compensatory Mitigation for State and Local Projects**

- Source of Funds: Developers make payments to a mitigation fund if unavoidable conversion of forest and other natural lands occurs.
- Action required: Legislative
- Note: Requiring mitigation for forest loss through the adoption of "no-net-loss of forest" laws would provide an opportunity to generate significant new funding for conservation from developers mitigating their forest impacts.[191] This program should also apply to disturbances on public land, i.e. any project conducted on public land that leads to a loss of forest cover must be compensated for by the state or municipality with an equivalent amount of replanting in another location (e.g., models in New Jersey and Maryland). Any program needs to carefully consider what is deemed "unavoidable conversion," which must be strictly construed (see below).

**Incentivize the Siting of Renewable Energy Infrastructure to Avoid Loss of Forests, Farmland and Other Sensitive Lands**

- Source of Funds: N/A
- Action Required: Legislative/Regulatory
- Note: Incentivize the development of renewable energy infrastructure on areas other than forests and other open lands by loosening regulatory requirements to do so (e.g. requiring only a general permit) and/or disincentivizing development on open lands by developing more stringent siting approval requirements. Require developers to make payments to a mitigation fund if unavoidable conversion occurs.

### 3. Municipal Funding Programs (See also Urban Forest Carbon Credit)

**Enable Municipal Option to Fund Local Land Conservation, Stewardship and Climate Mitigation Strategies**

- Source of Funds: Local Buyer's Conveyance Fee
- Action required: Legislative
- Note: The legislation is enabling, giving municipalities the option, if they so choose, to establish a buyer's conveyance fee program to generate a local source of revenue to implement nature-based climate solutions and other local environmental projects. 2020 draft legislation included specific authorization to use funds for local climate mitigation strategies and to offset loss of tax revenue from land that has been permanently protected. See www.ctconservation.org for case studies and other information.

### 4. Tax Revenue Options

**Sales Tax Increase or a Percentage of Current Sales Tax Devoted to Fund Land Conservation and Related Programs**

- Source of funds: Increase CT General Sales Tax by .125% (from 6.35% – 6.475%)
- Action required: Legislative
- Note: Using the State of Minnesota Clean Water, Land and Legacy Amendment model (funds natural and cultural heritage programs), a sales tax increase of .125% would generate an estimated $78.4 million to fund a variety of climate-related programs, including land conservation. Based upon on overall New England average, this tax increase would cost approximately $47 per family per year.[192] The revenue would not be a substitute for other state conservation funding; rather it would provide an additional source of dedicated funds which may be available to CT DEEP, as well as nonprofits and municipalities through a competitive grant process. An alternative to a tax increase is to allocate a percentage of the existing general sales tax paid on outdoor recreation and related goods and services to fund land conservation and stewardship programs.

**Carbon Tax**

- Source of funds: Tax on power plants, developments, and other uses (including renewable energy infrastructure projects on forest or agricultural lands) responsible for greenhouse gas (GHG) emissions and/or loss of $CO_2$ storage, with revenues to help pay for climate initiatives including forest carbon mitigation programs.
- Action required: Legislative
- Note: Carbon legislation in Washington State is a notable example.[193] If other subgroups are suggesting a carbon tax, then a portion of the revenue should go to investments in natural climate solutions.

### 5. Public – Private Partnership Pilot Programs to Advance Land Conservation

**Connecticut Land Conservation Partnership Program**

- Source of funds: State Bonding
- Action required: Legislative
- Note: This, and other suggested programs funded through bonding, could be packaged as part of a larger green bond program. Using the well-established New York State Conservation Partnership Program as a model, the state would partner with a private non-profit organization to offer competitive matching grants to qualified Connecticut land trusts for organizational capacity building, collaborations, stewardship/resource management, and conservation transaction support. Studies commissioned by the Land Trust Alliance found that stronger, more professional land trusts save more land.[194] Other public-private partnership programs may include DEEP personal services agreements with NGOs to provide direct services to municipalities and other NGOs for grant writing, grant administration, and project administration.

**Urban Forest Carbon Credit Project**

- Source of funds: Urban Forest Carbon Credit[195]
- Action required: None unless the state wants to incentivize partnerships, including (i) enacting enabling legislation for municipalities that want to set up special carbon districts; and/or (ii) using SRF; and/or (iii) expanding Urban Green and Community Garden Program, or other incentives.
- Note: This program would value carbon credit (metric tons of $CO_2$ captured in urban forests), including quantifiable ecosystem and other co-benefits associated with urban trees (stormwater reduction, air quality, energy savings, health and equity benefits, as well as employment); value the carbon revenue; establish a value per year; and sell the carbon credits to garner funding for local preservation, planting, restoration and other projects. Whether or not there is an urban forest carbon credit program established in Connecticut, the state should fund a program for municipalities (especially in underserved/EJ areas) to increase urban tree canopy cover and resilience in plantings and post-establishment treatments/monitoring as well as, in appropriate circumstances, to maintain mature and large trees which provide especially high levels of community benefits services such as cooling, mental health, pollution reduction, and habitat.

## Establishing a Forest Carbon Baseline for Connecticut

### Top Priority Actions

Connecticut relies heavily on the U.S. Environmental Protection Agency's State Inventory Tool (SIT) modules[196] for estimating annual GHG emissions. SIT is an interactive spreadsheet model that calculates sector-by-sector GHG emissions based on numerous state-level data sets. Currently, the Connecticut annual GHG inventory does not use the "land use, land use change, and forestry" (LULCF) SIT module. The SIT LULCF module applies national emission factors to state forest inventories. Data used in this model comes primarily from USDA Forest Service reports,[197] which can have significant sampling errors and inconsistent inventory methodologies over time. For Connecticut, this tool produces results that are not well understood.[198] For example, there are two large unexplained swings in total forest carbon flux (Figure 9). In 1998, a large increase in soil organic carbon and dead wood results in the total carbon flux in LULC changing from a sink to a source. Then in 2006, this trend sharply reverts, and soil organic carbon and litter becomes a large sink for $CO_2$ emissions. There are no changes in forest policy or disturbances that can account for these fluctuations.

**Figure 11.** Annual Connecticut GHG emissions by sector 1990-2017. Sectoral estimates are from EPA SIT modules and state-level data. LULCF module data included in figure but not counted in annual GHG total.


- Develop a usable model to reliably monitor carbon sinks related to working and natural lands, or to utilize models developed by state, academic, and nonprofit partners involved with the U.S. Climate Alliance.
- Report on Connecticut's "forest carbon inventory" over time alongside reported emissions for the building, energy, and transportation sectors.
- Include goals for increasing Connecticut's forest carbon sink (a.k.a. "negative emissions") with the next update to the Global Warming Solutions Act.

In effect, Connecticut does not account for carbon sinks. Connecticut statutes PA-08-98 and PA-18-82 established several future reduction goals below baseline estimates. Baseline estimates are based on 1990 and 2001 annual emission totals, years in which carbon sinks have not been estimated for Connecticut forests. Methods to quantify and assess sources and sinks of carbon in the forestry and land use sectors will help inform Connecticut's policy efforts to meet its statutory emission targets.

**Figure 12.** Annual Connecticut, sector-wide GHG emissions and future emission targets, 1990-2017. Black lines (solid and dashed) are annual emission totals without LULCF carbon sink accounting. Green lines (solid and dashed) are annual emission totals with LULCF carbon sink accounting.

Although the SIT LULCF estimates leave much to be desired in terms of accuracy, it does suggest that the carbon sequestered and stored in forests and related soils accounted for the equivalent of 20% of total emissions in 2017 (Figure 2). If estimates were reliable, the carbon sink from forests and related soils could represent about a decade's worth of emission reductions.

Another way to look at this challenge may be similar to what is currently done in Maryland (see Figure 3 below) where the state estimates that it can reduce emissions by 80% by 2040 using all available tools. However, the remaining 20% of emissions are proposed to be offset by "negative emissions" or carbon sinks from natural climate solutions such as management and protection of additional forest lands with increased carbon capture in mind.

0
10
20
30
40
50
60
1990 1995 2000 2005 2010 2015 2020
MMTCO2e

| | |
|---|---|
| **Annual Emissions** | **Annual Emissions w/ carbon sink** |
| **2030 Target(s)** | |
| **2020 Target(s)** | |
| **2050 Target(s)** | |

**Figure 13.** From presentation by Chris Hoaglund, Climate Change Program Manager with MD Department of the Environment showing the State efforts to both reduce emissions and account for sequestration from natural climate solutions, e.g. forests.

Accounting for carbon sink estimation through forestry is an important potential aspect of Connecticut's GHG emission inventory. Forests can be significant sinks for atmospheric carbon, potentially offsetting GHG emissions. For the New England region, projections show that despite land-use, land cover (LULC) change projected trends, carbon storage will increase.[199,200] Regardless of projected increases in soil respiration due to increased temperatures, the longer growing season and increased $CO_2$ fertilization account for this growth in carbon stock.

In a 2014 study,[201] a method was created to use land cover data for estimating land use, land change, and forestry (LUCF) impacts on GHG inventories. The authors used Stanford's Integrated Valuation of Ecosystem Services and Tradeoffs (InVEST) Carbon Storage and Sequestration model,[202] applied to the University of Connecticut's land cover change data (discussed below) for which carbon pool valuations had been assigned. The study was thus able to account for "foregone carbon sequestration" lost due to decreases in forested land cover over the 25-year period of the land cover dataset. Continuation of this work can inform state and local policy by accounting for $CO_2$ emissions from LUCF impacts while highlighting the potential for carbon sequestration to meet state statutory GHG emission goals.

The data that provided the basis for the Tomasso and Leighton (2014) study is from the University of Connecticut's Center for Land Use Education and Research (CLEAR). CLEAR has a long-running project, Connecticut's Changing Landscape (CCL), that uses remote sensing technology to chart changes in the state's major land cover categories over time. CLEAR developed the CCL project specifically to enable the public to compare multi-temporal land cover data sets, based on 30-meter pixel Landsat imagery.

The data in the CCL viewer dates back to 1985, the first year for which imagery of this resolution was available. CLEAR used cross-correlation analysis, which employs statistical analysis to identify pixels indicating a potential change between images, to produce a consistent land cover dataset for land cover change over time (Hurd et al., 2003[203]). Potentially changed pixels were identified and then merged with the 1985 classification to create the 1990 classification. This process was done for the 1995, 2002, 2006, 2010, and 2015 classifications, resulting in a 30-year record of land cover change for the state with 12 land cover categories. Land cover change data is compiled for the entire state, by town, by watershed, and shown in geographically-specific maps.

Previous work to construct a baseline in forest carbon storage has not yet resulted in a reproducible methodology for annual reporting. It should be a top priority to develop a usable model for reliably charting carbon sinks related to working and natural lands, and/or to utilize models developed by state, academic, and nonprofit partners involved with the U.S. Climate Alliance.

## Review & Rank of 2011 Climate Preparedness Report Recommendations

One of the important charges to the Forests Sub-Group was to review the recommendations made in the 2011 Connecticut Climate Change Preparedness Plan: Adaptation Strategies for Agriculture, Infrastructure, Natural Resources and Public Health Climate Change Vulnerabilities. This important report included recommendations on 15 Best Management Practices, 30 Research, Monitoring, and Education priorities, and 22 Policy, Legislation, Regulation, and Funding priorities. The members of the Forests Sub-Group utilized a survey and voted to determine the highest priority actions for Forests. The top priorities in each category follow:

### Top Priority Actions: Best Management Practices

### Top Priority Actions: Research, Monitoring, and Education

- Identify and conserve ecosystem services vulnerable to climate change.
- Encourage land management behaviors that support ecosystem services.
- Encourage adaptation strategies, including natural habitat conservation, Low Impact Development (LID) Best Management Practices (BMPs), agriculture water BMPs and drinking water treatment standards that will ameliorate the effects of water inundation.
- Apply adaptive management procedures.
- Increase active management of upland forests and reduce non-climatic stressors.
- Consider the public health needs of vulnerable populations in climate change adaptation planning.
- Engage and educate private landowners to manage their lands to minimize risk from climate change.
- Build public consensus for adaptation strategies through education and outreach.
- Develop educational campaigns for climate change adaptation awareness in Connecticut targeted at multiple sectors.
- Advance regional research and modeling to guide conservation efforts.
- Assess future flooding risks to natural and built infrastructure, including agricultural operations and public health and safety.
- Develop Connecticut- specific climate change projections for temperature, precipitation and sea level rise and support monitoring efforts for these climate drivers.
- Include students (future stakeholders) in climate change programs.
- Partner with educational institutions or organizations that conduct research.

### Policy, Legislation, Regulation, and Funding: Top-Ranked Priorities

- Acquire land and conservation easements in riparian areas adjacent to coldwater streams.
- Target headwaters for protection throughout the state.
- Reevaluate Connecticut's Green Plan and open space grant programs to prioritize acquisition of land and conservation easements for habitats most at risk from climate change.
- Collaborate among state agencies, municipalities and non-profits within Connecticut to implement regulations and policies that promote and facilitate the conservation of habitats and species most at risk from climate change.
- Continue to support regional cooperation on climate change adaptation through involvement in regional planning activities.
- Proceeds from RGGI auctions should support climate change adaptation work identified in this report and in accordance with Section 22a-200c(c).
- Implement new or modified policies that would encourage appropriate land use and reduce repetitive losses.
- Acquire land and conservation easements to provide upslope advancement zones adjacent to tidal marshes.

## Synergies with CT Forest Action Plan and Other GC3 Working Groups

The Forests Sub-Group did not develop this report in a vacuum, and tried to stay connected to the efforts of other Working Groups, Sub-Groups, and Subcommittees of the Governor's Council on Climate Change. In addition, we were mindful of the development of the 2020 Forest Action Plan for Connecticut by the Department of Energy and Environmental Protection, and hosted a presentation on this topic. Following are some of the notable synergies with these other efforts.

### 2020 Connecticut Forest Action Plan

Every 10 years, each State and US Territory is required to develop and submit to the USDA Forest Service a statewide comprehensive Forest Action Plan that covers all lands within its jurisdiction; Federal, State, private, municipal, and non-profit. The Plan requires considerable stakeholder input and public outreach ensuring identified strategies are the "State's" priorities but based upon three overarching national priorities 1) Conserving and managing working forest landscapes for multiple values and uses, 2) Protecting forests from threats, 3) Enhancing public benefits from trees and forests. State-based strategies are built upon an in-depth assessment of current forest and tree conditions.

As required in the 2008 Farm Bill, Connecticut developed and submitted its first Forest Action Plan in 2010. This plan was slightly revised in 2015 and by December 31, 2020 a new Forest Action Plan will be submitted to USDA Forest Service. Having a Forest Action Plan allows Connecticut to receive substantial annual federal financial assistance to address the threats and issues we as a State have identified.

### Other GC3 Working Groups and Sub-Groups

As the Forests Sub-Group was holding public meetings and preparing this report, other GC3 Working Groups and Sub-Groups were developing recommendations that at times touched on forests. The following groups deserve special recognition for their partnership and coordination:

- Agriculture/Soils, Rivers, and Wetlands Sub-Groups;
- Equity and Environmental Justice Working Group;
- Science & Technology Working Group; and
- Progress on Mitigation Strategies Working Group.

This report is being shared with those Working Groups and others to solicit additional input and suggestions before presenting an updated report to the full GC3 Council.

## Glossary of Terms & Endnotes

Early in the informational gather phase for the Forests Sub-Group it became apparent the need to define common terms to help working group members understand context of dialog and presentations. On February 27, 2020 GC3 Natural and Working Lands Work Group Forests Subgroup agreed upon the following definitions for the terms provided. While there are many ways to define these terms for the purpose of the Forests Subgroup effort the following definitions were agreed upon to achieve common understandings of ecological terms that relate to climate adaption and mitigation of forests. We are grateful to Mark Ashton, Robert Fahey, and Edward Faison and the following source materials UMASS/UVM (Forest-CarbonBooklet UMass UVM 2020.pdf.), Society of American Foresters, USDA FS R & D.

**Adaptation:** How forests react over time to all impacts including climate, fragmentation, insect disease, and pollution.

**Carbon sequestration:** The process of removing carbon from the atmosphere for use in photosynthesis, resulting in the maintenance and growth of plants and trees. The rate (or amount and speed) at which a forest sequesters carbon changes over time. In the northeastern United States, carbon sequestration [rates] typically peak when forests are young to intermediate in age (around 30–70 years old), but they continue to sequester carbon through their entire life span.

**Carbon storage:** The amount of carbon that is retained in a carbon pool within the forest. Storage levels increase with forest age and typically peak in the northeastern United States when forests are old (>200 years old). Forest-Carbon-Booklet UMass UVM 2020.pdf.

**Competitive hierarchy:** Longer lived species are site restrictive and will dominate specific sites reducing structural diversity and complexity.

**Diversity Theory (a.k.a. "negative density dependence hypothesis"):** Forests have evolved complexity over time including the adaptation and resistance to native insects and disease.

**Forest Health:** A tricky term because it is often used in the "eye of the beholder" and can refer to several different aspects of a forest. Most common use refers to an absence of invasive insects, disease, and related problems for tree survival.

**Intermediate disturbance hypothesis:** Relates to forest succession. How forests adapt and interact to site disturbance and climate. Guided by length in between disturbances and severity of disturbance. Forest diversity simplifies over time to late successional species.

**Mitigation (of forest carbon):** Action taken to alleviate potential adverse effects of climate change by increasing carbon sequestration in forest ecosystems.

**Redundancy:** A form of resilience. Multiple species comprising the same functional role.

**Resilience:** Rate of recovery from a disturbance. The ability of forest to absorb impacts over time. The capacity of an ecosystem to return to its previous pre-disturbance condition.

**Resistance:** Affiliated with resilience. The capacity to absorb disturbance and remain unchanged.

[1] https://portal.ct.gov/-/media/DEEP/climatechange/publications/BuildingaLowCarbonFutureforCTGC3Recommendationspdf.pdf
[2] https://portal.ct.gov/DEEP/Climate-Change/CT-Greenhouse-Gas-Inventory-Reports
[3] The U.S. Climate Alliance Commits to Maintain Lands as a Net Carbon Sink and Develop Pathways to Act by 2020. United States Climate Alliance. August 23, 2018.
[4] U.S. Climate Alliance Natural & Working Lands Challenge: http://www.usclimatealliance.org/nwlchallenge
[5] Valatin, Gregory. 2012. Additionality and climate change mitigation by the UK forest sector. Forestry: An International Journal of Forest Research. Volume 85, Issue 4, 445-462. https://doi.org/10.1093/forestry/cps056
[6] Virgilio, N. and S. Marshall. 2009. Forest Carbon Strategies in Climate Change Mitigation: Confronting Challenges Through On the-Ground Experience, The Nature Conservancy. Arlington, Virginia.
[7] Foster, D et al. 2017 as described in Southern New England Forest Management in an Era of Climate Change: A Position of the Yankee Division of the Society of American Foresters (2020), found at https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-2020-agendas-andminutes/GC3_Forests_Yankee_SAF_Position_061820.pdf
[8] As defined by the USDA Forest Service's Forest Inventory and Analysis National Program (FIA) available at https://www.fia.fs.fed.us/
[9] Hochholzer, H. (2015, Revised). Connecticut's Forest Action Plan 2010. 46. Retrieved from https://portal.ct.gov/-/media/DEEP/forestry/assessment_and_strategy/FAP2015pdf.pdf
[10] Arnold, C; Wilson, E; Hurd, J; and Civco, D. (2020) 30 Years of Land Cover Change in Connecticut, USA: A Case Study of Long-Term Research, Dissemination of Results, and Their Use in Land Use Planning and Natural Resource Conservation. Land, P. 12. https://www.mdpi.com/2073-445X/9/8/255?type=check_update&version=2
[11] Chart by 2006 D. Smith (former Connecticut State Forester). Updated to current with data from Forest Inventory and Analysis National Program
[12] Connecticut's Changing Landscape study on forest fragmentation since 1985 by UConn Center for Land Use Education and Research from http://clear.uconn.edu/projects/landscape/v2/index.htm
[13] Ibid. Arnold, C; Wilson, E; Hurd, J; and Civco, D. (2020). P. 16.
[14] USDA Forest Service. 2019. Forests of Connecticut, 2018. Resource Update FS-209. Madison, WI: U.S. Department of Agriculture, Forest Service. 2p. https://doi.org/10.2737/FS-RU-209
[15] Tyrrell, M. report by Yale University's Global Institute of Sustainable Forestry. 2015. Understanding Connecticut Woodland Owners: A Report on the Attitudes, Values and Challenges of Connecticut's Family Woodland Owners.
[16] https://portal.ct.gov/DEEP/Forestry/Management-on-State-Lands/Forest-Management-on-State-Lands
[17] Based on analysis of a 168,960-acre forest stands database by DEEP.
[18] Estimate of average annual active forest management provided by DEEP's State Forester, Christopher Martin.
[19] An assessment of the DEEP property layer was conducted in June 2020 by DEEP Forestry staff, and the Summary of Passive DEEP Land by Category has been produced summarizing the results. In presenting the assessment they noted this analysis is somewhat incomplete since not all DEEP land records have been added to the GIS property layer to date, but efforts are underway by DEEP Land Acquisition and Management staff to capture all holdings.
[20] Jenkins, M. & Schaap, B. (April 2018). Forest Ecosystem Services: Background study prepared for the thirteenth session of the United Nations Forum on Forests. Retrieved June 11, 2020 from https://www.un.org/esa/forests/wp-content/uploads/2018/05/UNFF13_BkgdStudy_ForestsEcoServices.pdf
[21] Hochholzer, H. (2015, Revised). Connecticut's Forest Action Plan 2010. 8. Retrieved from https://portal.ct.gov/-/media/DEEP/forestry/assessment_and_strategy/FAP2015pdf.pdf
[22] U.S. Climate Alliance. NWL Challenge. Retrieved from http://www.usclimatealliance.org/nwlchallenge-faqs
[23] Griscom, B., et al. (2017) Natural Climate Solutions. *Proceedings of the National Academy of Sciences of the United States of America.* https://doi.org/10.1073/pnas.1710465114
[24] McDonald, R., Kroeger, T., Boucher, T., Longzhu, W. & Salem, R. (2016). Planting Healthy Air: A global analysis of the role of urban trees in addressing particulate matter pollution and extreme heat. The Nature Conservancy. Retrieved June 10, 2020 from file:///C:/Users/lhayden/Downloads/20160825_PHA_Report_Final.pdf

[25] Maher, B., Ahmed, I., Davison, B., Karloukovski, V. & Clarke, R. (2013). Impact of Roadside Tree Lines on Indoor Concentrations of Traffic-Derived Particulate Matter. *Environmental Science & Technology. 47* (23), 13737-13744. https://pubs.acs.org/doi/10.1021/es404363m
[26] Yang, J., Y. Chang, and P. Yan. (2015). Ranking the suitability of common urban tree species for controlling PM2.5 pollution. *Atmospheric Pollution Research. 6*(2): 267-277.
[27] Connecticut Department of Public Health. What is a Public Water System? Retrieved June 10, 2020 from https://portal.ct.gov/DPH/Drinking-Water/DWS/Public-Drinking-Water-FAQs
[28] Hochholzer, H. (2015, Revised). Connecticut's Forest Action Plan 2010. 8. Retrieved from https://portal.ct.gov/-/media/DEEP/forestry/assessment_and_strategy/FAP2015pdf.pdf
[29] National Association of Home Builders. Estimate of lumber from http://imi.us.tripod.com/imi/lumber_cost.html
[30] Hunter, M. L., Jr. 1990. Wildlife, forests, and forestry: principles of managing forests for biological diversity. Prentice Hall, Englewood Cliffs, New Jersey, USA.
[31] North East State Foresters Association. (2015) The Economic Importance of Connecticut's Forest Based Economy: https://www.nefainfo.org/uploads/2/7/4/5/27453461/connecticuts_forest_based_economy_4.2.15.pdf
[32] New England Forestry Foundation. New England Forests: The Path to Sustainability. Retrieved June 8, 2020 from https://newenglandforestry.org/wp-content/uploads/2016/04/12._Grow_As_Much_As_We_Use_0613141.pdf
[33] USDA Forest Service. Ethnobotany. Retrieved June 8, 2020: https://www.fs.fed.us/wildflowers/ethnobotany/
[34] Yu, C. P., Lin, C. M., Tsai, M. J., Tsai, Y. C., & Chen, C. Y. (2017). Effects of Short Forest Bathing Program on Autonomic Nervous System Activity and Mood States in Middle-Aged and Elderly Individuals. *International journal of environmental research and public health*, *14*(8), 897. https://doi.org/10.3390/ijerph14080897
[35] Forests Make Us Healthier Toolkit: https://standupforforests.org/amplify-forests-make-us-healthier/
[36] McDonald, R., Kroeger, T., Boucher, T., Longzhu, W. & Salem, R. (2016). Planting Healthy Air: A global analysis of the role of urban trees in addressing particulate matter pollution and extreme heat. The Nature Conservancy. Retrieved June 10, 2020 from file:///C:/Users/lhayden/Downloads/20160825_PHA_Report_Final.pdf
[37] Link to text of MD Forest Preservation Act: http://mgaleg.maryland.gov/2013RS/bills/hb/hb0706T.pdf
[38] Description of the MD Forest Preservation Act of 2013 on the website of the National Association of State Foresters: https://www.stateforesters.org/2013/04/08/maryland-passes-landmark-forestry-legislation/
[39] The text for this session is modeled after recommendations set forth in the "Report on Policies to Achieve No Net Loss of Forests in Maryland" (2011) https://dnr.maryland.gov/forests/Documents/nonetlossfinalreport.pdf
[40] Visit https://www.tpl.org/parkscore to get the data, explore maps of Connecticut communities, and learn how well Connecticut cities are meeting the need for parks.
41 Cain, M.L., Bowman, W.D. and Hacker, S.D., 2014. Ecology, Sinaur Associates, Incorporated, Sunderland, MA. ISBN-13: 978-0878939084.
42 Peterson, G., Allen, C.R. and Holling, C.S., 1998. Ecological resilience, biodiversity, and scale. Ecosystems, 1(1), pp.6-18.
43 Foster, D.R., 1988. Species and stand response to catastrophic wind in central New England, USA. The Journal of Ecology, pp.135-151.
44 Boose, Emery R., Kristen E. Chamberlin, and David R. Foster. "Landscape and Regional Impacts of Hurricanes in New England." Ecological Monographs 71, no. 1 (2001): 27-48.
45 Jactel, H., Brockerhoff, E. and Duelli, P., 2005. A test of the biodiversity-stability theory: meta-analysis of tree species diversity effects on insect pest infestations, and re-examination of responsible factors. In Forest diversity and function (pp. 235-262). Springer, Berlin, Heidelberg.
46 Wright, J.S., 2002. Plant diversity in tropical forests: a review of mechanisms of species coexistence. Oecologia, 130(1), pp.1-14.
47 Canham, C.D., Papaik, M.J., Uriarte, M., McWilliams, W.H., Jenkins, J.C. and Twery, M.J., 2006. Neighborhood analyses of canopy tree competition along environmental gradients in New England forests. Ecological applications, 16(2), pp.540-554.
48 Liptzin, D. and Ashton, P.M.S., 1999. Early-successional dynamics of single-aged mixed hardwood stands in a southern New England forest, USA. Forest ecology and management, 116(1-3), pp.141-150.
49 Kelty, M.J., 1986. Development patterns in two hemlock–hardwood stands in southern New England. Canadian Journal of Forest Research, 16(5), pp.885-891.

Ellum, D.S., Ashton, M.S. and Siccama, T.G., 2010. Spatial pattern in herb diversity and abundance of second growth mixed deciduous-evergreen forest of southern New England, USA. Forest Ecology and Management, 259(8), pp.1416-1426.
51 Panchen, Z.A., Primack, R.B., Nordt, B., Ellwood, E.R., Stevens, A.D., Renner, S.S., Willis, C.G., Fahey, R., Whittemore, A., Du, Y. and Davis, C.C., 2014. Leaf out times of temperate woody plants are related to phylogeny, deciduousness, growth habit and wood anatomy. New Phytologist, 203(4), pp.1208-1219.
52 Lorimer, C.G. and White, A.S., 2003. Scale and frequency of natural disturbances in the northeastern US: implications for early successional forest habitats and regional age distributions. Forest Ecology and Management, 185(1-2), pp.41-64.
53 Burns, R.M., 1990. Silvics of North America: Conifers/Hardwoods (No. 654). US Department of Agriculture, Forest Service. Vols. 1-2.
54 Johnson, D.J., Beaulieu, W.T., Bever, J.D. and Clay, K., 2012. Conspecific negative density dependence and forest diversity. Science, 336(6083), pp.904-907.
55 LaManna, J.A., Mangan, S.A., Alonso, A., Bourg, N.A., Brockelman, W.Y., Bunyavejchewin, S., Chang, L.W., Chiang, J.M., Chuyong, G.B., Clay, K. and Condit, R., 2017. Plant diversity increases with the strength of negative density dependence at the global scale. Science, 356(6345), pp.1389-1392.
56 Cain, M.L., Bowman, W.D. and Hacker, S.D., 2014. Ecology, Sinaur Associates, Incorporated, Sunderland, MA. ISBN-13: 978-0878939084.
57 Ellison, A.M., Bank, M.S., Clinton, B.D., Colburn, E.A., Elliott, K., Ford, C.R., Foster, D.R., Kloeppel, B.D., Knoepp, J.D., Lovett, G.M. and Mohan, J., 2005. Loss of foundation species: consequences for the structure and dynamics of forested ecosystems. Frontiers in Ecology and the Environment, 3(9), pp.479-486.
58 Orwig, D.A., Plotkin, A.A.B., Davidson, E.A., Lux, H., Savage, K.E. and Ellison, A.M., 2013. Foundation species loss affects vegetation structure more than ecosystem function in a northeastern USA forest. PeerJ, 1, p.e41.
59 Case, B.S., Buckley, H.L., Barker-Plotkin, A.A., Orwig, D.A. and Ellison, A.M., 2017. When a foundation crumbles: forecasting forest dynamics following the decline of the foundation species Tsuga canadensis. Ecosphere, 8(7), p.e01893.
60 Bell, M., 1985. The Face of Connecticut: People. Geology and the Land.
61 Foster, D.R., Motzkin, G. and Slater, B., 1998. Land-use history as long-term broad-scale disturbance: regional forest dynamics in central New England. Ecosystems, 1(1), pp.96-119.
62 Hochholzer, H. (2015, Revised). Connecticut's Forest Action Plan 2010. 8. Retrieved from https://portal.ct.gov/-/media/DEEP/forestry/assessment_and_strategy/FAP2015pdf.pdf
63 Messier, C., Puettmann, K.J. and Coates, K.D. eds., 2013. Managing forests as complex adaptive systems: building resilience to the challenge of global change. Routledge.
64 Stuart-Haëntjens, E.J., Curtis, P.S., Fahey, R.T., Vogel, C.S. and Gough, C.M., 2015. Net primary production of a temperate deciduous forest exhibits a threshold response to increasing disturbance severity. Ecology, 96(9), pp.2478-2487.
65 Fahey, R.T., Fotis, A.T. and Woods, K.D., 2015. Quantifying canopy complexity and effects on productivity and resilience in late-successional hemlock-hardwood forests. Ecological applications: 25(3), p.834.
66 Ollinger, S.V., Aber, J.D. and Reich, P.B., 1997. Simulating ozone effects on forest productivity: Interactions among leaf-, canopy-, and stand-level processes. Ecological Applications, 7(4), pp.1237-1251
67 Gandhi, K.J. and Herms, D.A., 2010. Direct and indirect effects of alien insect herbivores on ecological processes and interactions in forests of eastern North America. Biological Invasions, 12(2), pp.389-405.
68 Harper, K.A., Macdonald, S.E., Burton, P.J., Chen, J., Brosofske, K.D., Saunders, S.C., Euskirchen, E.S., Roberts, D.A.R., Jaiteh, M.S. and Esseen, P.A., 2005. Edge influence on forest structure and composition in fragmented landscapes. Conservation biology, 19(3), pp.768-782.
69 Didham, R.K., Ghazoul, J., Stork, N.E. and Davis, A.J., 1996. Insects in fragmented forests: a functional approach. Trends in ecology & evolution, 11(6), pp.255-260
70 Seidl, R., SCHELHAAS, M.J. and Lexer, M.J., 2011. Unraveling the drivers of intensifying forest disturbance regimes in Europe. Global Change Biology, 17(9), pp.2842-2852.

71 Seidl, R., Thom, D., Kautz, M., Martin-Benito, D., Peltoniemi, M., Vacchiano, G., Wild, J., Ascoli, D., Petr, M., Honkaniemi, J. and Lexer, M.J., 2017. Forest disturbances under climate change. Nature climate change, 7(6), pp.395-402.
72 Seidl, R. and Rammer, W., 2017. Climate change amplifies the interactions between wind and bark beetle disturbances in forest landscapes. Landscape Ecology, 32(7), pp.1485-1498.
73 Ma, Z., Peng, C., Zhu, Q., Chen, H., Yu, G., Li, W., Zhou, X., Wang, W. and Zhang, W., 2012. Regional droughtinduced reduction in the biomass carbon sink of Canada's boreal forests. Proceedings of the National Academy of
Sciences, 109(7), pp.2423-2427.
74 Hubau, W., Lewis, S.L., Phillips, O.L., Affum-Baffoe, K., Beeckman, H., Cuní-Sanchez, A., Daniels, A.K., Ewango, C.E., Fauset, S., Mukinzi, J.M. and Sheil, D., 2020. Asynchronous carbon sink saturation in African and Amazonian tropical forests. Nature, 579(7797), pp.80-87.
75 The Nature Conservancy: Staying Connected Initiative (SCI): http://stayingconnectedinitiative.org/
76 Housatonic Valley Association: Follow the Forest: http://followtheforest.org
77 http://maps.tnc.org/resilientland/
78 https://www.adaptivesilviculture.org/
79 https://forestadaptation.org/
80 Messier, C., Puettmann, K. J., & Coates, K. D. (Eds.). (2013). Managing forests as complex adaptive systems: building resilience to the challenge of global change. Routledge.
81 Keeton, W. S. (2006). Managing for late-successional/old-growth characteristics in northern hardwoodconifer forests. Forest Ecology and Management, 235(1-3), 129-142.
82 Mylecraine, K. A., & Zimmerman, G. L. (2000). Atlantic white-cedar: Ecology and best management practices manual. Department of Environmental Protection, Division of Parks and Forestry, New Jersey Forest Service.
83 Conway, T. M., & Yip, V. (2016). Assessing residents' reactions to urban forest disservices: A case study of a major storm event. Landscape and Urban Planning, 153, 1-10.
84 Fargione, J. E., Bassett, S., Boucher, T., Bridgham, S. D., Conant, R. T., Cook-Patton, S. C., ... & Gu, H. (2018). Natural climate solutions for the United States. *Science advances*, *4*(11), eaat1869.
85 Fargione, J. E., Bassett, S., Boucher, T., Bridgham, S. D., Conant, R. T., Cook-Patton, S. C., ... & Gu, H. (2018). Natural climate solutions for the United States. *Science advances*, *4*(11), eaat1869.
86 Fargione, J. E., Bassett, S., Boucher, T., Bridgham, S. D., Conant, R. T., Cook-Patton, S. C., ... & Gu, H. (2018). Natural climate solutions for the United States. *Science advances*, *4*(11), eaat1869
87 Moomaw, W. R., Masino, S. A., & Faison, E. K. (2019). Intact Forests in the United States: Proforestation Mitigates Climate Change and Serves the Greatest Good. *Frontiers in Forests and Global Change*, *2*, 27.
88 Nunery, J. S., & Keeton, W. S. (2010). Forest carbon storage in the northeastern United States: net effects of harvesting frequency, post-harvest retention, and wood products. Forest Ecology and management, 259(8), 1363-1375.
89 Catanzaro, P., & D'Amato, A. (2019). Forest carbon: An essential natural solution for climate change. University of Massachusetts.
90 The 9 Northeastern states include the six New England states, New York, New Jersey, and Pennsylvania. USDA Forest Service, Forest Inventory and Analysis Program, Fri Jun 12 00:38:20 GMT 2020. Forest Inventory EVALIDator web-application Version 1.8.0.01. St. Paul, MN: U.S. Department of Agriculture, Forest Service, Northern Research Station. [Available only on internet: http://apps.fs.usda.gov/Evalidator/evalidator.jsp]
91 Mackey, B., Prentice, I. C., Steffen, W., House, J. I., Lindenmayer, D., Keith, H., & Berry, S. (2013). Untangling the confusion around land carbon science and climate change mitigation policy. *Nature Climate Change*, *3*(6), 552-557.
92 https://apps.fs.usda.gov/Evalidator/evalidator.jsp
93 https://apps.fs.usda.gov/Evalidator/evalidator.jsp
94 Oswalt, Sonja N.; Smith, W. Brad; Miles, Patrick D.; Pugh, Scott A., coords. 2019. Forest Resources of the United States, 2017: a technical document supporting the Forest Service 2020 RPA Assessment. Gen. Tech. Rep. WO-97. Washington, DC: U.S. Department of Agriculture, Forest Service, Washington Office. 223 p. https://doi.org/10.2737/WO-GTR-97.

[95] Curtis, P. S., & Gough, C. M. (2018). Forest aging, disturbance and the carbon cycle. New Phytologist, 219(4), 1188-1193.
[96] Harris, N. L., Hagen, S. C., Saatchi, S. S., Pearson, T. R. H., Woodall, C. W., Domke, G. M., ... & Fore, A. (2016). Attribution of net carbon change by disturbance type across forest lands of the conterminous United States. *Carbon balance and management*, *11*(1), 24.
[97] Gough, C. M., Atkins, J. W., Fahey, R. T., & Hardiman, B. S. (2019). High rates of primary production in structurally complex forests. *Ecology*, *100*(10), e02864. Curtis, P. S., & Gough, C. M. (2018). Forest aging, disturbance and the carbon cycle. *New Phytologist*, *219*(4), 1188-1193.
[98] Domke, G., Williams, C. A., Birdsey, R., Coulston, J., Finzi, A., Gough, C., ... & Kurz, W. A. (2018). Forests. *In Second State of the Carbon Cycle Report (SOCCR2): A Sustained Assessment Report.[Cavallaro, N.; Shrestha, G.; Birdsey, R.; Mayes, MA; Najjar, RG; Reed, SC; Romero-Lankao, P.; Zhu, Z., eds. Washington, DC, USA: US Global Change Research Program.*, 365-398.
[99] Tyrrell, Mary. Understanding Connecticut Woodland Owners: A Report on the Attitudes, Values and Challenges of Connecticut6s Family Woodland Owners. 2015.
[100] Catanzaro, P., & D'Amato, A. (2019). Forest carbon: An essential natural solution for climate change. *University of Massachusetts*.
[101] McGarvey, J. C., Thompson, J. R., Epstein, H. E., & Shugart Jr, H. H. (2015). Carbon storage in old-growth forests of the Mid-Atlantic: toward better understanding the eastern forest carbon sink. Ecology, 96(2), 311-317.
[102] Keeton, W. S., Whitman, A. A., McGee, G. C., & Goodale, C. L. (2011). Late-successional biomass development in northern hardwood-conifer forests of the northeastern United States. Forest Science, 57(6), 489-505.
[103] Adams, J. M., Faure, H. F. D. L., Faure-Denard, L., McGlade, J. M., & Woodward, F. I. (1990). Increases in terrestrial carbon storage from the Last Glacial Maximum to the present. *Nature*, *348*(6303), 711-714. McGarvey, J. C., Thompson, J. R., Epstein, H. E., & Shugart Jr, H. H. (2015). Carbon storage in old-growth forests of the Mid-Atlantic: toward better understanding the eastern forest carbon sink. *Ecology*, *96*(2), 311-317.
[104] Stuart-Haëntjens, E. J., Curtis, P. S., Fahey, R. T., Vogel, C. S., & Gough, C. M. (2015). Net primary production of a temperate deciduous forest exhibits a threshold response to increasing disturbance severity. Ecology, 96(9), 2478-2487.
[105] Oswalt, Sonja N.; Smith, W. Brad; Miles, Patrick D.; Pugh, Scott A., coords. 2019. Forest Resources of the United States, 2017: a technical document supporting the Forest Service 2020 RPA Assessment. Gen. Tech. Rep. WO-97. Washington, DC: U.S. Department of Agriculture, Forest Service, Washington Office. 223 p.
National Land Cover Database (NLCD) 2016.
[106] Defined using the University of Connecticut's Center Forest Land Use & Education (CLEAR) Forest Fragmentation Model 1 as an area of forest land cover at least 300 feet from a non-forest edge.
http://clear.uconn.edu/projects/landscape/CT/stats/change7dates.htm#top
[107] Oswalt, Sonja N.; Smith, W. Brad; Miles, Patrick D.; Pugh, Scott A., coords. 2019. Forest Resources of the United States, 2017: a technical document supporting the Forest Service 2020 RPA Assessment. Gen. Tech. Rep. WO-97. Washington, DC: U.S. Department of Agriculture, Forest Service, Washington Office. 223 p.
https://doi.org/10.2737/WO-GTR-97
[108] UConn/CLEAR Forest Fragmentation Analysis Project. Found at
http://clear.uconn.edu/projects/landscape/v2/forestfrag/index.htm
[109] Oswalt, Sonja N.; Smith, W. Brad; Miles, Patrick D.; Pugh, Scott A., coords. 2019. Forest Resources of the United States, 2017: a technical document supporting the Forest Service 2020 RPA Assessment. Gen. Tech. Rep. WO-97. Washington, DC: U.S. Department of Agriculture, Forest Service, Washington Office. 223 p.
https://doi.org/10.2737/WO-GTR-97.
[110] UConn/CLEAR Forest Fragmentation Analysis Project. Found at
http://clear.uconn.edu/projects/landscape/v2/forestfrag/index.htm
[111] Ibid.
[112] Reinmann, A. B., & Hutyra, L. R. (2017). Edge effects enhance carbon uptake and its vulnerability to climate change in temperate broadleaf forests. *Proceedings of the National Academy of Sciences*, *114*(1), 107-112.
Nowak, D.J., Crane, D.E., 2002. Carbon storage and sequestration by urban trees in the USA. Environmental Pollution 116 (3), 381e389

[113] https://www.itreetools.org/
[114] Nowak, D.J., 1994. Air pollution removal by Chicago's urban forest. In: McPherson, E.G., Nowak, D.J., Rowntree, R.A. (Eds.), Chicago's Urban Forest Ecosystem: Results of the Chicago Urban Forest Climate Project. USDA Forest Service General Technical Report NE- 186, Radnor, PA, pp. 63-81
[115] https://apps.fs.usda.gov/Evalidator/evalidator.jsp
[116] Canham, C. D. (2020). *Forests Adrift-Currents Shaping the Future of Northeastern Trees*. Yale University Press.
[117] Fargione, J. E., Bassett, S., Boucher, T., Bridgham, S. D., Conant, R. T., Cook-Patton, S. C., ... & Gu, H. (2018). Natural climate solutions for the United States. *Science advances*, *4*(11), eaat1869.
[118] Defined using the University of Connecticut's Center Forest Land Use & Education (CLEAR) Forest Fragmentation Model 1 as an area of forest land cover at least 300 feet from a non-forest edge.
[119] Medium core forests comprise 250-500 acres and Large core forests comprise >500 acres.
[120] Section 23-8 of the General Statutes
[121] Connecticut has 830,679 acres of core forest >250 acres [190,471 acres classified as medium size core forest of 250-499 acres, and 640,208 acres of large cores >500 acres]. Protected lands used in this analysis were calculated using POSM and Litchfield Hills Greenprint datasets. According to these data, 33.53% of these medium and large cores is permanently protected [42,324 acres or 22.22% of medium cores and 236,230 acres or 36.89% of large cores].
[122] Based on the National Land Cover Database (NLCD) 2016.
[123] USDA Forest Service, Forest Inventory and Analysis Program, Fri Jun 12 00:38:20 GMT 2020. Forest Inventory EVALIDator web-application Version 1.8.0.01. St. Paul, MN: U.S. Department of Agriculture, Forest Service, Northern Research Station. [Available only on internet: http://apps.fs.usda.gov/Evalidator/evalidator.jsp]
[124] Fargione, J. E., Bassett, S., Boucher, T., Bridgham, S. D., Conant, R. T., Cook-Patton, S. C., ... & Gu, H. (2018). Natural climate solutions for the United States. *Science advances*, *4*(11), eaat1869.
[125] Connecticut's Changing Landscape study on forest fragmentation since 1985 by UConn Center for Land Use Education and Research from http://clear.uconn.edu/projects/landscape/v2/index.htm
[126] Moomaw, W. R., Masino, S. A., & Faison, E. K. (2019). Intact Forests in the United States: Proforestation Mitigates Climate Change and Serves the Greatest Good. *Frontiers in Forests and Global Change*, *2*, 27.
[127] https://www.nrs.fs.fed.us/rna/
[128] https://en.wikipedia.org/wiki/Scientific_control
[129] Sohngen, B. (2020). Climate Change and Forests. Annual Review of Resource Economics. 12(17), 1–17. https://doi.org/10.1146/annurev-resource-110419-010208
[130] Natural Area Preserve statute Section 23-5a - i: https://www.cga.ct.gov/current/pub/chap_447.htm#sec_23-5a
[131] Example of Research Natural Area Management Plan from the Routt National Forest in Colorado: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5166048.pdf
[132] The Northeast Wilderness Trust offers a Wild Carbon option for landowners found at https://newildernesstrust.org/wilderness-conservation/climate-change/
[133] Reinmann, A. B., & Hutyra, L. R. (2017). Edge effects enhance carbon uptake and its vulnerability to climate change in temperate broadleaf forests. *Proceedings of the National Academy of Sciences*, *114*(1), 107-112. Nowak, D.J., Crane, D.E., 2002. Carbon storage and sequestration by urban trees in the USA. Environmental Pollution 116 (3), 381e389
[134] https://www.itreetools.org/
[135] Nowak, D.J., 1994. Air pollution removal by Chicago's urban forest. In: McPherson, E.G., Nowak, D.J., Rowntree, R.A. (Eds.), Chicago's Urban Forest Ecosystem: Results of the Chicago Urban Forest Climate Project. USDA Forest Service General Technical Report NE- 186, Radnor, PA, pp. 63-81
[136] Lutz, J. A., Furniss, T. J., Johnson, D. J., Davies, S. J., Allen, D., Alonso, A., ... & Blomdahl, E. M. (2018). Global importance of large-diameter trees. *Global Ecology and Biogeography*, *27*(7), 849-864.
[137] https://newenglandforestry.org/2019/02/11/what-is-exemplary-forestry/
[138] Krebs, J., Pontius, J., & Schaberg, P. G. (2017). Modeling the impacts of hemlock woolly adelgid infestation and presalvage harvesting on carbon stocks in northern hemlock forests. *Canadian Journal of Forest Research*, *47*(6), 727-734.

[139] Gutzat, F., & Dormann, C. F. (2018). Decaying trees improve nesting opportunities for cavity-nesting birds in temperate and boreal forests: A meta-analysis and implications for retention forestry. *Ecology and evolution*, *8*(16), 8616-8626.
[140] North East Association of State Foresters: Landscape stewardship guide (NA–IN–06–11). 2011. Found at https://www.fs.usda.gov/naspf/sites/default/files/publications/landscape_stewardship_guide_11_screen_1.pdf
[141] Donnelly, C. and Doria, G. The Use of Wood from Urban and Municipal Trees. CT DEEP Division of Forestry publication. June 2014. Found at https://portal.ct.gov/-/media/DEEP/forestry/urban_forestry/Biomassfinal62914pdf.pdf
[142] Waller, D. M., and N. J. Reo. 2018. First stewards: ecological outcomes of forest and wildlife stewardship by indigenous peoples of Wisconsin, USA. Ecology and Society 23(1):45. https://doi.org/10.5751/ES-09865-230145
[143] U.S. Global Change Research Program, Section 9.2
[144] U.S. Census Bureau Profile of Connecticut: https://data.census.gov/cedsci/profile?q=Connecticut&g=0400000US09
[145] Governing: A State-by-State Look at Growing Minority Populations. 2015. https://www.governing.com/topics/urban/gov-majority-minority-populations-in-states.html
[146] Graphic of urban heat island effect in Hartford on Climate Central website: https://www.climatecentral.org/news/urban-heat-islands-threaten-us-health-17919
[147] https://health2016.globalchange.gov/populations-concern
[148] Nowak, David & Dwyer, John. (2010). Understanding the Benefits and Costs of Urban Forest Ecosystems. 10.1007/978-1-4020-4289-8_2.
149 Nowak, D. and Heisler, G. Air Quality Effects of Urban Trees and Parks. National Recreation and Parks Association Research Series. 2010.
150 Wolf, K. L., & Robbins, A. S. (2015). Metro nature, environmental health, and economic value. Environmental health perspectives, 123(5), 390–398. https://doi.org/10.1289/ehp.1408216
[151] Berto R., Baroni M.R., Zainaghi A., Bettella S. An exploratory study of the effect of high and low fascination environments on attentional fatigue. J. Environ. Psychol. 2010;30:494–500. doi: 10.1016/j.jenvp.2009.12.002.
[152] Kaplan, S. The restorative benefits of nature: Toward an integrative framework. Journal of Environmental Psychology. Volume 15, Issue 3, September 1995, Pages 169-182.
[153] White, MP; Alcock, I; Wheeler, BW; et al. Coastal proximity, health and well-being: results from a longitudinal panel survey. Health Place Journal. 2015.
[154] Landsat-8 satellite imagery provided by Jarlath O'Neil-Dunne at the University of Vermont Spatial Analysis Laboratory as part of 2014 study on urban tree cover in New Haven.
[155] Mock, B. CityLab Article. "Why Detroit residents pushed back against tree planting." https://getpocket.com/explore/item/why-detroit-residents-pushed-back-against-tree-planting
[156] American Forests Magazine. Tree Equity Issue. Winter/Spring 2020. Found at https://www.ctwoodlands.org/sites/default/files//AmericanForests%20Magazine%20Tree%20Equity%20Issue%202.11.20.pdf
[157] American Journal of Preventative Medicine (2013); 44(2):139 –145.
[158] Study of urban tree cover in New Haven (2009): https://portal.ct.gov/-/media/DEEP/forestry/urban_forestry/UTCReportNewHavenpdf.pdf
[159] Study of urban tree cover in Hartford (2010): https://portal.ct.gov/-/media/DEEP/forestry/urban_forestry/TreeCanopyReportHartfordpdf.pdf
[160] Study of urban tree cover in Bridgeport (2012): https://portal.ct.gov/-/media/DEEP/forestry/urban_forestry/TreeCanopyReportBridgeportpdfpdf.pdf
[161] Study of urban tree cover in Greater Bridgeport region (2014): https://portal.ct.gov/-/media/DEEP/forestry/urban_forestry/GreaterBridgeportTreeCanopyReportpdf.pdf
[162] City of Hartford Urban Tree Canopy Assessment and Planting Plan (2014): https://www.americanforests.org/wp-content/uploads/2015/04/AF-Community-ReLeaf-%e2%80%94-HartfordUTC-Assessment.pdf

[163] City of Hartford Tree Canopy Action Plan (June 2020): https://hartfordgovmy.sharepoint.com/:b:/g/personal/yig001_hartford_gov/EWf4RrmpvSxHrB8f4LP8QU8BN8o8gHUfvI89QN4EJzi82g?e=kUV41m

[164] https://www.mass.gov/service-details/greening-the-gateway-cities-program

[165] Donnelly, C. and Doria, G. The Use of Wood from Urban and Municipal Trees. CT DEEP Division of Forestry publication. June 2014. Found at https://portal.ct.gov/-/media/DEEP/forestry/urban_forestry/Biomassfinal62914pdf.pdf

[166] Sherrill, S. and Bratkovich, S. (2018) Estimates of Carbon Dioxide withheld from the Atmosphere by Urban Hardwood Products. https://www.researchgate.net/publication/324687399_ESTIMATES_OF_CARBON_DIOXIDE_WITHHELD_FROM_THE_ATMOSPHERE_BY_URBAN_HARDWOOD_PRODUCTS

[167] USDA Forest Service. Wood Education Resource Center/Urban Wood Utilization resources: https://www.fs.usda.gov/naspf/programs/wood-education-and-resource-center/urban-wood-utilization

[168] Oliver, C., Nassar, N., Lippke, B., & McCarter J. (2014). Carbon, Fossil Fuel, and Biodiversity Mitigation with Wood and Forests. *Journal of Sustainable Forestry. 33*(3), 248-275.

[169] Forest Management & Greenhouse Gas Mitigation Opportunities. Information Sheet #7. Peter Woodbury & Jenifer Wightman (2017).

[170] McDowell, N.G., Allen, C.D., Anderson-Teixeira, K., Aukema, B.H., Bond-Lamberty, B., Chini, L., Clark, J.S., … Xu, C. (2020.) Pervasive shifts in forest dynamics in a changing world. Science. 368 (6494). DOI: 10.1126/science.aaz9463

[171] Brodribb, T.J., Powers, J., Cochard, H. and Choat, B. (2020) Hanging by a thread? Forests and drought. Science. 68, 261–266.

[172] Anderegg, W.R.L., Trugman, A.T., Badgley, G., Anderson, C.M., Bartuska, A., Ciais, P., Cullenward, D., … Randerson,J.T. (2020) Climate-driven risks to the climate mitigation potential of forests. Science 368, 1327.

[173] Janowiak, Maria K. et al. 2018. *New England and northern New York forest ecosystem vulnerability assessment and synthesis*: a report from the New England Climate Change Response Framework project. Gen. Tech. Rep. NRS-173. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 234 p. https://doi.org/10.2737/NRS-GTR-173

[174] Swanston, C., Brandt, L.A., Janowiak, M.K. *et al.* Vulnerability of forests of the Midwest and Northeast United States to climate change. *Climatic Change* **146,** 103–116 (2018). https://doi.org/10.1007/s10584-017-2065-2

[175] Ibid.

[176] Joyce, Dennis G., and Gerald E. Rehfeldt, Management strategies for black spruce (*Picea mariana* (Mill.) B.S.P.) in the face of climate change: climatic niche, clines, climatypes, and seed transfer, *Forestry: An International Journal of Forest Research*, Volume 90, Issue 4, October 2017, Pages 594–610, https://doi.org/10.1093/forestry/cpx018

[177] Janowiak, Maria K. et al. 2018. *New England and northern New York forest ecosystem vulnerability assessment and synthesis*: a report from the New England Climate Change Response Framework project. Gen. Tech. Rep. NRS-173. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 234 p. https://doi.org/10.2737/NRS-GTR-173

[178] Manomet Center for Conservation Science (Manomet) and Massachusetts Division of Fisheries and Wildlife (MA DFW). 2010. Climate change and Massachusetts fish and wildlife: Volume 2 habitat and species vulnerability. Massachusetts Division of Fisheries and Wildlife, Westborough, MA. https://climateactiontool.org/

[179] Ibid.

[180] Ibid, Janowiak, Maria K. et al. 2018.

[181] Adaptation Subcommittee to the Governor's Steering Committee on Climate Change (ASGSCCC). 2010. The impacts of climate change on Connecticut agriculture, infrastructure, natural resources and public health. Available at: http://www.ct.gov/deep/lib/deep/climatechange/impactsofclimatechange.pdf

[182] Climate Change Atlas https://www.fs.fed.us/nrs/atlas/tree/43 U.S. Department of Agriculture, Forest Service.

[183] Moore Myers, Jennifer, Coastal Forests Face Rising Sea Levels, Increased Salinity, SRS Science Communications, November 7, 2019: U.S. Department of Agriculture, Forest Service. https://www.srs.fs.usda.gov/compass/2019/11/07/coastal-forests-face-rising-sea-levels-increased-salinity/

[184] Wildlands and Woodlands, "Public Conservation Funding in New England: Recent Trends in Government Spending on Land Conservation."
https://www.wildlandsandwoodlands.org/sites/default/files/Public%20Funding%20LR.pdf
[185] From powerpoint presentation by Chris Hoagland, Climate Change Program Manager, Maryland Department of the Environment on May 18, 2020.
[186] U.S. Climate Alliance Natural and Working Lands Learning Lab, July 9-11, 2018
[187] https://www.rggi.org/allowance-tracking/offsets/offset-categories/forestry-afforestation
[188] U.S. Climate Alliance Natural and Working Lands Learning Lab, July 9-11, 2018
[189] https://www.landtrustalliance.org/topics/taxes/income-tax-incentives-land-conservation
[190] U.S. Climate Alliance Natural and Working Lands Learning Lab, July 9-11, 2018
[191] Highstead, "New England Conservation Pathways Report", pp 73-80
https://www.wildlandsandwoodlands.org/sites/default/files/Highstead_Pathways_Report.pdf
[192] Id., pp. 52-58
[193] U.S. Climate Alliance Natural and Working Lands Learning Lab, July 9-11, 2018
[194] Land Trust Alliance, Studies by Peter Szabo, Bloomington Management Advisors
[195] https://www.cityforestcredits.org/
[196] https://www.epa.gov/statelocalenergy/state-inventory-and-projection-tool
[197] Butler, B. (2018). Forests of Connecticut, 2017. Resource Update FS-159. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 3 p. https://doi.org/10.2737/FS-RU-159.
[198] Tomasso, L., and M. Leighton (2014). The impact of land use change for greenhouse gas inventories and statelevel climate mediation policy: A GIS methodology applied to Connecticut. Journal of Environmental Protection, 5:
1572-1587. http://dx.doi.org/10.4236/jep.2014.517149
[199] Brown, M., Canham, C., Murphy, L., and T. Donovan (2018). Timber harvest as the predominant disturbance regime in northeastern U.S. forests: effects of harvest intensification. Ecosphere 9, e02062.
[200] Duveneck, M., and J. Thompson (2019). Social and biophysical determinants of future forest conditions in New England: Effects of a modern land-use regime. Global Environmental Change, 55: 115-129.
https://doi.org/10.1016/j.gloenvcha.2019.01.009
[201] Tomasso, L., and M. Leighton (2014). The impact of land use change for greenhouse gas inventories and statelevel climate mediation policy: A GIS methodology applied to Connecticut. Journal of Environmental Protection, 5:
1572-1587. http://dx.doi.org/10.4236/jep.2014.517149
[202] Sharp, R., H. Tallis, T. Ricketts, A. Guerry, S. Wood, R. Chaplin-Krame, E. Nelson, D. Ennaanay, S. Wolny, N. Olwero, K. Vigerstol, D. Pennington, G. Mendoza, J. Aukema, J. Foster, J.Forrest, D. Cameron, K. Arkema, E. Lonsdorf, C. Kennedy, G. Verutes, C. Kim, G. Guannel, M. Papenfus, J. Toft, M. Marsik, J. Bernhardt, R. Griffin, K. Glowinski, N. Chaumont, A. Perelman, M. Lacayo, L. Mandle, P. Hamel, A. Vogl, L. Rogers, W. Bierbower, D. Denu, and J. Douglass (2018). InVEST 3.6.0 User's Guide. The Natural Capital Project, Stanford University, University of Minnesota, The Nature Conservancy, and World Wildlife Fund.
[203] Hurd, J., E. Wilson, D. Civco, S. Prisloe, and C. Arnold (2003). Temporal Characterization of Connecticut's Landscape: Methods, Results and Applications. In Proc 2003 ASPRS Annual Convention, Anchorage, AK 12 p.

**Page 25: [1] Deleted** **Michael Ferrucci** **10/21/20 8:23:00 AM**

**Page 25: [2] Commented [OJ28]** **Orefice, Joseph** **10/19/20 10:31:00 PM**

Again, not supported by the citation provided. This suggests that tree mortality from invasives is increasing the standing biomass over the last 10 years? If that is true, than cutting trees should also increase the standing biomass over a 10 year period. Which could be true in some instances where the best trees are favored and the worst growing are removed – however that typically occurs with management. Whereas with EAB and gypsy moth it is often the most dominate trees that succumb and the suppressed trees left- likely leading to less biomass and growth in a 10-year period.

This entire section thus far is based on a poor understanding of forest science. It should be completely re-written by a team with knowledge of forest development.

**Page 25: [3] Deleted** **Michael Ferrucci** **10/21/20 8:27:00 AM**

**Page 25: [4] Commented [OJ29]** **Orefice, Joseph** **10/19/20 10:35:00 PM**

Over what time period? Hurricane of 1938? Chestnut blight? Gypsy moth outbreaks? Historic fires?

**Page 28: [5] Deleted** **Michael Ferrucci** **10/21/20 8:45:00 AM**

**Page 28: [6] Deleted** **Michael Ferrucci** **10/21/20 8:52:00 AM**

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Comments for GC3 Forests Subcommittee

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 5:34 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** mferrucci@iforest.com <mferrucci@iforest.com>
**Sent:** Wednesday, October 21, 2020 4:40 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Cc:** Eric Hammerling <ehammerling@ctwoodlands.org>; Martin, Christopher <Christopher.Martin@ct.gov>
**Subject:** RE: Comments for GC3 Forests Subcommittee

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Please direct this email to the Governor's Council on Climate Change, Working and Natural Lands Working Group, particularly the Forests Subcommittee.

Please note that there are three (3) attachments, my letter summarizing my comments, and then two documents with detailed, page-specific edits and comments shown with "changes" tracked.

Michael Ferrucci

26 Commerce Drive

North Branford, CT 06471

203-887-9248 mferrucci@iforest.com

**3 attachments**

**Ferrucci GC3 Forests Subcommittee Letter.docx**
27K

**GC3 Forest Sub.Comments.DEEP.Urban.Vulnerable.COMP by FERRUCCI A.docx**
257K

**GC3 Forest Sub.Comments COMPILED by FERRUCCI B.docx**
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October 21, 2020

CT GC3 Mitigation - Buildings Working Group

Report Appendix

Sustainability and Production Potential for Biodiesel in CT

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**Biodiesel - Direct Path to a Sustainable Energy Future**


Biodiesel is a renewable replacement for petroleum diesel fuel and natural gas. It is made from used cooking oil, animal fats, brown (sewer) grease, and agricultural byproducts and co-products.

The feedstock used to produce U.S. biodiesel has become increasingly diversified, with waste products making up an increasing volume of feedstock used to produce fuel. Biodiesel offers an especially effective outlet for fat-based waste streams that can incur substantial disposal costs.

Several different types of plants, including soybeans and canola, can also provide feedstock for biodiesel production. It is important to understand that demand for protein meal used as livestock feed is the primary driver for the planting of soybeans since 80 percent of a soybean is comprised of protein meal. The remaining 20 percent of the soybean is comprised of oil, which cannot be digested by animals and must therefore be removed. The biodiesel industry helps to make economical use of this excess oil with the result that the net cost of protein meal is reduced.

Biodiesel achieves greenhouse gas (GHG) emissions of about 80% compared to oil-fired combustion systems and about 70% compared to natural gas-fired systems. Biodiesel thus provides a direct pathway toward achieving the common energy policy goals of 40% GHG savings by the year 2030 and 80% GHG savings by the year 2050.

New York and Rhode Island have addressed food and fuel concerns in their respective Bioheat® requirement laws by allowing only US EPA-approved “Advanced Biofuel” feedstocks, which must meet a 50% lifecycle greenhouse gas threshold. Recent reports and publications from Argonne National Laboratory state that biodiesel from virgin oil feedstock in fact now achieves greenhouse gas (GHG) savings of 66 to 72%, even with consideration of indirect land use change (ILUC), and up to 81% of direct carbon savings. US EPA regulations also preclude palm oil and palm derivatives as feedstocks for biodiesel.

The notion that biodiesel feedstocks are diverted from food supplies is a myth. Most biodiesel manufactured in New England is made from used cooking oil. But importantly, the virgin oils used for biodiesel production in the US are coproducts of protein production. For every gallon of biodiesel produced from soybean oil, 30 pounds of protein and 22 pounds of carbohydrates and dietary fiber enter the food supply.[1] The natural symbiosis of stored solar energy in the food supply is a reason to promote biofuels coproduced from food commodities. Sustainable energy systems and a circular economy should embrace the fundamental idea of harnessing more bioenergy from these natural systems that are essential to feeding a growing global population.

Between 2004 and 2011, global land in agricultural production declined by 60 million acres[2] and forested area increased by 19 million acres. This was possible because farmers produced more food per acre. They did so by growing less grass for beef and ruminant consumption, and by growing crops that produce more protein, fat, and soluble carbohydrates per area. Biofuels can improve both the economics of food production and the sustainability of energy supplies. The more efficient production of protein from fewer acres results in overproduction of fat beyond what can be consumed as food[3]. Biodiesel is a key outlet for this excess fat. Biodiesel also enables the transition to more efficient agriculture and more room for forests.

Other new sources of biodiesel feedstock under development include winter annual oilseeds, which can be planted in the fall and harvested in May or June of the following year. As an example, the promise for CoverCress (field pennycress with specific oil and fiber traits) stems from the fact that it fits into an existing traditional corn-soy rotation without materially affecting either of those crops. The crop can reduce runoff and loss of nutrients during the winter, thus improving soil biology and providing an additional revenue stream for farmers.

**Bioheat Emissions Reductions**

Biodiesel can be blended with heating oil (including No. 2 through No. 6 oils) to improve the operational and environmental performance of oil-fired systems. Biodiesel significantly reduces emissions that are harmful to human health and the environment including particulate matter, sulfur oxides, nitrogen oxides, carbon monoxide, and aromatic hydrocarbons.

[1] One gallon of biodiesel requires 7.5 pounds of vegetable oil. Every pound of soybean oil is coproduced with approximately 4 pounds of protein meal. 7.5 x 4 = 30 pound of protein meal.
[2] Taheripour et al. (2017), Taheripour, Zhao, and Tyner. "The Impact of Considering Land Intensification and Updated Data on Biofuels Land Use Change and Emissions Estimates,' Biotechnology for Biofuels (2017) 10:191; https://biotechnologyforbiofuels.biomedcentral.com/articles/10.1186/s13068-017-0877-y
[3] Taheripour et al. (2018). "Technological Progress in US Crop production: Productivity Gains, Abundant Supply of Crop Calories, Evolution in the Livestock Industry and Implications for Biofuel Production, International Conference of Agricultural Economists, August 2018 Vancouver; 10.22004/ag.econ.277291

PHOTO A. A B100-fired boiler in a Brookhaven National Laboratory testing facility.

The environmental and public health benefits of blending biodiesel with heating oil include direct reductions in particulate matter, sulfur oxides, nitrogen oxides, carbon monoxide, aromatic hydrocarbons, and lifecycle reduction for carbon dioxide and equivalent greenhouse gases. Emission benefits increase with the percentage of biodiesel from 5% (B5), 10% (B10), and 20% (B20), and are significant even at low blend levels.

**Carbon Dioxide ($CO_2$):** 100% biodiesel reduces lifecycle greenhouse gases (primarily $CO_2$) by 81%. The corresponding reductions for B5, B10 and B20 blends of biodiesel would be 4%, 8%, and 16%, respectively.

**Nitrogen Oxides ($NO_X$):** Study results vary as nitrogen oxide emissions vary with the type of appliance as well as the blend of biodiesel. For residential space heating equipment, typical biodiesel blends (B0-B20) can produce NOx reductions between 5 and 7.5%. Commercial boilers using higher blends can reduce NOx by as much as 35% using B100.

**Particulate Matter ($PM_{2.5}$):** Practically all particulate matter emitted falls in the $PM_{2.5}$ fraction. B20 reduces $PM_{2.5}$ by 15.7%.

**Carbon Monoxide: (CO):** Carbon monoxide reductions due to 100% biodiesel in heating oil applications vary between 40% for commercial boilers and 16% for residential boilers. Residential application can expect 5% CO reduction using B10 and 9% reduction using B20.

**Biodiesel is a Drop-in Replacement for Traditional Heating Oil**

Biodiesel is a drop-in fuel that can be implemented with only limited or no equipment modifications. Recent testing has shown that B100 neat biodiesel can be used in boiler systems via engineered conversions that incorporate cleaning and usually just limited hardware upgrades to fuel storage systems and burners. B100 biodiesel can enable buildings to immediately achieve the 80% GHG savings that are necessary for protecting our environment. Biodiesel can also be used as a supplement or replacement for natural gas in buildings that have existing or retrofit, dual-fuel capability in their boiler or furnace systems. Biodiesel provides a technically feasible pathway for gas-fired heating systems to achieve a sustainable energy future while maintaining clean emissions performance.

The National Oilheat Research Alliance (NORA) has been running cycling tests at its Liquid Fuels Research Center in New York. Final results have not been documented, as the full testing is not yet complete, however, interim findings are available. In the test procedure, NORA has run different blends of biodiesel (B0, B20, B50 and B100) on the most common fuel pump in the market. The procedure essentially has the pump turn on for a short time and then shut off, and this process is repeated continuously. NORA has established a goal of having 500,000 cycles, which would be equivalent to approximately 50 years of service. After that cycling is completed, a test to evaluate whether the seals hold pressure is done. NORA's results indicate there are no issues with B20 and B50 at 500,000 cycles, and B100 is now over 350,000 cycles with no issues. The B100 cycling will be completed in mid-July and a report will be issued thereafter.

Biodiesel blends up to at least B50 can and are currently being used successfully in residential and commercial heating applications. The field experience of retail home heating companies using biodiesel blends up to B50 has resulted in no operability issues and no need for appliance adjustments, cleaner burning appliances with less need for maintenance, and this is all achieved at no additional cost to the

consumer. It is simply the delivery of up to a 50% biodiesel blended fuel versus ultra-low sulfur diesel fuel.

In November 2018, Brookhaven National Laboratory (Sustainable Energy Technologies Department / Energy Conversion Group) reported "field experience with biodiesel blends has shown no clear technical issue compared to that of conventional No. 2 oil. Overall, the results of this work have not identified a clear technical barrier which would limit the use of biodiesel in home heating systems. It should be emphasized that these results are only applicable to biodiesel which has been properly processed from its parent oil/fat into biodiesel and that meets the stringent ASTM D6751 specification for B100 prior to blending."[4]

Further, Underwriters Laboratories (UL) has established a test procedure for B20 and is expected to begin establishing a procedure for blends from B20 to B100 in the near term. Burner manufacturers are now evaluating their equipment against this standard and doing the necessary research and testing to achieve UL approval. Currently, the barrier to having manufacturer approved equipment for higher blends is the process of development and approval of the UL test procedures. The biodiesel and oilheat industries are participating in the formal process of developing this UL standard.

Transportation

Biodiesel's overall emissions from internal combustion engines are significantly lower than those of petroleum diesel. Biodiesel emissions have decreased levels of all target polycyclic aromatic hydrocarbons (PAH) and nitro PAH compounds.[5] These compounds have been identified as potential cancer-causing agents.

Biodiesel is the only alternative fuel to voluntarily perform Environmental Protection Agency (EPA) Tier I and Tier II testing to quantify emission characteristics and health effects. That study found that B20 biodiesel blends provide significant reductions in total hydrocarbons, carbon monoxide, and total particulate matter.

Research also documents the fact that the ozone forming potential of the hydrocarbon emissions of pure biodiesel is nearly 50 percent less than for petroleum fuel. Biodiesel reduces sulfur dioxide emissions to virtually zero and complements Ultra Low Sulfur Diesel (ULSD) fuel as an alternative to sulfur-containing fuels.

Biodiesel offers a significant opportunity to reduce our carbon footprint for transportation and should be given equal consideration with electric vehicles as a pathway to a sustainable transportation system. Our view is that electric vehicles and biodiesel-fueled vehicles can work in harmony to reduce fossil consumption in the transportation sector.

[4] Brookhaven National Laboratory, Sustainable Energy Technologies Department/Energy Conversion Group, B20-B100 Blends as Heating Fuels, November 2018, pages 55-56

[5] Biodiesel Tier 1 Health Effects, S. Howell, MARC-IV, C. Sharp, Southwest Research Institute, TRU Workshop, October 2002

Biodiesel is Good for the Environment

Biodiesel is environmentally safe and is the most viable renewable fuel for transportation, power generation and thermal applications, based on its low carbon footprint and favorable air quality characteristics. A full life-cycle analysis performed by U.S. EPA for RFS2 shows that biodiesel reduces greenhouse gas emissions by as much as 81 percent compared to traditional heating oil and diesel fuel.

We would stress the importance of performing due diligence evaluation of all renewable resources, with emphasis on economic benefits and least-cost solutions including capital cost factors (e.g., upfront costs for heat pump equipment vs. drop-in application for renewable fuels) that can impact the level of economic burden on consumers and businesses during the transition to a renewable energy future.

Biodiesel is Good for the Economy

Connecticut is already a significant producer and user of biodiesel and also has good access to waste cooking oil and other, agriculturally derived feed stocks via economical rail and water transportation, and could thus further expand its existing biodiesel production capacity. Biodiesel production offers the opportunity for significant job creation in the agricultural and food industry sectors throughout the US. The economics of biodiesel can be favorable for small through large-scale, thus providing flexibility for locally based, feedstock and fuel production.

**Conclusion**

The National Biodiesel Board urges DEEP and the GC3 to implement a significant role for biodiesel during their energy planning activities. Biodiesel can enable Connecticut to achieve environmental sustainability while realizing the economic benefits that come from new job creation. The National Biodiesel Board would be pleased to work with you to further explore the issues that we have described above.

Sincerely,

Floyd Vergara, Esq., P.E.
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**October 21, 2020**

**Comments Submitted to the Connecticut Department of Energy and Environmental Protection**

**and**

**CT Governor's Council on Climate Change**

**Draft Report on Progress of Mitigation Strategies Working Group dated September 2020**

The National Biodiesel Board (NBB) represents the biodiesel, renewable diesel, and renewable jet fuel industries. NBB members play an important role in displacing petroleum, improving public health, and protecting the environment. Many NBB members are members of environmental organizations and are supportive of state and local initiatives to achieve a sustainable energy future.

NBB commends the Connecticut Department of Energy and Environmental Protection (DEEP) and the Governor's Council on Climate Change (GC3) for allowing stakeholders to participate in their energy planning activities. We believe that stakeholder involvement will enable DEEP and GC3 to chart a path forward to successfully meet our environmental goals.

The heating oil industry in Connecticut is proactively working toward reducing the carbon intensity of its products. NBB and the CT heating oil industry are focused on displacing just the current volumes of traditional heating oil consumption. It is not our goal to meet the state's heating resource needs that are met by other sources. The state's total annual consumption of heating oil is approximately 400 million gallons,[1] which is less than 10% of current EPA-registered biodiesel production capacity in the United States.[2] The heating oil industry's goal, as set forth in its "Providence Resolution,"[3] adopted in 2019, is to adopt B50 by 2030. Within this context, the required biodiesel volumes would be reasonable, and much of the actual production could occur directly within Connecticut.

NBB is supportive of the GC3 initiative and wishes to offer comments and suggestions relating to specific topics. We urge you to implement a significant role for biodiesel to help achieve environmental sustainability while realizing the economic benefits that come from new job creation. We would be please to work with you to further explore the issues that we describe in this document.

[1] https://www.eia.gov/dnav/pet/pet_cons_821dsta_dcu_SCT_a.htm
[2] 84 Federal Register at 36,873
[3] https://nefi.com/news-publications/recent-news/heating-oil-industry-commits-net-zero-emissions-2050/

**Summary Comments on Draft Report**

Page 9 and following:

The second bullet point, "*Building electrification*: Eliminate direct emissions from combustion in buildings, while improving health" is misleading and should be deleted, since fossil fuel-fired, power generation plants often produce higher levels of NOx and fine particulates, compared to direct combustion systems, during morning and evening peak periods, due to poor combustion performance during turbine start-up. The electricity section of the draft report includes thoughtful consideration of the environmental justice issue relating to power generation. The buildings section of the draft report should be aligned with the electricity section, to reflect the challenge of power plant emissions. A later section of this comment document describes the emissions characteristics of representative power plants and heating system technologies, which show that the emissions from turbine start-up essentially negate the common perception that heat pumps are cleaner than direct combustion systems.

Page 14 and following:

The recommendations for use of smart controls, to align building operation with low GHG emissions, should be revised to incorporate the real-time analysis of ISO New England marginal emission rates (MERs) of CO2 compared to the corresponding emission rates of renewable fuels such as biodiesel. It is important to recognize that the operation of heat pumps during morning and evening peak periods, as well as during cold weather, will foster the continued use of low-efficiency, fossil fuel-fired power generation, until renewable generation capacity has reached the capacity level required to serve the entire grid. Electrification of buildings would increase grid loads to the extent that the goal of 100% renewable electricity would be pushed back by many decades. The incentivizing of electrification should be implemented only during periods when renewable resources serve grid loads at the margin.

Page 17 and following:

The section entitled, "Transition building fossil fuel thermal loads to efficient renewable thermal technologies", seems to presume that the term Renewable Thermal Technologies applies only to electrically-driven heat pumps, to the exclusion of renewable fuels such as biodiesel. The draft report needs to be revised to include a clear, and more inclusive, definition of the RTT term.

The "Equity and environmental justice" part of this report section needs to be revised to recognize that increased grid loads, especially during morning and evening peak periods, will increase NOx and fine particulate emissions into economically disadvantaged neighborhoods adjacent to power plants until marginal loads, such as those imposed by heat pumps, are served by fully renewable power generation. Again, the Buildings section of the draft GC3 report needs to be aligned with the Electricity section, rather than making the unsupported, and incorrect, claim that electrification technologies are cleaner than direct combustion systems.

Page 18 and following:

The section entitled, "Strategy – Incentivize installation of renewable thermal technologies in new construction," should be revised to include more than just electrification measures. Incentive recommendations should also be made relating to ultra-clean, renewable fuel-fired, heating equipment that can achieve ultra-clean combustion performance with renewable fuels, plus distribution and storage infrastructure necessary for transition away from traditional fossil fuels.

NBB supports the recommendation in this portion of the draft report to establish "a Renewable Thermal Portfolio Standard that comprehensively investigates and develops all practical pathways to zero or low-GHA thermal energy, including biodiesel." Renewable thermal RPS programs have recently been established in New Hampshire, Vermont and Massachusetts. The Maine legislature has also just recently authorized rulemaking for a thermal RPS program. A renewable thermal RPS program in Connecticut could build on the experience gained in other states and accelerate the transition of the thermal sector to renewable energy at a significantly faster rate than has been achieved by existing incentive and financing programs.

Thermal RPS programs can achieve rapid adoption of renewable energy through market-based, lowest-cost market forces, without causing economic harm or dislocation to businesses and job growth. Recently established thermal RPS programs elsewhere in New England have been enthusiastically supported by small business participants.

NBB believes Connecticut should also develop a standard for clean fuel blends in heating oil which increases over time. Our organization's general view is that more biodiesel and more petroleum displacement is better than less biodiesel and less petroleum displacement. Even with major incentives, millions of homes will continue to rely on home heating oil for space heating needs post-2030. In addition, a Massachusetts survey of 622 homes showed that 92% of homes retrofitted with heat pumps retained a secondary heat source to provide supplement heat. So regardless of Connecticut's policy regarding adoption of electric heat pumps, a secondary source of heat would be necessary in many homes. Thus, the state should seek to capture as much of the GHG and other emissions benefits that occur from use of biodiesel to displace petroleum fuel in space heating applications.

A biodiesel blending requirement would be the most efficient and immediate way for Connecticut to reach its GHG emission reduction goals with a low carbon liquid heating fuel at a reasonable cost to the consumer. There is sufficient supply of biodiesel in the state to meet ambitious blend percentages, based on the biodiesel blending requirements that exist in New York City and its surrounding counties, as well as in Rhode Island. The New York City Metropolitan area and Rhode Island both have 5% blending requirements. New York City local law will have that percentage increase to 10% in 2025, 15% in 2030 and 20% in 2034. In addition, New York City also currently uses a 20% blend in all its diesel fleet vehicles and up to 20% blend in all municipal buildings.

Page 21 and following:

The bullet point, "models and solves the 'winter peak' issue attributed to thermal electrification," deserves far greater attention in the draft report since it is a core issue in how to achieve a sustainable energy future. A later section of this comment document goes into detail describing the technical and economic challenges of ISO New England grid operation during the winter.

Page 35 and following:

The bullet point, "Reduce petroleum use by power plants needed to serve winter peak demand," should be revised to add language encouraging the use of renewable fuels, such as biodiesel, in place of traditional No. 2 and No. 6 heating oil, in power generation facilities. Fuel-fired power generation facilities, equipped with SCR and OC pollution controls, could be operated with biodiesel at ultra-low (less than 5 ppm) NOx levels, especially when coupled to battery storage systems during times of low offshore wind/solar PV output, thus allowing operation at steady-state full output. This would help to fill

in output gaps that impede full renewable energy utilization for electricity, while also serving as a key tool in maintaining robust ISO New England grid reliability.

Page 37 and following:

The electricity section of the draft report includes language on page 37 that describes the environmental justice challenge of electrification. We believe the second paragraph merits serious consideration:

> "power generation facilities are a significant source of harmful air pollutants such as ground-level ozone, carbon monoxide, lead, sulfur dioxide, and nitrogen dioxide; particulate matter, and noise pollution that can negatively impact public health and wellbeing of residents in surrounding communities. The negative impacts of power generation are disproportionately felt by populations in close proximity to generation facilities. In many cases, these communities are minority, low income, or underserved areas."

The electrification of thermal loads, which typically occur simultaneously with, and are often the underlying cause of, peak grid loads, can exacerbate the environmental justice problem related to power generation emissions.

Page 75 and following:

The Transportation chapter of the draft report needs to be substantially revised to give recognition to the major role that renewable fuels already play in decarbonizing our society.

SUPPLEMENTAL COMMENTS

**Biodiesel - Direct Path to a Sustainable Energy Future**


Biodiesel is a renewable replacement for petroleum diesel fuel and natural gas. It is made from used cooking oil, animal fats, brown (sewer) grease, and agricultural byproducts and co-products.

The feedstock used to produce U.S. biodiesel has become increasingly diversified, with waste products making up an increasing volume of feedstock used to produce fuel. Biodiesel offers an especially effective outlet for fat-based waste streams that can incur substantial disposal costs.

Several different types of plants, including soybeans and canola, can also provide feedstock for biodiesel production. It is important to understand that demand for protein meal used as livestock feed is the primary driver for the planting of soybeans since 80 percent of a soybean is comprised of protein meal. The remaining 20 percent of the soybean is comprised of oil, which cannot be digested by animals and must therefore be removed. The biodiesel industry helps to make economical use of this excess oil with the result that the net cost of protein meal is reduced.

Biodiesel achieves greenhouse gas (GHG) emissions of about 80% compared to oil-fired combustion systems and about 70% compared to natural gas-fired systems. Biodiesel thus provides a direct pathway

toward achieving the common energy policy goals of 40% GHG savings by the year 2030 and 80% GHG savings by the year 2050.

New York and Rhode Island have addressed food and fuel concerns in their respective Bioheat® requirement laws by allowing only US EPA-approved "Advanced Biofuel" feedstocks, which must meet a 50% lifecycle greenhouse gas threshold. Recent reports and publications from Argonne National Laboratory state that biodiesel from virgin oil feedstock in fact now achieves greenhouse gas (GHG) savings of 66 to 72%, even with consideration of indirect land use change (ILUC), and up to 81% of direct carbon savings. US EPA regulations also preclude palm oil and palm derivatives as feedstocks for biodiesel.

The notion that biodiesel feedstocks are diverted from food supplies is a myth. Most biodiesel manufactured in New England is made from used cooking oil. But importantly, the virgin oils used for biodiesel production in the US are coproducts of protein production. For every gallon of biodiesel produced from soybean oil, 30 pounds of protein and 22 pounds of carbohydrates and dietary fiber enter the food supply.[4] The natural symbiosis of stored solar energy in the food supply is a reason to promote biofuels coproduced from food commodities. Sustainable energy systems and a circular economy should embrace the fundamental idea of harnessing more bioenergy from these natural systems that are essential to feeding a growing global population.

Between 2004 and 2011, global land in agricultural production declined by 60 million acres[5] and forested area increased by 19 million acres. This was possible because farmers produced more food per acre. They did so by growing less grass for beef and ruminant consumption, and by growing crops that produce more protein, fat, and soluble carbohydrates per area. Biofuels can improve both the economics of food production and the sustainability of energy supplies. The more efficient production of protein from fewer acres results in overproduction of fat beyond what can be consumed as food[6]. Biodiesel is a key outlet for this excess fat. Biodiesel also enables the transition to more efficient agriculture and more room for forests.

Other new sources of biodiesel feedstock under development include winter annual oilseeds, which can be planted in the fall and harvested in May or June of the following year. As an example, the promise for CoverCress (field pennycress with specific oil and fiber traits) stems from the fact that it fits into an existing traditional corn-soy rotation without materially affecting either of those crops. The crop can reduce runoff and loss of nutrients during the winter, thus improving soil biology and providing an additional revenue stream for farmers.

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[4] One gallon of biodiesel requires 7.5 pounds of vegetable oil. Every pound of soybean oil is coproduced with approximately 4 pounds of protein meal. 7.5 x 4 = 30 pound of protein meal.

[5] Taheripour et al. (2017), Taheripour, Zhao, and Tyner. "The Impact of Considering Land Intensification and Updated Data on Biofuels Land Use Change and Emissions Estimates,' Biotechnology for Biofuels (2017) 10:191; https://biotechnologyforbiofuels.biomedcentral.com/articles/10.1186/s13068-017-0877-y

[6] Taheripour et al. (2018). "Technological Progress in US Crop production: Productivity Gains, Abundant Supply of Crop Calories, Evolution in the Livestock Industry and Implications for Biofuel Production, International Conference of Agricultural Economists, August 2018 Vancouver; 10.22004/ag.econ.277291

**Bioheat Emissions Reductions**

Biodiesel can be blended with heating oil (including No. 2 through No. 6 oils) to improve the operational and environmental performance of oil-fired systems. Biodiesel significantly reduces emissions that are harmful to human health and the environment including particulate matter, sulfur oxides, nitrogen oxides, carbon monoxide, and aromatic hydrocarbons.

*PHOTO A. A B100-fired boiler in a Brookhaven National Laboratory testing facility.*

The environmental and public health benefits of blending biodiesel with heating oil include direct reductions in particulate matter, sulfur oxides, nitrogen oxides, carbon monoxide, aromatic hydrocarbons, and lifecycle reduction for carbon dioxide and equivalent greenhouse gases. Emission benefits increase with the percentage of biodiesel from 5% (B5), 10% (B10), and 20% (B20), and are significant even at low blend levels.

**Carbon Dioxide ($CO_2$):** 100% biodiesel reduces lifecycle greenhouse gases (primarily $CO_2$) by 81%. The corresponding reductions for B5, B10 and B20 blends of biodiesel would be 4%, 8%, and 16%, respectively.

**Nitrogen Oxides ($NO_X$):** Study results vary as nitrogen oxide emissions vary with the type of appliance as well as the blend of biodiesel. For residential space heating equipment, typical biodiesel blends (B0-B20) can produce NOx reductions between 5 and 7.5%. Commercial boilers using higher blends can reduce NOx by as much as 35% using B100.

**Particulate Matter ($PM_{2.5}$):** Practically all particulate matter emitted falls in the $PM_{2.5}$ fraction. B20 reduces $PM_{2.5}$ by 15.7%.

**Carbon Monoxide: (CO):** Carbon monoxide reductions due to 100% biodiesel in heating oil applications vary between 40% for commercial boilers and 16% for residential boilers. Residential application can expect 5% CO reduction using B10 and 9% reduction using B20.

**Biodiesel is a Drop-in Replacement for Traditional Heating Oil**

Biodiesel is a drop-in fuel that can be implemented with only limited or no equipment modifications. Recent testing has shown that B100 neat biodiesel can be used in boiler systems via engineered conversions that incorporate cleaning and usually just limited hardware upgrades to fuel storage systems and burners. B100 biodiesel can enable buildings to immediately achieve the 80% GHG savings that are necessary for protecting our environment. Biodiesel can also be used as a supplement or replacement for natural gas in buildings that have existing or retrofit, dual-fuel capability in their boiler or furnace systems. Biodiesel provides a technically feasible pathway for gas-fired heating systems to achieve a sustainable energy future while maintaining clean emissions performance.

The National Oilheat Research Alliance (NORA) has been running cycling tests at its Liquid Fuels Research Center in New York. Final results have not been documented, as the full testing is not yet complete, however, interim findings are available. In the test procedure, NORA has run different blends of biodiesel (B0, B20, B50 and B100) on the most common fuel pump in the market. The procedure essentially has the pump turn on for a short time and then shut off, and this process is repeated

continuously. NORA has established a goal of having 500,000 cycles, which would be equivalent to approximately 50 years of service. After that cycling is completed, a test to evaluate whether the seals hold pressure is done. NORA's results indicate there are no issues with B20 and B50 at 500,000 cycles, and B100 is now over 350,000 cycles with no issues. The B100 cycling will be completed in mid-July and a report will be issued thereafter.

Biodiesel blends up to at least B50 can and are currently being used successfully in residential and commercial heating applications. The field experience of retail home heating companies using biodiesel blends up to B50 has resulted in no operability issues and no need for appliance adjustments, cleaner burning appliances with less need for maintenance, and this is all achieved at no additional cost to the consumer. It is simply the delivery of up to a 50% biodiesel blended fuel versus ultra-low sulfur diesel fuel.

In November 2018, Brookhaven National Laboratory (Sustainable Energy Technologies Department / Energy Conversion Group) reported "field experience with biodiesel blends has shown no clear technical issue compared to that of conventional No. 2 oil. Overall, the results of this work have not identified a clear technical barrier which would limit the use of biodiesel in home heating systems. It should be emphasized that these results are only applicable to biodiesel which has been properly processed from its parent oil/fat into biodiesel and that meets the stringent ASTM D6751 specification for B100 prior to blending."[7]

Further, Underwriters Laboratories (UL) has established a test procedure for B20 and is expected to begin establishing a procedure for blends from B20 to B100 in the near term. Burner manufacturers are now evaluating their equipment against this standard and doing the necessary research and testing to achieve UL approval. Currently, the barrier to having manufacturer approved equipment for higher blends is the process of development and approval of the UL test procedures. The biodiesel and oilheat industries are participating in the formal process of developing this UL standard.

Transportation

Biodiesel's overall emissions from internal combustion engines are significantly lower than those of petroleum diesel. Biodiesel emissions have decreased levels of all target polycyclic aromatic hydrocarbons (PAH) and nitro PAH compounds.[8] These compounds have been identified as potential cancer-causing agents.

Biodiesel is the only alternative fuel to voluntarily perform Environmental Protection Agency (EPA) Tier I and Tier II testing to quantify emission characteristics and health effects. That study found that B20 biodiesel blends provide significant reductions in total hydrocarbons, carbon monoxide, and total particulate matter.

Research also documents the fact that the ozone forming potential of the hydrocarbon emissions of pure biodiesel is nearly 50 percent less than for petroleum fuel. Biodiesel reduces sulfur dioxide emissions to virtually zero and complements Ultra Low Sulfur Diesel (ULSD) fuel as an alternative to sulfur-containing fuels.

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[7] Brookhaven National Laboratory, Sustainable Energy Technologies Department/Energy Conversion Group, B20-B100 Blends as Heating Fuels, November 2018, pages 55-56

[8] Biodiesel Tier 1 Health Effects, S. Howell, MARC-IV, C. Sharp, Southwest Research Institute, TRU Workshop, October 2002

Biodiesel offers a significant opportunity to reduce our carbon footprint for transportation and should be given equal consideration with electric vehicles as a pathway to a sustainable transportation system. Our view is that electric vehicles and biodiesel-fueled vehicles can work in harmony to reduce fossil consumption in the transportation sector.

Biodiesel is Good for the Environment

Biodiesel is environmentally safe and is the most viable renewable fuel for transportation, power generation and thermal applications, based on its low carbon footprint and favorable air quality characteristics. A full life-cycle analysis performed by U.S. EPA for RFS2 shows that biodiesel reduces greenhouse gas emissions by as much as 81 percent compared to traditional heating oil and diesel fuel.

We would stress the importance of performing due diligence evaluation of all renewable resources, with emphasis on economic benefits and least-cost solutions including capital cost factors (e.g., upfront costs for heat pump equipment vs. drop-in application for renewable fuels) that can impact the level of economic burden on consumers and businesses during the transition to a renewable energy future.

Biodiesel is Good for the Economy

Connecticut is already a significant producer and user of biodiesel and also has good access to waste cooking oil and other, agriculturally derived feed stocks via economical rail and water transportation, and could thus further expand its existing biodiesel production capacity. Biodiesel production offers the opportunity for significant job creation in the agricultural and food industry sectors throughout the US. The economics of biodiesel can be favorable for small through large-scale, thus providing flexibility for locally based, feedstock and fuel production.

**Conclusion**

The National Biodiesel Board urges DEEP and the GC3 to implement a significant role for biodiesel during their energy planning activities. Biodiesel can enable Connecticut to achieve environmental sustainability while realizing the economic benefits that come from new job creation. The National Biodiesel Board would be pleased to work with you to further explore the issues that we have described above.

Sincerely,

Floyd Vergara, Esq., P.E.
Director of State Governmental Affairs

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Alec Shub <alec.shub@uconn.edu>

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:35 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Menounos, Molly L. (2023) <molly.menounos@trincoll.edu>
**Sent:** Wednesday, October 21, 2020 9:23 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change,

Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit.

Nature is essential for the future, for evolution and for everything we need, and serves the public good now and for the long term.

We have so many beautiful natural areas, and some need to be protected for nature study, hiking, and places that people can count on. This has never been more important.

Meanwhile - we are burning and exporting our public forests? Who benefits? This is beyond disturbing.

We need systems that support good jobs, local resource use, AND natural areas.

Our public land is held in the public trust.

We need your leadership.

Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 5:36 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Monica Jakuc Leverett <mjakuc@smith.edu>
**Sent:** Wednesday, October 21, 2020 5:09 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change,

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Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

October 21, 2020

Via email: deep.climatechange@ct.gov
Connecticut Department of Energy and Environmental Protection
Office of Climate Planning
79 Elm Street
Hartford, CT 06106-5127

Re: Governor's Council on Climate Change (GC3) Draft Working Group Reports

To the Esteemed Members of the GC3 Council,

As a Board members of The Warren Land Trust, we respectfully submit the following comments on the Governor's Council on Climate Change (GC3) draft Working Group Reports.

The Warren Land Trust and is a member of the Litchfield Hills Greenprint Collaborative, a Regional Conservation Partnership active throughout a 29-town region of Northwest Connecticut. With our colleagues we have joined in pursuit of a regional conservation strategy incorporating the Follow the Forest multistate initiative to protect core forests and the natural areas connecting them. The Working Group Reports deeply resonate with and impact our work.

We strongly support a great many of the recommendations and goals included in the draft reports while highlighting herein some of the bold recommendations .

1. We must ***prioritize the capacity of Connecticut's forests*** to mitigate climate change through carbon storage and sequestration. New England's forests have been specifically identified as part of the "Global Safety Net" needed to stabilize the climate. Connecticut's forests are critical within this Safety Net due to their considerable capacity to store aboveground carbon and their situation within climate corridors of connected core forest habitat we must:
   - ***Keep Forest as Forests***.
   - ***Establish Extensive Natural Area Forest Preserves*** on existing and new state conservation lands and prioritize proforestation.
   - ***Increase land protection funding*** from all available sources.
   - ***Encourage land stewardship behaviors that support ecosystem services.***.
   - ***Action must start right now***.

2. We must be ***guided by science, and do no harm***. GHG mitigation policies in particular should ensure that gains are not offset by (i) poorly sited solar and wind installations that convert forestland and remove stored carbon, or (ii) timber sales on state lands that are far more valuable for their carbon storage as living trees than the generally low value that the state generates from the sale of logs (and associated leakage of stored carbon from the state).

3. We must ***support research and education***. Provide funding to target areas where research is still needed to discover, monitor, and develop the science needed to adequately and rapidly mitigate climate change. Augment, accelerate and formalize a broad program of positive education and cultural change across all sectors of state government, municipalities, NGOs, and public schools.

We appreciate the cross-sector nature of many of the Working Groups' recommendations and recognize the possibilities in coordinating work around the recommendations. Community nonprofits can effectively partner at the municipal and state levels.

The Warren Land Trust can help by protecting and responsibly stewarding conservation land, including that expressly protected as natural area forest preserves. We can provide needed education to the broad public and to the youth who will inherit our climate and carry on our mitigation and adaptive strategies.

Thank you once again for your leadership in this significant work, and for providing this opportunity to present comments on the recommendations. We look forward to assisting in their implementation.

Respectfully,

Nancy Adams Morse, Secretary
Ted Morse, former President
Warren Land Trust
50 Cemetery Road
Warren, CT 06754

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Comments on Climate Change Working and Natural Lands Agriculture and Soils Sub-Group Report

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 2:59 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Nathan W. L'Etoile <Nletoile@farmland.org>
**Sent:** Wednesday, October 21, 2020 2:49 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>; Hurlburt, Bryan <Bryan.Hurlburt@ct.gov>
**Cc:** Jim Smith <jasmith05@charter.net>; Kip Kolesinskas <kkolesinskas@farmland.org>; Chelsea Gazillo <cgazillo@farmland.org>; 'Armando P. Paolino III' <armando@paolinopublicaffairs.com>; Tim Fink <tfink@farmland.org>; Emily Cole <ecole@farmland.org>
**Subject:** Comments on Climate Change Working and Natural Lands Agriculture and Soils Sub-Group Report



Good Afternoon Commissioners:

On behalf of American Farmland Trust, I am pleased to submit comments on the Governor's Council on Climate Change Working and Natural Lands Agriculture and Soils Sub-Group report. We sincerely appreciate your leadership and the opportunity to comment on this critical report that will guide our agricultural producers, policy makers, state officials, and the public on how Connecticut's agricultural sector can work to mitigate the effects of climate change for years to come.

You will find our comments attached to this email. Please feel free to reach out to me or Chelsea Gazillo (copied here) should you have any questions regarding AFT's public comment submissions or any other issues relative to farms, farmers, or farmland.

With best regards,

Nathan

**Nathan W. L'Etoile**

*New England Regional Director*

he/him/his

---

*Phone: +1 4132404331*

*Email: Nletoile@farmland.org*

*Website: www.farmland.org*

***Join the Farming Is Our Future campaign today!***



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**AFT Comments on CT GC3 Report_21OCT20.pdf**
199K

American Farmland Trust

1 Short Street
Northampton, MA 01060

October 21, 2020

Commissioner Katie Dykes
Connecticut Department of Energy and Environmental Protection
79 Elm Street
Hartford, CT 06106-5127

Via email only at: deep.climatechange@ct.gov

Dear Commissioner Dykes and members of Governor Lamont's Council on Climate Change:

Thank you for the opportunity to submit public comments on the Working and Natural Lands Working Group Agriculture/Soils Sub-Group draft report. We appreciate your leadership in drafting these important recommendations. We also commend you for your efforts to bring together diverse perspectives regarding the impacts of climate change on the agricultural sector, and to build a strong case supporting the need for natural agricultural climate solutions that are cost-effective, accessible, and benefit the farmers and citizens of Connecticut.

American Farmland Trust (AFT) is the only national organization that takes a holistic approach to agriculture, focusing on the land itself, the practices used on the land, and the farmers and ranchers who do the work. In addition to our focus on conservation and farm viability, we have also consistently advocated for the creation of policies that will support farmers as allies in the fight against climate change. We believe that farmers can play a key part in mitigating climate change through many avenues, from adopting regenerative practices which sequester carbon in the soil, to permanently protecting farmland from development. These practices not only help to mitigate climate change, they also improve the greater environment, make farmers resilient to extreme weather, and increase community food security. In Connecticut, AFT:

- Runs programing for women landowners and managers on conserving their land;
- Is beginning a 5-year soil health project with dairy farmers funded by USDA-Natural Resource Conservation Services; and
- Leads the Working Lands Alliance (WLA), a broad-based, statewide coalition comprised of many organizations (including the Connecticut Forest and Park Association, New Connecticut Farmer Alliance, CT NOFA, and the CT Farm Bureau Association) dedicated to preserving Connecticut's farmland. WLA cares deeply about both saving Connecticut's farmland, and ensuring a healthy agricultural sector and prosperous future for the state's farmers.

AFT is grateful for the opportunity to offer comments on two sections of this report: *Soils in Connecticut* and *Land Use Planning Tools.* What follows is the aggregated comments of our organization.

## Soils in Connecticut:

AFT appreciates the overall context that this section provides on the potential for agriculture to contribute to addressing climate change through carbon sequestration. We suggest the policy recommendations section be further expanded to provide policymakers with additional concrete steps for their consideration.

**Scope:**
We appreciate the focus on increasing the existing body of research to optimize new cropping systems, as well as on improving outreach and education. We suggest including specific recommendations to increase capacity for outreach, education, and technical assistance through organizations such as Cooperative Extension and local conservation districts.

**Introduction:**
AFT is supportive of methane digesters, and believes they are rightly included in this report as a source of renewable energy. However, we suggest either removing the labeling of dairy farm digesters as a "soil health conservation practice," or further explaining their connection to soil health. High phosphorus levels in Connecticut surface waters, because of manure application, is a priority water quality concern. However, manure digestate application in place of manure does not reduce phosphorus loading onto our farm fields. While the energy capture is a valuable benefit of methane digesters, the state could better improve phosphorus management by increasing local feed production and lessening dependence on out-of-state feed.

AFT suggests drawing a connection between increased soil health and flood mitigation. This will benefit not only an individual farmer, but also their downstream neighbors and surrounding urban areas which might primarily consist of impervious surfaces.

**Background:**
Although the Agriculture Resilience Act does provide numerous examples of how federal policy could be used to improve soil health, it is important to note that this bill has not been passed into law. While it can serve as a rich source of ideas, it should not be labeled an "existing program." Similarly, it is important to note that the House Select Committee on the Climate Crisis' Report is not legislation, but rather an "Action Plan" presenting a set of recommendations for federal policy.

AFT suggests including additional concrete examples of soil health legislation and programs that could be easily adapted in Connecticut, such as the Vermont Environmental Stewardship Program or the Maryland Healthy Soils Program. Because the California soil health programs are funded through the state's cap-and-trade proceeds, it might not serve as the best possible model for the state at this time.

We also recommend using the full title of Iowa's crop insurance program, the "Cover Crop - Crop Insurance Demonstration Project" as well as mentioning Illinois' analogous program, "Fall Covers for Spring Savings."

We suggest using available tools such as the CaRPE Tool(TM) to assist in planning, education, and outreach regarding the potential of conservation practices to mitigate greenhouse gas (GHG) emissions. The CaRPE Tool (TM) was developed by AFT to quantify and visualize county-level GHG emission reductions resulting from the implementation of a suite of cropland and grazing land management practices. To learn more about the CaPRE Tool visit this website: https://carpe.shinyapps.io/CarpeTool/

**Goals:**
In Section I, we commend the recommendation to increase the use of easements as a climate solution and would suggest setting specific annual farmland protection goals.

In Section II, we appreciate the inclusion of the importance of permanent easements as a climate tool. We would suggest expanding this section to cover the climate benefits of permanent easements on agricultural land that engages in climate-mitigating agricultural practices such as cover crops. Since protected lands are not threatened by development, they represent particularly effective investments for carbon sequestration since the climate benefit due to carbon sequestration is only retained for as long at the land remains undeveloped.

**Policy Recommendations:**
In Section I, we suggest clarifying what type of goal should be set for each land use.

In Section V, an additional state incentive could be added to the federal program match.

We suggest adding several policy recommendations to this section:

1. Create a program to increase the capacity of state and non-profit organizations to engage in outreach, education, and technical assistance to farmers who wish to implement soil health practices. This could include a grant program to support organizations such as cooperative extension.
2. Create a program to help Connecticut farmers access conservation equipment, which can be very expensive. This could involve a "Cash for Clunkers" program that allows farmers to trade in old equipment for conservation equipment, and/or a grant program that allows conservation districts to purchase relevant equipment to then lend or rent to local farmers.
3. Create a Connecticut soil health program that incentivizes the adoption of soil health practices through grants, positive publicity, tax incentives, and/or increased education and outreach. This program should not come at the expense of the state's Farmland Restoration Program.

**Additional Comments:**
We recognize that compiling a report of this caliber is challenging, and we are grateful to the individuals who spent countless hours creating this section. To provide more clarity to the reader, we would suggest more consistent formatting for increased readability, and a more streamlined organization of this section since there appears to be some redundancy.

## Land Use Planning Tools

We appreciate the clear writing in this section and the highly detailed policy recommendations. We also appreciate the focus on: planning for agriculture; the recognition that farmland must be able to withstand development pressure; and that in order to be a viable industry, farm operations need access to specific infrastructure.

We recommend expanding the section to include two areas that are touched upon but not fully explored. First, we suggest drawing a stronger connection between agriculture as a climate solution and the importance of perpetual agricultural conservation easements. As discussed earlier in the report, farmland has immense potential to sequester atmospheric carbon, and thus serve as a climate solution, as well as to provide other environmental benefits. However, all this benefit is lost when farmland is developed, and the topsoil is removed. AFT supports the use of conservation easements to ensure the permanence of farmland's climate benefit.

Second, we suggest developing a discrete set of recommendations for increasing farmland access for young and beginning producers, especially socially disadvantaged farmers such as Black, Indigenous, and People of Color (BIPOC), and women. One of the best ways to keep land in agriculture is to ensure that an eager new generation of farmers has easy access to farmland.

Although Connecticut already has a strong FarmLink program, the program could be expanded to not only connecting new farmers with retiring landowners, but also to providing education as well as financial and technical support to aspiring farmers. Further programmatic recommendations as to how the state can increase farmland access are outlined in a recent report jointly drafted by the Connecticut Department of Agriculture and AFT called "Farmland Needed: How Connecticut Can Help Farmers Access the Land They Need to Succeed" that will be released by the Connecticut Department of Agriculture before the end of 2020.

Robust policies are also needed to support the transfer of farmland. Such policies could include relieving student debt for young farmers; providing generous grants in return for limited-term non-development covenants; promoting outreach programs for high-school and college students to learn about the agricultural opportunities in Connecticut; and implementing a tax credit that would incentivize landowners to sell their land to young, beginning, or socially disadvantaged farmers.

**Land Use Planning, State-Level:**
AFT appreciates the recognition that although solar energy is an important step towards a renewable energy future, it must be carefully sited to not threaten agricultural land. We especially appreciate the suggestions that a representative of the agricultural community be appointed to the Connecticut Siting Council, and that additional research be pursued to understand the relationship between land-use planning and Urban High-Density and Low-Density Residential conversion. AFT suggests making use of its recent research report *Farms Under Threat: The State of the States.*

We would also suggest broadening this section to include discrete state-level policy recommendations regarding solar siting, to encourage non-agricultural siting when possible, and dual-use siting otherwise. Recommendations could include:

- Expedited permitting for rooftop arrays, or other "preferred" locations that do not threaten agricultural land such as brownfields and parking lots;

- Providing solar energy rate incentives for solar arrays that are located on preferred locations, or for dual-use arrays;
- Protected status of underlying agricultural land when used for energy;
- Established rules for solar development on "Current Use" enrolled land;
- Performance standards established for agri-voltaics/dual use arrays; and
- Energy-specific definition of farmland for agricultural use.

We would also suggest developing training programs for state and local planners to help them better understand the issues faced by Connecticut farmers, and to help develop plans to support agriculture. This could be done by engaging the Southern New England American Planning Association in the importance of planning for agriculture to mitigate the impacts of climate change.

**Tax Programs and Incentives:**
AFT commends the use of tax incentives to support farming in Connecticut, especially regarding the agricultural-use valuation. We would also suggest including recommendations for tax incentives for landowners who sell their land to historically underserved and socially disadvantaged farmers such as farmers of color, immigrant and refugee farmers, new and begging famers, veteran farmers, limited resource farmers, etc. . .

**Farmland Preservation:**
We appreciate this section's focus on the importance of agricultural land protection as a climate solution, and as a way of ensuring the region's future food security and overall resiliency. We also appreciate the recognition that permanently protecting farmland is neither a quick nor an easy process, highlighting the importance of policies that lower the barriers to land protection.

We suggest expanding Recommendation 1 and identifying some of the pertinent regulatory roadblocks that should be eliminated.

In Recommendation 3, we suggest prioritizing and utilizing both the state's "buy-protect-farm" provision and USDA's "buy-protect-sell" mechanisms. Sometimes, properties are threatened by development and the owner must act more quickly than the traditional farmland protection procedures. If the land is not protected within a narrow window of time, the land may be sold for development and the resource lost forever. In these circumstances, it may be possible to work with a land trust, the Connecticut Department of Agriculture, or USDA-NRCS on a "buy-protect-sell" approach. These programs can allow a town or land trust to make a fee-simple purchase and then place an easement on the property.

AFT fully supports incentivizing the sale or lease of farmland to young, beginning and socially disadvantaged farmers, as envisioned by Recommendation 8's suggestion of a tax incentive for farmers to purchase permanently protected farmland. AFT notes, however, that tax incentives work best on individuals with a high tax burden, which is why several states have adopted tax credits that incentivize landowners to sell or lease agricultural land to beginning and disadvantaged producers. These tax credits are not limited to permanently protected land, and AFT would urge that any such tax incentive be available for use on all agricultural land. Moreover, tools like an "Option to Purchase at Agricultural Value" and "buy-protect-sell" projects, both of which have been discussed as potential additions to the state Farmland Preservation Program, can help young, beginning, and disadvantaged farmers to access more affordable permanently protected farmland.

We suggest reimagining Recommendation 10. We agree that it is important to support the use of "new technologies that can help mitigate climate change while protecting soil health." However, dual-use solar arrays, which are given as an example in this recommendation, neither protect soil health nor directly mitigate climate change. We feel as though commercial (for more than just on-farm energy usage) solar arrays should only be located on permanently protected farmland as a last resort, or be located only on the portions of land that that do not displace agriculture or cannot be used for other purposes.

Finally, on Recommendation 11, we disagree that forest management plans should be requisite for any agricultural easement that includes forestland. Although we support forest management, requiring a management plan to be maintained in perpetuity is unreasonable and could be perceived as a barrier to protection by the landowner.

**Conclusion:**
Thank you for your hard work developing this report. We have no doubt that it will help Connecticut prepare for a future where agriculture is viable, productive, and plays a key role in mitigation, adaptation, and becoming resilient in the face of climate change. We look forward to continuing our engagement in this process.

Should you have any questions regarding these public comments, please feel free to reach out to me or our New England staff at American Farmland Trust.

Sincerely,

N. W. L'Etoile

Nathan W. L'Etoile
New England Director
American Farmland Trust

CC: Commissioner Bryan Hurlburt, Connecticut Department of Agriculture
Kayleigh Royston, Connecticut Department of Agriculture Policy Liaison
Kip Kolesinskas, Working Lands Alliance Co-Chair
James Smith, Working Lands Alliance Co-Chair
Chelsea Gazillo, Working Lands Alliance Director

UCONN
UNIVERSITY OF CONNECTICUT

**Alec Shub <alec.shub@uconn.edu>**

# FW: Comment on GC3 EEJ Group Draft Report

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 8:48 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Bompoti, Nefeli <nefeli.bompoti@uconn.edu>
**Sent:** Wednesday, October 21, 2020 8:42 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Cc:** Chrysochoou, Maria <maria.chrysochoou@uconn.edu>; Pestana, Edith <Edith.Pestana@ct.gov>
**Subject:** Comment on GC3 EEJ Group Draft Report



Dear EEJ Group Members,

Please find below a comment on EEJ Group's Draft on Public Participation.

Public participation and community engagement in EJ communities could be facilitated through established community engagement programs within public educational institutions. Preparation of educational materials suitable for the public such as fact sheets and handouts, workshop and meeting organization, as well as webinars and email outreach are only a handful of examples to effectively engage and inform the community.

The Connecticut Brownfields Initiative (CBI) is a community engagement and service-based learning program, operating within the University of Connecticut's School of Engineering in collaboration with a multidisciplinary team of academic and industrial partners. Our goal is to advance brownfields redevelopment in the State of Connecticut and engage the community in the process in an inclusive and equitable manner. CBI has primarily three functions: a) to assist communities within the State; b) to conduct community engagement; and c) train the next generation of environmental professionals through hands-on learning experiences. CBI is uniquely positioned to conduct community engagement activities in EJ communities within the State.

We appreciate including us in the dialogue and we are happy to provide more details and assistance.

Best regards,

Nefeli Bompoti

**Nefeli Bompoti, Ph.D.**

Assistant Research Professor
CT Brownfields Initiative

Dept. of Civil & Environmental Engineering

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clf
conservation law foundation

For a thriving New England

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**By Electronic Mail**

October 21, 2020

State of Connecticut
Governor's Council on Climate Change
Progress on Mitigation Strategies Working Group
deep.climatechange@ct.gov

**Re: Comments of Conservation Law Foundation Regarding the Draft Report of the Progress on Mitigation Strategies Working Group –Transportation, Buildings, Electricity, Non-Energy Emissions, Cross Sector**

Dear Members of the Progress on Mitigation Strategies Working Group:

The Conservation Law Foundation ("CLF") is pleased to offer comments regarding Progress on Mitigation Strategies Working Group's ("Mitigation WG") September 2020 Draft Report (the "Draft Report"). Specifically, we offer comments on Chapters 2-6: Transportation, Buildings, Electricity, Non-Energy Emissions, and Cross-Sector.

Founded in 1966, CLF is a nonprofit, member-supported, regional environmental organization working to conserve natural resources, protect public health, and promote thriving communities for all in the New England region. CLF protects New England's environment for the benefit of all people. We use the law, science, and the market to create solutions that preserve our natural resources, build healthy communities, and sustain a vibrant economy. We are working to cut pollution from our cars and trucks, create alternatives to driving, and push for more affordable and equitable public transit options across New England. CLF is also working to reduce greenhouse gas emissions in the building sector, by advocating in favor of increased electrification and energy efficiency, and working to promote policies that support renewable energy development and end the use of fossil fuels in electricity generation in New England.

CLF offers the following suggestions to strengthen the Draft Report and ensure that Connecticut spurs electric vehicle adoption and prioritizes building a transportation future that is accessible, equitable, reliable, and climate resilient. CLF also offers a number of recommendations for improving Connecticut's decarbonization transition with respect to the buildings, electricity, and non-energy sectors.

September 9, 2020

Ms. Donna Wieting
Director, Office of Protected Resources
National Marine Fisheries Service
1315 East-West Hwy.
Silver Spring, MD 20910

Ms. Jolie Harrison
Division Chief, Permits and Conservation Division, Office of Protected Resources
National Marine Fisheries Service
1315 East-West Hwy.
Silver Spring, MD 20910

**RE: Failure to Adequately Protect Endangered and Protected Marine Mammals During Marine Site Characterization Surveys Required for Offshore Wind Development**

Dear Ms. Wieting and Ms. Harrison,

We are writing to express our profound concern regarding flaws in the incidental harassment authorizations ("IHAs") issued by the National Marine Fisheries Service ("NMFS") for marine site characterization surveys required for offshore wind development. Our organizations are united in support of responsibly developed offshore wind energy as a critically needed climate change solution, and we have long advocated for policies and actions needed to bring it to scale in an environmentally protective manner. We are heartened to see that in some instances developers are going beyond sub-standard NMFS requirements to adopt more protective measures, but NMFS should require even stronger protections of all developers.

Since March 2018, our groups have submitted 12 comment letters to NMFS on proposed IHAs for marine site characterization surveys associated with 12 offshore wind Lease Areas and associated potential export cable route corridors from Massachusetts to North Carolina (*see* Attachment 1). In these letters, we consistently identified recurring flaws in NMFS' incidental take analyses and recommended measures to mitigate and monitor potential impacts to endangered and protected marine mammals—actions critical to environmentally responsible offshore wind development. Despite our urging, NMFS has made no meaningful improvements to the IHAs issued; in fact, NMFS has weakened the required mitigation and monitoring measures over time. This trend is irresponsible in light of the worsening conservation status of a number of species, including the critically endangered North Atlantic right whale, and the significant increase in the number and geographic and temporal scale of marine site characterization surveys.

Here, we summarize our overarching concerns and necessary improvements, and request a meeting with you and your staff to discuss how NMFS should adjust its current IHA process to reflect requirements under the Marine Mammal Protection Act ("MMPA").

In brief, NMFS must:

A. Incorporate additional data sources into calculations of marine mammal density and take;
B. Analyze cumulative impacts to North Atlantic right whales and other endangered and protected marine mammal species and stocks as part of the take estimation and permitting process;
C. Not adjust take numbers downward for large whales based on unproven mitigation measures;
D. Require mitigation measures that meet the least practicable adverse impact standard;
E. Strengthen its vessel speed restrictions to mitigate the harm of increased vessel traffic; and
F. Prohibit extensions of any one-year IHA through a truncated 15-day comment period as is contrary to the MMPA.

We also submit our recommendations for advancing monitoring and mitigation during offshore wind development.

## I. The Marine Mammal Protection Act

Congress enacted the MMPA because "certain species and population stocks of marine mammals are, or may be, in danger of extinction or depletion as a result of man's activities."[1] The statute seeks to ensure that species and population stocks are not "permitted to diminish beyond the point at which they cease to be a significant functioning element of the ecosystem of which they are a part," and do not "diminish below their optimum sustainable population."[2] Congress intended for NMFS to act conservatively in the face of uncertainty when authorizing activities harmful to marine species.[3] This careful approach to management was deemed necessary because of the vulnerable status of many species and because it is difficult to measure the impacts of human activities on marine mammals in the wild.[4]

At the heart of the MMPA is its "take" prohibition, which establishes a moratorium on the capture, harassing, hunting, or killing of marine mammals, and generally prohibits any person or vessel subject to the jurisdiction of the United States from taking a marine mammal on the high seas or in waters or on land under the jurisdiction of the United States.[5] Harassment is any act that "has the potential to injure a marine mammal or marine mammal stock in the wild" or to "disturb a marine mammal . . . by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering."[6]

NMFS may grant exceptions to the take prohibition. As relevant here, the agency may authorize, for not more than a one-year period, the incidental, but not intentional, "taking by harassment of small numbers

[1] 16 U.S.C. § 1361(1).

[2] *Id.* § 1361(2); see also *Conservation Council for Hawaii v. NMFS*, 97 F. Supp. 3d 1210, 1216 (D. Haw. 2015).

[3] H.R. Rep. No. 92-707 (Dec. 4, 1971), as reprinted in 1972 U.S.C.C.A.N. 4144, 4148.

[4] 16 U.S.C. § 1361(1), (3).

[5] *Id.* § 1362(13), 1371(a).

[6] *Id.* § 1362(18)(A).

of marine mammals of a species or population stock" if the agency determines that such take would have only "a negligible impact on such species or stock."[7] The agency must prescribe permissible methods of taking to ensure that the activity has "the least practicable impact on such species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance."[8] NMFS must also establish monitoring and reporting requirements.[9] No later than 45 days after receiving an application for an IHA, NMFS must publish a proposed authorization and open a 30-day comment period.[10]

## II. The Status of Marine Mammals in the Northwestern Atlantic

The North Atlantic right whale is on a path to extinction. Although the species has been listed as endangered under the Endangered Species Act ("ESA") for decades, recent scientific analysis confirms a population decline since 2010 due to entanglements in commercial fishing gear and vessel strikes.[11] In the wake of an alarming number of detected deaths of North Atlantic right whales in 2017, NMFS declared an Unusual Mortality Event ("UME"),[12] which devotes additional federal resources to determining and—if possible—mitigating the source of excessive mortality. This designation is still in effect. At least 31 animals are known to have been killed since 2017 and an additional ten whales have been documented with serious injuries they will not survive.[13] These 41 animals represent roughly ten percent of the population that now numbers approximately 400 individuals.[14] Moreover, these documented serious injuries and deaths only represent a small fraction of whales that are injured or killed by human activities.[15] Of great concern is that females are more negatively affected than males by the lethal and sublethal effects of human activity, surviving to only 30-40 years of age with an extended inter-calf interval of approximately ten years.[16] Calf survival is also severely diminished. Two of the ten calves born in the 2019/2020 calving season are already either confirmed or likely dead due to vessel strikes.[17] In 2019, North Atlantic right whales were listed as a NOAA "Species in the Spotlight" indicating that they

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[7] *Id.* § 1371(a)(5)(D)(i).

[8] *Id.* § 1371(a)(5)(D)(ii)(I).

[9] *Id.* § 1371(a)(5)(D)(iii).

[10] *Id.* § 1371(a)(5)(D)(iii).

[11] Sharp, S.M., McLellan, W.A., Rotstein, D.S., Costidis, A.M., Barco, S.G., Durham, K., Pitchford, T.D., Jackson, K.A., Daoust, P.Y., Wimmer, T. and Couture, E.L., "Gross and histopathologic diagnoses from North Atlantic right whale Eubalaena glacialis mortalities between 2003 and 2018." *Diseases of Aquatic Organisms*, vol. 135, pp.1-31 (2019).

[12] NOAA-NMFS, "2017-2020 North Atlantic right whale Unusual Mortality Event." Available at: https://www.fisheries.noaa.gov/national/marine-life-distress/2017-2020-north-atlantic-right-whale-unusual-mortality-event.

[13] The preliminary cumulative total number of animals in NMFS' North Atlantic right whale Unusual Mortality Event has been updated to 41 individuals to include both the confirmed mortalities (dead stranded or floaters) (n=31) and seriously injured free-swimming whales (n=10) to better reflect the confirmed number of whales likely removed from the population during the UME and more accurately reflect the population impacts. *Id.*

[14] NOAA Fisheries, "North Atlantic right whale." Available at: https://www.fisheries.noaa.gov/species/north-atlantic-right-whale.

[15] Sharp, S.M., et al., "Gross and histopathologic diagnoses from North Atlantic right whale Eubalaena glacialis mortalities between 2003 and 2018," *supra* note 11.

[16] Corkeron, P., Hamilton, P., Bannister, J., Best, P., Charlton, C., Groch, K.R., Findlay, K., Rowntree, V., Vermeulen, E., and Pace, R.M., "The recovery of North Atlantic right whales, *Eubalaena glacialis*, has been constrained by human-caused mortality." *Royal Society Open Science*, vol 5, art. 180892 (2018).

[17] NOAA-NMFS, "2017-2020 North Atlantic right whale Unusual Mortality Event," *supra* note 12.

are one of nine marine species to be at greatest risk of extinction in the United States.[18] In July, the International Union for Conservation of Nature ("IUCN") reclassified the North Atlantic right whale from "endangered" to "critically endangered" on the IUCN Red List of Threatened Species, one step away from "extinction."[19]

Ongoing UMEs exist for other large whales. Alarmingly, 93 minke whales have stranded between Maine and South Carolina from January 2017 to September 2020 (data through September 1, 2020).[20] Elevated numbers of humpback whales have also been found stranded along the Atlantic Coast since January 2016 and, in a little over four years, 131 humpback whale mortalities have been recorded (data through September 1, 2020), with strandings occurring in every state along the East Coast.[21] NMFS' declaration of these UMEs in the past few years for three large whale species for which anthropogenic impacts are a significant cause of mortality[22] demonstrates an increasing risk to whales from human activities along the East Coast.

In addition to endangered and protected large whales, the Western North Atlantic Southern Migratory Coastal stock of bottlenose dolphin is of concern. The stock is considered to be both strategic and depleted under the MMPA due to the number of annual human-caused mortalities and previous UMEs.[23]

We also note that the waters off Cape Hatteras, North Carolina, have the highest marine mammal biodiversity of any area along the East Coast, and compare favorably to other locations internationally renowned for their diversity of species, including waters off Northwest Spain, New Zealand, and South Africa.[24] Nine families and 34 species (29 cetaceans, 4 pinnipeds, and 1 manatee) were recorded for the entire coast of North Carolina in a recent study.[25] In addition to the diversity of species, marine mammals also occur at unusually high densities off Cape Hatteras compared to other areas along the East Coast.[26] In

[18] NOAA-NMFS, "North Atlantic right whale – In the Spotlight." Available at: https://www.fisheries.noaa.gov/species/north-atlantic-right-whale#spotlight.

[19] Cooke, J.G., "Eubalaena glacialis." *The IUCN Red List of Threatened Species*, e.T41712A162001243 (2020). Available at: https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T41712A162001243.en.

[20] NOAA-NMFS, "2017-2020 Minke whale Unusual Mortality Event along the Atlantic Coast." Available at: https://www.fisheries.noaa.gov/national/marine-life-distress/2017-2020-minke-whale-unusual-mortality-event-along-atlantic-coast#:~:text=While%20minke%20whales%20are%20protected,Unusual%20Mortality%20Event%20(UME).

[21] NOAA-NMFS, "2016-2020 Humpback whale Unusual Mortality Event along the Atlantic Coast." Available at: https://www.fisheries.noaa.gov/national/marine-life-distress/2016-2020-humpback-whale-unusual-mortality-event-along-atlantic-coast.

[22] *Id*.; NOAA-NMFS, "2017-2020 North Atlantic right whale Unusual Mortality Event," *supra* note 12; NOAA-NMFS, "2017-2020 Minke whale Unusual Mortality Event along the Atlantic Coast," *supra* note 20.

[23] Hayes, S.A., et al., "U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments – 2017," *NOAA Technical Memorandum NMFS-NE-245*, at pp. 110-124 (Sept. 2018). Available at: https://repository.library.noaa.gov/view/noaa/22730.

[24] Byrd, B.L., Hohn, A.A., Lovewell, G.N., Altman, K.M., Barco, S.G., Friedlaender, A., Harms, C.A., McLellan, W.A., Moore, K.T., Rosel, P.E., and Thayer, V.G., "Strandings as indicators of marine mammal biodiversity and human interactions off the coast of North Carolina." *Fishery Bulletin*, vol. 112, pp.1-23 (2014).

[25] *Id*.

[26] Halpin, P.N., Read, A.J., Fujioka, E.I., Best, B.D., Donnelly, B.E.N., Hazen, L.J., Kot, C., Urian, K., LaBrecque, E., Dimatteo, A., and Cleary, J., "OBIS-SEAMAP: The world data center for marine mammal, sea bird, and sea turtle distributions." *Oceanography*, vol. *22*, pp.104-115 (2009).

light of the outstanding importance for marine mammals, including the aforementioned strategic species and stocks, this area demands special attention from NMFS during the IHA permitting process.

NMFS is obligated under both the ESA and the MMPA to protect the North Atlantic right whale from additional harmful impacts of human activities and required by the MMPA to consider the full range of potential impacts on all marine mammal species, including minke and humpback whales and strategic stocks of small cetaceans, that are known to utilize the proposed survey area(s) and surrounding regions before issuing an IHA with appropriate avoidance, minimization, mitigation, and monitoring measures. NMFS must use the best available scientific information on marine mammal presence and density, as required by law.[27] Considering the elevated threat to federally protected species and populations in the Atlantic, and emerging evidence of dynamic shifts in the distribution of marine mammal habitat, NMFS must ensure that any potential stressors posed by the proposed surveys are mitigated to effectuate the least practicable impact on affected species and stocks.[28]

## III. Concerns Regarding Current Incidental Harassment Authorizations for Marine Site Characterizations Surveys and Necessary Improvements

### *A. NMFS must incorporate additional data sources into calculations of marine mammal density and take*

To comply with statutory requirements of the MMPA, NMFS must base its IHA analysis on the best available scientific information.[29] However, in determining the proportion of marine mammal species and populations taken by the proposed activities—a calculation that lies at the heart of the agency's "small numbers" analysis—NMFS has chosen to rely on estimates of marine mammal densities derived from the habitat-based density model (the "Roberts et al." model) produced by the Duke University Marine Geospatial Ecology Laboratory.[30] While this model has been updated to incorporate additional data sources, including in Cape Cod Bay, and two or more years of data,[31] it still excludes important data sources.

**Of particular concern is NMFS' continuing assertion that the lease areas and cable routes south of Nantucket and Martha's Vineyard are situated only within the North Atlantic right whale**

[27] 16 U.S.C. § 1362(19), § 1362(27).

[28] 16 U.S.C. § 1371(a)(5)(D)(ii)(I).

[29] 16 U.S.C. § 1362(19), § 1362(27).

[30] Roberts, J.J., Best, B.D., Mannocci, L., Fujioka, E., Halpin, P.N., Palka, D.L., Garrison, L.P., Mullin, K.D., Cole, T.V., Khan, C.B. and McLellan, W.A., "Habitat based cetacean density models for the U.S. Atlantic and Gulf of Mexico," *Scientific Reports*, vol. 6, p.22615 (2016); Roberts J.J., Mannocci L., and Halpin P.N., "Final Project Report: Marine Species Density Data Gap Assessments and Update for the AFTT Study Area, 2016-2017 (Opt. Year 1)." Document version 1.4. Report prepared for Naval Facilities Engineering Command, Atlantic by the Duke University Marine Geospatial Ecology Lab, Durham, NC (2017); Roberts J.J., Mannocci L., Schick R.S., and Halpin P.N., "Final Project Report: Marine Species Density Data Gap Assessments and Update for the AFTT Study Area, 2017-2018 (Opt. Year 2)." Document version 1.2 - 2018-09-21. Report prepared for Naval Facilities Engineering Command, Atlantic by the Duke University Marine Geospatial Ecology Lab, Durham, NC. (2018).

[31] *Id*.

**migratory corridor,[32] rather than acknowledging that North Atlantic right whales are now regularly observed aggregating socially and foraging in these areas year-round.** This omission is irresponsible in light of NMFS' current work to develop new regulations to reduce entanglement of North Atlantic right whales,[33] for which the importance of this area as a new aggregation and foraging site forms a central point of consideration. A recent NMFS Technical Memorandum authored by the agency's North Atlantic right whale "Expert Working Group" describes the area "South of the Islands" as "core" North Atlantic right whale foraging habitat during the "Winter/Spring/Summer/Fall."[34] The Roberts et al. model does not adequately capture this increase in habitat use by right whales and, therefore, levels of take based solely on those models will most certainly be underestimates. The Expert Working Group specifically notes the need to improve the North Atlantic right whale habitat model and recommends "a coordinated and unified modeling approach [with Canada] to provide distribution and density predictions across the range of NARW habitat."[35]

Similarly, NMFS defined the North Atlantic right whale migratory corridor as a biologically important area ("BIA") in 2015 before evidence emerged of the new foraging areas south of Martha's Vineyard and Nantucket. While helpful in identifying key areas of importance, the BIAs are not comprehensive and are intended to be periodically reviewed and updated to reflect the best available scientific information.[36] Until this review is undertaken for the East Coast, NMFS should not rely on the North Atlantic right whale migratory corridor BIA as the sole indicator of habitat importance for the species.

NMFS must require that all available data are used to ensure that any potential shifts in North Atlantic right whale habitat usage are reflected in estimations of marine mammal density and take. Additional data can be obtained from sightings databases (*e.g.*, NOAA Right Whale Sighting Advisory System;[37] NEFSC Monthly DMA analysis[38]), and passive acoustic monitoring efforts (*e.g.*, Robots4Whales detections;[39]

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[32] *See*, *e.g.*, 85 Fed. Reg. at 37,872 (Jun. 24, 2020).

[33] *See*, *e.g.*, "Atlantic Large Whale Take Reduction Team Meeting—Key Outcomes Memorandum," Providence, Rhode Island, April 23-26, 2019 (October 2019). Available at: https://www.fisheries.noaa.gov/webdam/download/97751765.

[34] Oleson, E.M., Baker, J., Barlow, J., Moore, J.E., and Wade, P., "North Atlantic Right Whale Monitoring and Surveillance: Report and Recommendations of the National Marine Fisheries Service's Expert Working Group." NOAA Technical Memorandum NMFS-OPR-64 (August 2020), at Fig. 1. Available at: https://www.fisheries.noaa.gov/resource/document/north-atlantic-right-whale-monitoring-and-surveillance-report-and-recommendations.

[35] *Id*., at 22.

[36] "However, these BIAs are meant to be living documents that should be routinely reviewed and revised to expand the number of species covered and to update the existing BIAs as new information becomes available." Van Parijs, S. M., "Letter of introduction to the Biologically Important Areas issue." *Aquatic Mammals*, vol. 41, p.1 (2015).

[37] NOAA Fisheries, "NOAA Right Whale Sighting Advisory System." Available at: https://apps-nefsc.fisheries.noaa.gov/psb/surveys/MapperiframeWithText.html.

[38] NOAA Fisheries, "Interactive DMA Analyses." Northeast Fisheries Science Center, updated September 2019. Available at: https://apps-nefsc.fisheries.noaa.gov/psb/surveys/interactive-monthly-dma-analyses/.

[39] Woods Hole Oceanographic Institution, "Robots4Whales." Available at: http://dcs.whoi.edu/; *See*, *also*, WCS/WHOI, "Autonomous real-time marine mammal detections, New York Bight buoy." Available at: http://dcs.whoi.edu/nyb0218/nyb0218_buoy.shtml; WCS/WHOI, "Autonomous real-time marine mammal detections, New York Bight buoy NW." Available at: http://dcs.whoi.edu/nybnw0120/nybnw0120_buoy.shtml; WCS/WHOI, "Autonomous real-time marine mammal detections, New York Bight buoy SE." Available at: http://dcs.whoi.edu/nybse0120/nybse0120_buoy.shtml.

NEFSC Acoustic Indicators of Right Whale Occurrence[40]). Further, from February 2017 through June 2018, monthly standardized marine mammal aerial surveys were flown in the Massachusetts and Rhode Island and Massachusetts Wind Energy Areas ("WEAs") by the New England Aquarium. Right whales were seen in every season and 14 of the 18 months surveyed.[41] As part of the New England Aquarium Study, a digital acoustic monitoring instrument at Nomans Land station detected right whales throughout the sampling period.[42] During the 2018 Atlantic Marine Assessment Program for Protected Species ("AMAPPS") ship-based surveys,[43] two *foraging* right whales were sighted within the Massachusetts WEA by NMFS researchers studying the potential linkages between biological and physical oceanography and marine mammal sightings on April 7. Additional sightings in the North Atlantic right whale consortium database document 47 right whales in the WEA from March 18, 2018 to April 11, 2018. A study funded by the Bureau of Offshore Energy Management ("BOEM") using autonomous vehicles for real-time monitoring of marine mammals from December 2019 through March 2020 on Cox's Ledge acoustically detected right whales in all months of the study.[44] NMFS should take immediate steps to collate and integrate these different data sets that more accurately reflect marine mammal presence for future IHAs and other work.

As a general matter, the Roberts et al. model does not differentiate between species of pilot whale or seal, or between stocks of bottlenose dolphin, including the depleted and strategic Western North Atlantic Southern Migratory Coastal Stock of bottlenose dolphin. To make up for the general data, NMFS authorizes the total take for each stock of bottlenose dolphins and all pilot whale and seal species.[45] However, the MMPA requires that the agency look at the impact to both species and marine mammal stocks to support a negligible impact finding. A record that provides "general discussions with little, if any, relevance to the population-level effects on specific species and stock, and to conclusory statements that no such effects are expected," is inadequate.[46] Miscalculation of take levels based on incomplete data could have serious implications for the future conservation of these species and stocks.

*B. NMFS must analyze cumulative impacts to North Atlantic right whales and other endangered and protected marine mammal species and stocks as part of the take estimation and permitting process*

[40] Northeast Fisheries Science Center, "Acoustic Indicators of Right Whale Occurrence." Available at: https://apps-nefsc.fisheries.noaa.gov/psb/surveys/interactive-monthly-dma-analyses/.

[41] Quintana, E., Kraus, S., and Baumgartner, M., "Megafauna aerial surveys in the Wind Energy Area of Massachusetts and Rhode Island with emphasis on large whales. Summary Report – Campaign 4, 2017-2018." New England Aquarium and Woods Hole Oceanographic Institution (December 2019).

[42] *Id*.

[43] Northeast Fisheries Science Center and Southeast Fisheries Science Center, "2018 Annual Report of a Comprehensive Assessment of Marine Mammal, Marine Turtle, and Seabird Abundance and Spatial Distribution in US waters of the Western North Atlantic Ocean – AMAPPS II." (2019). Available at: https://www.fisheries.noaa.gov/resource/publication-database/atlantic-marine-assessment-program-protected-species.

[44] Woods Hole Oceanographic Institution, "Autonomous Real Team Marine Mammal Detections: Cox Ledge, Winter 2019-2020," Available at: http://dcs.whoi.edu/cox1219/cox1219_we16.shtml.

[45] *See, e.g.*, 85 Fed. Reg. at 36,537 (Jun. 17, 2020).

[46] *Conservation Council for Hawaii v. NMFS*, 97 F. Supp. 3d 1210, 1223 (D. Haw. 2015).

The spatial and temporal scale of site characterization surveys has increased significantly over the last three years. For example, the Final IHA issued to Orsted Wind Power LLC in 2019, authorizes surveys conducted across a geographic area spanning waters off Massachusetts, Rhode Island, and New York twenty-four hours a day for up to a year, utilizing between five and nine survey vessels at any one time (representing 666 "vessel days").[47] The number of authorizations granted to different applicants in the same geographic region has also increased. This is particularly true of the Lease Areas and associated potential export cable routes off Rhode Island and Massachusetts where there are currently eight separate wind energy projects in various stages of development.[48] Each project has, or will need to, request authorization from NMFS to carry out site assessment and characterization activities that will then be undertaken concurrently or sequentially in space and time.

The operation of multiple, large-scale geophysical surveys within the same area at the same time presents significant potential for cumulative disturbance of strategic and otherwise vulnerable marine mammal species and stocks. The agency acknowledges that "[a]ny disturbance to marine mammals is likely to be in the form of temporary avoidance or alteration of opportunistic foraging behavior near the survey location,"[49] but makes no attempt to account for cumulative impacts from multiple sound sources operating concurrently and continuously across the survey areas. Additionally, "vessel days" are treated equally by the agency in terms of potential impacts to marine mammals[50] even though there are times of year when some species have higher vulnerability to noise exposure from the survey activities being undertaken (*e.g.*, during foraging periods), or may have reduced ability to avoid noise exposure due to multiple survey vessels operating in the same vicinity at the same time.

**We are extremely concerned about the cumulative impacts of survey activities in the Lease Areas and associated potential cable export routes off Rhode Island and Massachusetts on North Atlantic right whales.** These areas coincide directly with year-round "core" North Atlantic right whale foraging habitat[51] and well as ESA critical habitat.[52] Protection of North Atlantic right whales during foraging, and the protection of their foraging habitat, must be one of NMFS' highest priorities. Foraging areas with suitable prey density are limited relative to the overall distribution of North Atlantic right whales, and a decreasing amount of habitat is available for resting, pregnant and lactating females.[53] This means that

[47] 84 Fed. Reg. at 36,055 (Jul. 26, 2019).

[48] *See*, BOEM, "Atlantic OCS Renewable Energy – Massachusetts to South Carolina," (March 30, 2020). Available at: https://www.boem.gov/sites/default/files/images/Map%20of%20Atlantic%20OCS%20renewable%20energy%20areas.jpg

[49] *See*, *e.g.*, 84 Fed. Reg. at 36,054 (Jul. 26, 2019), at 36,065.

[50] *Id*.

[51] Oleson, E.M., et al., "North Atlantic Right Whale Monitoring and Surveillance: Report and Recommendations of the National Marine Fisheries Service's Expert Working Group," *supra* note 34.

[52] 81 Fed. Reg. at 4,837 (Jan. 27, 2016).

[53] Van der Hoop, J., Nousek-McGregor, A.E., Nowacek, D.P., Parks, S.E., Tyack, P., and Madsen, P, "Foraging rates of ram-filtering North Atlantic right whales." *Functional Ecology*, vol. 33, pp. 1290-1306 (2019); Plourde, S., Lehoux, C., Johnson, C. L., Perrin, G., and Lesage, V. "North Atlantic right whale (*Eubalaena glacialis*) and its food: (I) a spatial climatology of Calanus biomass and potential foraging habitats in Canadian waters." *Journal of Plankton Research*, vol. 41, pp. 667-685 (2019); Lehoux, C., Plourde S., and Lesage, V., "Significance of dominant zooplankton species to the North Atlantic Right Whale potential foraging habitats in the Gulf of St. Lawrence: a bioenergetic approach." DFO Canadian Science Advisory Secretariat (CSAS) Research Document 2020/033 (2020). Gavrilchuk, K., Lesage, V., Fortune, S., Trites, A.W., and Plourde,

unrestricted and undisturbed access to suitable areas, when they exist, is extremely important for the species to maintain its energy budget.[54] Scientific information on North Atlantic right whale functional ecology also shows that the species employs a "high-drag" foraging strategy that enables them to selectively target high-density prey patches, but is energetically expensive.[55] Thus, if access to prey is limited in any way, the ability of the whale to offset its energy expenditure during foraging is jeopardized. In fact, researchers have concluded: "[R]ight whales acquire their energy in a relatively short period of intense foraging; even moderate changes in their feeding behavior or their prey energy density are likely to negatively impact their yearly energy budgets and therefore reduce fitness substantially."[56] North Atlantic right whales are already experiencing significant food-stress: juveniles, adults, and lactating females have significantly poorer body condition relative to southern right whales and the poor condition of lactating females may cause a reduction in calf growth rates.[57] NMFS must ensure undisturbed access to foraging habitat to adequately protect the species.

The best available scientific information shows that the North Atlantic right whale population cannot withstand any additional stressors; any potential interruption of foraging behavior may lead to population-level effects and is of critical concern.[58] Currently, NMFS undertakes take analyses and prescribes mitigation measures on a project-by-project basis, leading to inconsistency, inefficiency, and inadequacy. **NMFS must carefully analyze the cumulative impacts from the proposed survey activities on the North Atlantic right whale and other endangered and protected species and stocks and ensure appropriate mitigation of these cumulative impacts. We suggest that the agency advance a programmatic incidental take regulation for site characterization activities.**[59] This will ensure NMFS considers alternatives and mitigation measures at the scale at which impacts will occur and may potentially help increase the pace of environmentally responsible offshore wind development along the East Coast.

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S., "A mechanistic approach to predicting suitable foraging habitat for reproductively mature North Atlantic right whales in the Gulf of St. Lawrence." DFO Canadian Science Advisory Secretariat (CSAS) Research Document 2020/034 (2020).

[54] *Id*.

[55] Van der Hoop, J., et al., *id*.

[56] *Id*.

[57] Christiansen, F., Dawson, S.M., Durban, J.W., Fearnbach, H., Miller, C.A., Bejder, L., Uhart, M., Sironi, M., Corkeron, P., Rayment, W., Leunissen, E., Haria, E., Ward, R., Warick, H.A., Kerr, I., Lynn, M.S., Pettis, H.M., & Moore, M.J., "Population comparison of right whale body condition reveals poor state of the North Atlantic right whale." *Marine Ecology Progress Series*, vol. 640, pp. 1-16 (2020).

[58] *See, e.g., id*; Van der Hoop, J., *et al*., "Foraging rates of ram-filtering North Atlantic right whales," *supra* note 53.

[59] *See* Letter from National Wildlife Federation, Natural Resources Defense Council, National Audubon Society, Conservation Law Foundation, Defenders of Wildlife, Sierra Club, Mass Audubon, New Hampshire Audubon, NY4WHALES, Southern Environmental Law Center, Surfrider, and Whale and Dolphin Conservation, submitted to the Program Manager, Office of Renewable Energy, Bureau of Ocean Energy Management, re: "Vineyard Wind 1 Construction and Operations Plan Supplement to the Draft Environmental Impact Statement." Docket ID: BOEM-2020-0005 (July 27, 2020). Some of our groups have mirrored this recommendation in comments to BOEM. To best account for the impacts of the simultaneous development of multiple lease areas on the North Atlantic right whale, we have stressed that BOEM prepare a full Programmatic Environmental Impact Statement ("EIS") encompassing all U.S. East Coast renewable energy development as soon as possible to inform future offshore wind development. It would be highly beneficial to collectively consider available information on North Atlantic right whales in U.S. Atlantic waters to build a picture of responsible development accounting for the lifespan and migratory movements of the species, which have the potential to overlap with every Lease Area along the U.S. East Coast on a twice-yearly basis (*i.e.*, northern and southern migration). A Programmatic EIS is also particularly timely given the climate-driven shifts in North Atlantic right whale habitat use observed over the past decade as well as significant changes in their conservation status and major threats.

*C. NMFS must not adjust take numbers downward for large whales based on unproven mitigation measures*

In a number of IHAs, NMFS elected to adjust take numbers of endangered large whales downward by as much as 100 percent, based on assumptions that marine mammals will avoid the sound and the presumed effectiveness of mitigation measures. For example, in the IHA for Bay State Wind, issued in 2018, the agency elected to adjust take numbers of North Atlantic right whales to zero "due to the implementation of a 500 m shutdown zone [i.e., exclusion zone or "EZ"], which is greater than the 400 m Level B behavioral harassment zone."[60] For Avangrid Renewables, LLC (issued in 2019), NMFS adjusted take numbers of endangered North Atlantic right whales and fin whales to zero as "the calculated numbers of potential acoustic exposures above the 160 dB threshold are small" and based on the implementation of a 500-m exclusion zone for North Atlantic right whales and a 200-m exclusion zone for fin whales that are greater than or, in the case of fin whales, equal to the calculated Level B harassment zone.[61] In the IHA for Mayflower Wind issued in 2020, NMFS adjusted take numbers for North Atlantic right whales and other large whale species downward by 50 percent, acknowledging risk to the species during the night:

> "… expect[s] the proposed mitigation measures, including a 500-m exclusion zone for right whales (which exceeds the Level B harassment zone by over 350-m), will be effective in reducing the potential for takes by Level B harassment, but there is still a risk that right whales may not be detected within the Level B harassment zone during periods of diminished visibility, particularly at night."[62]

While we appreciate NMFS' decision to authorize fewer Level B takes for the North Atlantic right whale and other endangered and protected species, **we do not share the agency's confidence that it can successfully mitigate Level B harassment simply through the implementation of the IHA mitigation measures currently required.**[63]

Our reasons are threefold. First, NMFS' reliance on a 160 dB threshold for behavioral harassment is not supported by the best available scientific information and grossly underestimates Level B take.[64] Second,

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[60] 83 Fed. Reg. at 22,458 (May 15, 2018).

[61] 84 Fed. Reg. at 17,400 (Apr. 25, 2019).

[62] 85 Fed. Reg. at 37,866 (May 25, 2020).

[63] *E.g.*, In support of the adjustment of take numbers authorized for the Avangrid Renewables, LLC. project, the agency reflects on the success of required monitoring during previous geophysical surveys conducted off the U.S. East Coast: "Marine mammal monitoring reports submitted after the completion of HRG surveys indicated that authorized take numbers have never been exceeded."[63] The assumption inherent in this statement is that the number and nature of takes are possible to accurately determine by what has largely been visual monitoring. Moreover, the agency is proposing to authorize solely Level B take, which is highly unlikely to be detected by visual observation. 84 Fed. Reg. 17,384 (April 25, 2019).

[64] *See, e.g.*, Gomez, C., Lawson, J.W., Wright, A.J., Buren, A.D., Tollit, D. and Lesage, V. "A systematic review on the behavioural responses of wild marine mammals to noise: the disparity between science and policy." *Canadian Journal of Zoology*, vol. 94, pp. 801-819 (2016); Tyack, P.L., and Thomas, L. "Using dose-response functions to improve calculations of the impact of anthropogenic noise." *Aquatic Conservation: Marine and Freshwater Ecosystems*, vol. 29, pp. 242-253 (2019). *See, also*, Letter from the Marine Mammal Commission to Ms. Jolie Harrison, Chief, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service, regarding the IHA requested by Orsted Wind LLC. (June 13, 2018). Available at: https://www.mmc.gov/wp-content/uploads/18-06-13-Harrison-Orsted-Bay-State-IHA.pdf. The Marine

the agency relies on the assumption that marine mammals will take measures to avoid the sound[65] even though studies have not found avoidance behavior to be generalizable among species and contexts[66] and even though avoidance may itself constitute take under the MMPA.[67] Third, we agree with the Marine Mammal Commission that until the effectiveness of mitigation measures are determined, it is premature to include any related assumptions to reduce the numbers of marine mammal takes.[68]

Disturbingly, we have also witnessed an erosion in the strength of mitigation measures in recent IHAs that NMFS has issued compared to previous IHA authorizations for the region, even as the conservation status of the North Atlantic right whale and other species has continued to deteriorate. For example, NMFS required multiple Protected Species Observers ("PSO"), night vision and infrared technology, and passive acoustic monitoring for Bay State Wind in 2018. In subsequent IHAs, NMFS required the use of PSOs as the sole monitoring method[69] and, by Fall 2019, NMFS further weakened requirements to only a single PSO as the primary means of detecting marine mammals during the day, requiring neither night vision or infrared technology nor real-time passive acoustic monitoring.[70]

Collectively, the agency's assumptions regarding acoustic thresholds and mitigation effectiveness are unfounded and NMFS cannot justify any reduction in the number of takes authorized based on these faulty assumptions.

### *D. NMFS must require mitigation measures that meet the least practicable adverse impact standard*

Mammal Commission "…remains concerned that NMFS' current behavior thresholds do not reflect the current state of understanding regarding the temporal and spectral characteristics of various sound sources and their impacts on marine mammals. Therefore, the Commission recommends that, until the behavior thresholds are updated, NMFS require applicants to use the 120- rather than 160-dB re 1 µPa threshold for acoustic, non-impulsive sources (e.g., parametric SBPs, chirps, echosounders, and other sonars including side-scan and fish-finding)."

[65] *See, e.g.*, "We expect that all potential takes would be in the form of short-term Level B behavioral harassment in the form of temporary avoidance of the area, reactions that are considered to be of low severity and with no lasting biological consequences (e.g., Southall et al., 2007)." 85 Fed. Reg. at 37,872.

[66] Miller, P. J. O., Johnson, M. P., Madsen, P. T., Biassoni, N., Quero, M., and Tyack, P. L., "Using at-sea experiments to study the effects of airguns on the foraging behavior of sperm whales in the Gulf of Mexico," *Deep Sea Research Part I: Oceanographic Research Papers*, 56, pp. 1168-1181 (2009); Pirotta, E., Milor, R., Quick, N., Moretti, D., Di Marzio, N., Tyack, P., Boyd, I., and Hastie, G., "Vessel noise affects beaked whale behavior: results of a dedicated acoustic response study." *PloS ONE*, vol. *7*, e42535 (2012). *See, also*, Letter from the Marine Mammal Commission to Ms. Jolie Harrison, Supervisor, Incidental Take Program, Permits and Conservation, Office of Protected Resources, National Marine Fisheries Service, regarding the NMFS 5 September 2014 notice (79 Fed. Reg. 53025) and the letter of authorization (LOA) application submitted by the U.S. Department of the Navy seeking issuance of regulations under section 101(a)(5)(A) of the Marine Mammal Protection Act (the MMPA). (September 15, 2015). Available at: https://www.mmc.gov/wp-content/uploads/Navy_GOA_ANPR_091514.pdf. The Marine Mammal Commission "knows of no scientifically established basis for predicting the extent to which marine mammals will abandon their habitat based on the presence of vessels or aircraft. That would be essential information for adjusting the estimated numbers of takes."

[67] 16 U.S.C. § 1362(18)(A)(ii).

[68] *See, e.g.*, Letter from the Marine Mammal Commission to Naval Facilities Engineering Command, Pacific MITT Supplemental EIS/OEIS Project Manager regarding the U.S. Navy's (the Navy) Draft Supplemental Environmental Impact Statement/Overseas Environmental Impact Statement (DSEIS) for training and research, development, testing, and evaluation (testing) activities conducted within the Mariana Islands Training and Testing (MITT) study area (Phase III; 84 Fed. Reg. 677) (February 11, 2019). Available at: https://www.mmc.gov/wp-content/uploads/19-02-11-Naval-Facilities-Engineering-Command-Pacific-MITT-DSEIS.pdf.

[69] *See, e.g.*, 84 Fed. Reg. at 31,032 (Jun. 28, 2019); 84 Fed. Reg. at 52,464 (Oct. 2, 2019).

[70] *See, e.g.*, 84 Fed. Reg. at 66,156 (Dec. 3, 2019); 85 Fed. Reg. at 55,415 (Sep. 8, 2020).

In authorizing "take" by incidental harassment under the general authorization provision of the MMPA, NMFS must prescribe "methods" and "means of effecting the least practicable adverse impact" on marine mammals and set additional "requirements pertaining to the monitoring and reporting of such taking."[71] Knowing the cumulative risks posed to the North Atlantic right whale and other protected marine mammal stocks by increased site assessment and characterization activities, NMFS has an obligation to impose robust mitigation requirements to protect these species to the maximum extent practicable.

The following site assessment and characterization mitigation measures would help ensure adequate protections for the North Atlantic right whale; many offer protections to other endangered and protected species and stocks as well.

a. Seasonal and diel restrictions

**It is most protective to avoid and reduce impacts in the first instance by separating harmful activities from the species potentially affected.** NMFS should prohibit site assessment and characterization activities involving equipment with noise levels that could cause injury or harassment to North Atlantic right whales (based on the best available science, we consider source levels greater than 180 dB re 1 µPa (SPL) at 1-meter at frequencies between 7 and 35 kHz to be potentially harmful to low-frequency cetaceans[72]) during periods of highest risk to right whales. These periods are defined as times of highest relative density of animals during their migration, and times when mother-calf pairs, pregnant females, surface active groups (indicative of breeding or social behavior), or aggregations of three or more whales (indicative of feeding or social behavior) are, or are expected to be, present, as supported by review of the best available scientific information at the time of the activity (*see* Attachment 2).[73]

Further, while NMFS must minimize existing and potential stressors to the North Atlantic right whale to promote the survival and recovery of the species, the agency must also address potential impacts to other protected whale species, particularly in light of the UMEs declared for humpback whales and minke whales,[74] as well as the several strategic stocks that populate the Atlantic seaboard. It is therefore imperative that NMFS fully account for the consequences of the proposed North Atlantic right whale seasonal restriction on other protected species. NMFS should also advance a robust and effective near real-time monitoring and mitigation system for North Atlantic right whales and other endangered and

[71] 16 U.S.C. § 1371(a)(5)(D)(vi).

[72] *See*, *e.g.*, Gomez, C., et al., "A systematic review on the behavioural responses of wild marine mammals to noise: the disparity between science and policy," *supra* note 64. Tyack, P.L., and Thomas, L., "Using dose-response functions to improve calculations of the impact of anthropogenic noise," *supra* note 64.

[73] Letter from Kraus, S., Quintana, E., Rice, A., Good, C., and Baumgartner, M. to Mr. James Bennet, Chief of the Office of Renewable Energy Programs, Bureau of Ocean Energy Management, and Ms. Donna Wieting, Director, Office of Protected Resources, National Marine Fisheries Service, regarding recommendations for adequate and effective mitigation of noise impacts to the North Atlantic right whale during offshore wind construction (August 2, 2018).For the Rhode Island and Massachusetts and Massachusetts Wind Energy Areas, the scientists recommend a temporary prohibition on pile driving from January 1 to April 30 and an "enhanced mitigation protocol be in place from May 1 through 14 and November 1 through December 31. As North Atlantic right whale distribution is known to be shifting, the scientists recommend the dates of these restrictions and the enhanced mitigation protocol be reassessed every two years by an independent advisory group based on the best scientific and commercial data available.

[74] NOAA-NMFS, "2018-2020 North Atlantic right whale Unusual Mortality Event," *supra* note 12; NOAA-NMFS, "2016-2020 Humpback whale Unusual Mortality Event along the Atlantic Coast," *supra* note 21; NOAA-NMFS, "2017-2020 Minke whale Unusual Mortality Event along the Atlantic Coast," *supra* note 20.

protected species (*see* Section IV: "Advancing Monitoring and Mitigation During Offshore Wind Development").

In addition, when geophysical survey equipment with the potential to injure or harass protected species and stocks is deployed, NMFS should require that work commence, with ramp up, only during daylight hours and good visibility conditions to maximize the probability that marine mammals are detected and confirmed clear of the exclusion zone before activities begin. The activity can then continue into periods of darkness and low visibility. If the activity is halted or delayed because of documented or suspected North Atlantic right whale presence in the area, NMFS should require developers to wait until daylight hours and good visibility conditions to recommence.

b. Adequate monitoring of exclusion zones

As noted above, the 160 dB threshold for behavioral harassment is not supported by best available scientific information and grossly underestimates Level B take (*see* Section III(C)). **For the North Atlantic right whale, NMFS should establish an exclusion zone of 1,000-meters around each vessel conducting activities with noise levels that could result in injury or harassment to this species** (*i.e.*, source levels > 180 dB re 1 μPa (SPL) at 1-meter at frequencies between 7 and 35 kHz). NMFS should establish a minimum exclusion zone of 500 meters for other large whale species and strategic stocks. We agree with NMFS' previous requirements that observations must begin at least 30 minutes prior to the commencement of geophysical survey activity and should be conducted throughout the time of geophysical survey activity. NMFS should require that activity be halted or delayed if a North Atlantic right whale or other species is detected in the relevant exclusion zone.

As noted above in Section C, **NMFS has established a wholly inadequate standard for visual monitoring during marine site characterization surveys and has weakened that inadequate standard over time.** Recently, NMFS approved an IHA that required only a single PSO to be on duty during daylight hours and 30 minutes prior to and during nighttime ramp-ups of HRG equipment,[75] stating that "[v]isual PSOs would coordinate to ensure 360° visual coverage around the vessel from the most appropriate observation posts…"[76] It is not possible for a single PSO to continually visually monitor 360°. NMFS' minimum requirement of a single PSO is underprotective. Furthermore, PSOs are unable to visually monitor the exclusion area during darkness and periods of low visibility. NMFS must require the use of infrared equipment to support visual monitoring by PSOs during periods of darkness.[77]

[75] 85 Fed. Reg. at 45,590-45,591 (Jul. 29, 2020).

[76] *Id*.

[77] Lathlean, J. and Seuront, L., "Infra-red thermography in marine ecology: methods, previous applications and future challenges." *Marine Ecology Progress Series*, vol. 514, p. 263-277 (2014); Smith, H.R., Zitterbart, D.P., Norris, T.F., Flau, M., Ferguson, E.L., Jones, C.G., Boebel, O. and Moulton, V.D., "A field comparison of marine mammal detections via visual, acoustic, and infrared (IR) imaging methods offshore Atlantic Canada." *Marine Pollution Bulletin*, vol. *154*, p.111026 (2020); Zitterbart, D.P., Smith, H.R., Flau, M., Richter, S., Burkhardt, E., Beland, J., Bennett, L., Cammareri, A., Davis, A., Holst, M. and Lanfredi, C., "Scaling the Laws of Thermal Imaging–Based Whale Detection." *Journal of Atmospheric and Oceanic Technology*, vol. 37, pp.807-824 (2020). In addition, NMFS must consider the limitations of the infrared system proposed and ensure that the detection of marine mammals is possible at distances out to and beyond the exclusion zones, in the geographic region in question, and for all relevant endangered and protected species. These technologies have not been well tested for detection of North Atlantic right whales, and may be relatively ineffective for detecting minke whales, both species of concern

Moreover, visual observations are not enough. Studies suggest that North Atlantic right whales exhibit behaviors that reduce their likelihood of detection by PSOs. These behavioral responses may be heightened when whales are in the proximity of the acoustic disturbance from geophysical surveys, meaning that animals may be less detectable by observers during the survey period relative to other times.[78] Other endangered and protected large whales pose similar monitoring challenges. There are also sighting condition limitations. For even the most conspicuous large whale species, estimates of relative detection probability for a Beaufort Sea State of 6 is less than half that for a Beaufort Sea State of 0.[79] Based on data collected by the National Buoy Data Center,[80] a monthly average Beaufort Sea State of at least 3 or 4 can be expected in lease areas situated along the East Coast, year-round. Given these data, observers alone are certain to underestimate the total number of large whales in the mitigation area based on sea state.

NMFS' failure to require using passive acoustic monitoring at any time during geophysical surveys is extremely concerning**. NMFS should require passive acoustic monitoring at all times—not only during nighttime hours—to maximize the probability of detection for North Atlantic right whales, and ideally other protected species and stocks**, including during periods of fog, precipitation, and high sea states, when PSOs and infrared technologies are less effective. It should be noted that passive acoustic monitoring without visual observers would also be insufficient as individuals may not continually vocalize. At minimum, NMFS should always require a combination of agency-approved PSOs to visually detect whales and passive acoustic monitoring to detect vocalizations in real or near-real time when noise levels that could result in injury or harassment to the species are being conducted.

c. Reduction of underwater noise

According to NOAA's "Ocean Noise Strategy Roadmap:"

in light of the current UMEs declared for the Atlantic coast. Further, NMFS should encourage developers to partner with scientists and collect data that increases our understanding of the effectiveness of infrared technologies, with a view towards greater reliance on these technologies to commence surveys during nighttime hours in the future.

[78] Robertson, F.C., Koski, W.R., Thomas, T.A., Richardson, W.J., Würsig, B., and Trites, A.W., "Seismic operations have variable effects on dive-cycle behavior of bowhead whales." *Endangered Species Research*, vol. 21, p. 143-160 (2013).

[79] Barlow, J., "Inferring trackline detection probabilities, g(0), for cetaceans from apparent densities in different survey conditions," *Marine Mammal Science*, vol. 31, p. 923-943 (2015); Baumgartner, M.F., Cole, T.V.N., Clapham, P.J., and Mate, B.R., "North Atlantic right whale habitat in the lower Bay of Fundy and on the SW Scotian Shelf during 1999-2001." *Marine Ecology Progress Series*, vol. 264, p. 137-154 (2003). Sea state has been demonstrated to have a direct effect on the sighting probability of North Atlantic right whales in the Lower Bay of Fundy and in Roseway Basin of the Southwest Scotian Shelf (Baumgartner et al. 2003). In line with Barlow (2015), the probability of sighting a North Atlantic right whale in this area changed by a factor of 0.628 (95% CI: 0.428-0.921) for every unit increase in sea state. These studies indicate the effect of increasing Beaufort Sea State in reducing the probability of detection of large whales, including the North Atlantic right whale. From the findings of Baumgartner et al. (2003), a reduction in detection probability of North Atlantic right whales by up to 84.5 percent based on an average Beaufort Sea State of 4 would be expected, relative to ideal sighting conditions (*i.e.*, Beaufort sea state = 0). Notably, the detectability of North Atlantic right whales even under ideal sighting conditions is likely to be significantly less than 100 percent given availability and perception biases other than those involving sea state.

[80] NOAA-NWS, "National Data Buoy Center." Available at: http://www.ndbc.noaa.gov/.

> "[W]here noise is concerned, mitigation should be broadly designed to do one of two things: (1) reduce the temporal or spatial overlap of ensonified areas with marine taxa (or acoustic habitat) in particular times, places or circumstances, and/or (2) reduce the sound level at the source (which may include replacing the source with a different type of source capable of the same function)."[81]

In addition, simulation studies comparing the level of risk reduction associated with technologies that allow for reduced source levels and current exclusion zone mitigation practices indicate that there will be very few instances where mitigation using visual observers can achieve a greater risk reduction than would be achieved by a reduction in source level.[82] Thus, reducing sound emissions at the source is one the most effective means of mitigating the impacts of noise on protected species.

**NMFS must require IHA applicants to minimize the impacts of underwater noise to the fullest extent feasible, including through the use of best available technology and methods to minimize sound levels from geophysical surveys.** For example, NMFS should require developers to select sub-bottom profiling systems, and operate those systems at power settings, that achieve the lowest practicable source level for the objective. NMFS currently has no such requirements.

*E. NMFS must strengthen its vessel speed restrictions to mitigate the harm of increased vessel traffic*

Vessel collisions are a leading cause of large whale injury and mortality and a primary driver of the East Coast's three ongoing UMEs. Serious injury or mortality can occur from a vessel traveling above 10 knots irrespective of its length.[83] The number of recorded vessel collisions on large whales each year is likely a gross underestimate of the actual number of animals struck, as animals struck but not recovered, or not thoroughly examined, cannot be accounted for.[84] North Atlantic right whales are particularly prone to vessel strike given their slow speeds, their occupation of waters near shipping lanes, and the extended time they spend at or near the water's surface.[85] Some types of anthropogenic noise have been shown to induce sub-surface positioning in North Atlantic right whales, increasing the risk of vessel strike at

[81] Gedamke, J., et al., "Ocean Noise Strategy Roadmap." NOAA Fisheries, (2016), at p. 23. Available at: https://cetsound.noaa.gov/Assets/cetsound/documents/Roadmap/ONS_Roadmap_Final_Complete.pdf.

[82] Leaper, R., Calderan, S., & Cooke, J., "A Simulation Framework to Evaluate the Efficiency of Using Visual Observers to Reduce the Risk of Injury from Loud Sound Sources." *Aquatic Mammals*, vol. 41, pp. 375-387 (2015).

[83] NOAA-NMFS, "Reducing ship strikes to North Atlantic right whales." Available at: https://www.fisheries.noaa.gov/national/endangered-species-conservation/reducing-ship-strikes-north-atlantic-right-whales#:~:text=All%20vessels%2065%20feet%20(19.8,endangered%20North%20Atlantic%20right%20whales. To reflect the risk posed by vessels of any length, the Commonwealth of Massachusetts established a mandatory vessel speed restriction for all vessels (including under 20 meters) in the Cape Cod Bay SMA.

[84] Reeves, R.R., Read, A.J., Lowry, L., Katona, S.K., and Boness, D.J., "Report of the North Atlantic Right Whale Program Review." 13–17 March 2006, Woods Hole, Massachusetts, prepared for the Marine Mammals Commission, (2007); Parks, S.E., Warren, J.D., Stamieszkin, K., Mayo, C.A., and Wiley, D., "Dangerous dining: surface foraging of North Atlantic right whales increases risk of vessel collisions." *Biology Letters*, vol. 8, p. 57-60 (2011).

[85] NOAA-NMFS, "Recovery plan for the North Atlantic right whale (*Eubalaena glacialis*) Revision" prepared by the Office of Protected Resources, National Marine Fisheries Service" (August 2004).

relatively moderate levels of exposure.[86] It is possible that geophysical surveys could produce the same effects, and should therefore be treated conservatively. **The agency has a responsibility to implement mitigation measures to prevent any further vessel collisions for the North Atlantic right whale and other large whale species currently experiencing a UME (*i.e.*, humpback whales and minke whales), as well as other endangered and protected marine mammals (*e.g.*, fin whales), which, in light of the broad distributional shifts observed for multiple species,[87] may be at potential future risk of experiencing a UME.**

NMFS' authorizations acknowledge that vessel strikes can kill animals, that speed is a factor, and that North Atlantic right whales are particularly vulnerable because they are "generally unresponsive to vessel sound" and "more susceptible to vessel collisions,"[88] yet these authorizations only discuss the impacts of survey vessels that generally travel at speeds of less than four knots.[89] This ignores the impacts of all other project vessels on right whales (*e.g.*, crew transfer vessels). While we appreciate that NMFS expressly requires all survey vessels to observe a 10-knot speed restriction within Seasonal Management Areas ("SMAs") or otherwise voluntary Dynamic Management Areas ("DMAs"),[90] NMFS implicitly authorizes project vessels to travel at speeds greater than 10 knots at all other times, unless a right whale is actually observed within 500 meters.[91] This is wholly insufficient. The recent death of a North Atlantic right whale calf off New Jersey[92] indicates how even single or pairs of animals are at risk of vessel strike year-round. North Atlantic right whales had been acoustically detected in the New York/New Jersey Bight region, yet no vessel speed rules were triggered under current regulations. In light of this tragic event, a sighting of three or more North Atlantic right whales is too high a bar to trigger a DMA. As a general matter**, NMFS should require mandatory speed restrictions within DMAs in every instance that a single North Atlantic right whale is sighted or acoustically detected, not just aggregations of three or more whales.** At minimum, NMFS must immediately pay special attention to protecting mother-calf pairs.

As NMFS notes, studies indicate that noise can induce flight responses, behavioral disturbances, habitat avoidance, and stress responses that reduce feeding rates and reproductive success.[93] Because of the noise, geophysical surveys could also cause horizontal displacement[94] and push a North Atlantic right whale out of a protected area (SMA or DMA) into an area where vessels are traveling at greater speed, presenting an

[86] Nowacek, D.P., et al., "North Atlantic right whales (*Eubalaena glacialis*) ignore ships but respond to alerting stimuli." *Proceedings of the Royal Society B,* vol. 271 (2004).

[87] Davis, G.E., Baumgartner, M.F., Corkeron, P.J., Bell, J., Berchok, C., Bonnell, J.M., Bort Thornton, J., Brault, S., Buchanan, G.A., Cholewiak, D. and Clark, C.W., "Exploring movement patterns and changing distributions of baleen whales in the western North Atlantic using a decade of passive acoustic data." *Global Change Biology*, vol. 26, p. 4812-4840 (2020).

[88] *See, e.g.*, 85 Fed. Reg. at 37,862 (Jun. 24, 2020) (citing Nowacek *et al*., 2004).

[89] *See, e.g.*, 85 Fed. Reg. at 37,866 (Jun. 24, 2020)

[90] *See, e.g.*, 85 Fed. Reg. at 55,430 (Sep. 8, 2020).

[91] *See, e.g., id.*

[92] NOAA Fisheries, "Dead North Atlantic Right Whale Sighted off New Jersey" (June 29, 2020). Available at: https://www.fisheries.noaa.gov/feature-story/dead-north-atlantic-right-whale-sighted-new-jersey#:~:text=June%2028%2C%202020,of%20the%202019%2F20%20season.

[93] *See, e.g.*, 85 Fed. Reg. at 37,860-37,862 (Jun. 24, 2020).

[94] *E.g*., Castellote, M., Clark, C.W., and Lammers, M.O., "Acoustic and behavioural changes by fin whales (Balaenoptera physalus) in response to shipping and airgun noise." *Biological Conservation*, vol. 147, pp. 115-122 (2012).

even greater danger of vessel collision. Thus, NMFS' analysis must also account for habitat displacement producing an indirect vessel strike.

**Vessel strikes pose an unacceptable risk. NMFS must require all project vessels operating within or transiting to/from survey areas, regardless of size, to observe a 10-knot speed restriction during the entire survey period.**

*F. NMFS must prohibit extensions of any one-year authorizations through a truncated 15-day comment period as is contrary to the MMPA*

On March 7, 2019, NMFS began issuing notice of a new reauthorization process for a multitude of permits. Specifically, NMFS requests comment on the potential one-year renewal of authorizations on a case-by-case basis for identical or nearly identical activities, with only an additional 15 days for public comment, should various criteria be met.[95]

For several reasons, our organizations have repeatedly opposed this process as contrary to law. First, NMFS' proposal to provide one-year renewals does not comport with the plain language of the MMPA. Section 101(a)(D)(i) unambiguously states that incidental harassment authorizations are valid for periods of not more than one year.[96] Second, the statute is clear on its face that a 30-day comment period is required in all instances.[97] The legislative history of the 1972 Act demonstrates that Congress viewed a robust notice and comment process as central to the agency's implementation of the IHA process: "As approved by the Committee, the [MMPA] involves a number of basic concepts," one being that "the public is invited and encouraged to participate fully in the agency decision-making process."[98] When NMFS adheres to this process, "the public is assured of the right to be informed of actions taken or proposed."[99] Third, the legislative history removes any doubt that this 30-day comment period applies even in cases where a new application extends the IHA for another year without change.[100]

The agency lacks discretionary authority to interpret the statute otherwise, whether by regulation, by policy, or on a permit-by-permit basis as it purports to do here.[101] Moreover, NMFS has not supplied a sufficient explanation for why it might assert that the statutory language of Sec. 101(a)(5)(D)(iii) is ambiguous, such that the agency might appropriately exercise its congressionally-delegated gap-filling

[95] *See, e.g.*, 84 Fed. Reg. at 8,316 (Mar. 7, 2019); 84 Fed. Reg. at 13,246 (Apr. 4, 2019); 84 Fed. Reg. at 8,312 (Mar. 7, 2019); 84 Fed. Reg. at 32,881 (July 10, 2019); 84 Fed. Reg. at 20,336 (May 9, 2019); 84 Fed. Reg. at 72,301 (Dec. 31, 2019); 85 Fed. Reg. at 26,962 (May 6, 2020); 85 Fed. Reg. at 42,832 (July 15, 2020); 85 Fed. Reg. at 33,124 (June 1, 2020); 85 Fed. Reg. at 41,560 (July 10, 2020). In fact, NMFS has begun actually issuing renewals through this new reauthorization process. *See, e.g.*, 84 Fed. Reg. at 17,784 (Apr. 26, 2019); 84 Fed. Reg. at 18,801 (May 2, 2019); 84 Fed. Reg. at 15,598 (Apr. 16, 2019); 84 Fed. Reg. at 41,958 (Aug. 16, 2019); 84 Fed. Reg. at 26,405 (June 6, 2019); 85 Fed. Reg. at 9,740 (Feb. 20, 2020); 85 Fed. Reg. at 37,064 (June 19, 2020); 85 Fed. Reg. at 38,863 (June 29, 2020).

[96] 16 U.S.C. § 1371(a)(5)(D)(i).

[97] *Id.* § 1371(a)(5)(D)(iii).

[98] H.R. Rep. No. 92-707, at 4151 (1972), *reprinted in* 1972 U.S.C.C.A.N. 4144, 4151.

[99] *Id.* at 4146.

[100] H.R. Rep. No. 103-439, at 29 (1994).

[101] *See Chevron, U.S.A., Inc. v. NRDC*, 467 U.S. 837, 842–43 (1984) ("If the intent of Congress is clear, that is the end of the matter; for the court, as well as the agency, must give effect to the unambiguously expressed intent of Congress.").

authority to set forth a permissible interpretation of the statute that comports with the statute's objectives.[102]

Should the agency wish to establish its new IHA renewal process as a reasonable interpretation of an ambiguous statutory provision, it should do so through notice-and-comment rulemaking or comparable process with the appropriate indicia of formality. In so doing, NMFS must also explain why applicants whose activities may result in the incidental harassment of marine mammals over more than one year should not be required to apply for authorization to do so through the incidental take regulation procedure established by Sec. 101(a)(5)(A)(i), which provides for authorizing incidental take during periods of "not more than five consecutive years each."[103] Where Congress established clear and distinct statutory processes for authorizing incidental take via harassment for one-year periods versus periods extending more than one year and up to five years, NMFS must justify how its proposed unlawful hybrid administrative extension process, with a curtailed comment period, is consistent with both statutorily-established processes.

NMFS' statement regarding Incidental Harassment Authorization Renewals on its website[104] fails to provide a clear and legally adequate justification for its purported new reauthorization process especially in light of the burden the foreshortened comment period places on interested members of the public to review and formulate comments, all within 15 calendar days. As NMFS apparently intends the new reauthorization process to become the rule rather than the exception, it is incumbent on the agency to set forth, via proposed regulation or policy document, its rationale for this new process and to allow public comment.

## IV. Advancing Monitoring and Mitigation During Offshore Wind Development

While the best available scientific information justifies the use of seasonal restrictions to temporally separate survey activity from North Atlantic right whales in some areas, it is becoming increasingly clear that there may not be a time of "low risk" for this species. The population size is now so small that any individual-level impact is of great concern. In addition, climate-driven changes in oceanographic conditions, and resulting shifts in prey distribution, are rapidly changing the spatial and temporal patterns of habitat use for North Atlantic right whales and other large whale species.[105] Therefore**, we recommend NMFS work, with relevant experts and stakeholders, towards developing a robust and effective near real-time monitoring and mitigation system for North Atlantic right whales and other**

[102] *See Northpoint Tech. Ltd. v. FCC*, 412 F.3d 145, 151 (D.C. Cir. 2005) (a "'reasonable' explanation of how an agency's interpretation serves the statute's objectives is the stuff of which a 'permissible' construction is made").

[103] 16 U.S.C. § 1371(a)(5)(A)(i) (emphasis added). *See also id.* at § 1371(a)(5)(A)(i)(I) (negligible impact finding must evaluate total of such taking "during each five-year (*or less*) period concerned") (emphasis added).

[104] *See, e.g., NOAA Fisheries*, "Incidental Take Authorizations under Marine Mammal Protection Act," last updated June 24, 2020, https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act.

[105] Davis, G.E., et al., "Exploring movement patterns and changing distributions of baleen whales in the western North Atlantic using a decade of passive acoustic data," *supra* note 87; Davis, G.E., Baumgartner, M.F., Bonnell, J.M., Bell, J., Berchick, C., Bort Thorton, J., Brault, S., Buchanan, G., Charif, R.A., Cholewiak, D., *et al.*, "Long‐term passive acoustic recordings track the changing distribution of North Atlantic right whales (*Eubalaena glacialis*) from 2004 to 2014," *Scientific Reports*, vol. 7, p. 13460 (2017); Record, N., Runge, J., Pendleton, D., Balch, W., Davies, K., Pershing, A., Johnson, C., Stamieszkin, K., Ji, R., Feng, Z. and Kraus, S., "Rapid Climate-Driven Circulation Changes Threaten Conservation of Endangered North Atlantic Right Whales," *Oceanography*, vol. *32*, pp. 162-169 (2019).

**endangered and protected species (*e.g.*, fin, sei, minke, and humpback whales) during offshore wind development.**

The ability to reliably detect North Atlantic right whales and other species on a near real-time basis and adjust survey (and future construction) activities accordingly (*e.g.*, if a North Atlantic right whale is detected with X distance of the survey/construction area on Day 1, no survey/construction activity will be undertaken on Day 2) would enable NMFS to adaptively manage and mitigate risks to protected species in near-real time while affording flexibility to offshore wind developers. This approach could be used in conjunction with seasonal restrictions in North Atlantic right whale foraging areas (*e.g.*, off southern New England), or potentially year-round in the Mid-Atlantic region where a changing climate is leading to novel spatial and temporal habitat-use patterns. A near real-time monitoring and mitigation approach would also minimize risks to other protected species that may be present at high densities at times when North Atlantic right whales are expected to be present in lower numbers (*e.g.*, humpback whale and fin whale foraging aggregations that occur in the summer months in the New York Bight).

There are several technologies in various stages of development that would allow near real-time detection of protected species (*e.g.*, Robots4Whales[106]) and convey that information to decisionmakers (*e.g.*, "Mysticetus"[107]) to inform mitigation action. Near real-time monitoring systems are already being deployed to mitigate risks to North Atlantic right whales. For example, an unmanned acoustic glider capable of auto-detecting North Atlantic right whale calls is currently informing decisions being made by Transport Canada on when to impose vessel speed restrictions in the Laurentian Channel. Ten-knot speed limits can be issued within an hour of North Atlantic right whales being detected.[108] NMFS should evaluate the current status of near real-time detection technologies and develop recommendations for an integrated near real-time monitoring and mitigation system that combines, at minimum, both visual and acoustic detections.

It is also of paramount importance that NMFS encourage and promote adaptive management and robust long-term monitoring to assess impacts as offshore wind is developed and operational. Offshore wind remains a relatively nascent technology in the U.S. and it is therefore imperative that the impact of offshore wind operations on marine wildlife and the ocean ecosystem be closely monitored to guide the industry's adaptive management and future development. It is vital that we gain an understanding of baseline environmental conditions prior to large-scale offshore wind development in the United States. To this end, NMFS must coordinate with BOEM to establish and fund a robust, long-term scientific plan to monitor the effects of offshore wind development on marine mammals and other species before, during, and after large-scale commercial projects are constructed. Without strong baseline data collection and environmental monitoring in place, we risk losing the ability to detect and understand potential impacts and set an under-protective precedent for future offshore wind development. Such monitoring must inform and drive future mitigation as well as potential practical changes to existing operations to reduce any potential impacts to natural resources and wildlife. **We are extremely concerned that no such long-**

[106] Woods Hole Oceanographic Institution WHOI and WHOI/WCS, "Robots4Whales," *supra* note 39.

[107] Available at: https://www.mysticetus.com/.

[108] *See, e.g.*, CBC News, "Underwater glider helps save North Atlantic Right Whales from Ship Strikes," (August 30, 2020), https://www.cbc.ca/news/canada/new-brunswick/nb-north-atlantic-right-whales-underwater-glider-1.5701984.

**term monitoring requirements are currently in place for the first commercial-scale projects in the United States.**

## V. Conclusion

NMFS' current approach to authorizing incidental take of marine mammals during marine site characterization activities for offshore wind energy development is inadequate and not compliant with the law. Our groups request the opportunity to meet with you and your staff to further discuss these issues and necessary improvements in more detail. For further discussion, please contact Michael Jasny (mjasny@nrdc.org) at the Natural Resources Defense Council.

Sincerely,

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Seatuck Environmental Association

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ATTACHMENTS:

1. "ENGO Comments on Proposed IHAs 2018-2020"
2. "Scientist Letter. North Atlantic right whale mitigation measures for offshore wind. 2 Aug 2018"

CC: Mr. James F. Bennett, Program Manager, Renewable Energy Program, Bureau of Ocean Energy Management

**Conservation Law Foundation ● National Wildlife Federation ● Natural Resources Defense Council**

**All Our Energy ● Association to Preserve Cape Cod ● Defenders of Wildlife ● Environmental League of Massachusetts ● International Fund for Animal Welfare ● Mass Audubon ● Nassau Hiking & Outdoor Club ● NY4WHALES ● Seatuck Environmental Association ● Southern Environmental Law Center ● Surfrider Foundation ● Whale and Dolphin Conservation ● Wildlife Conservation Society**

# Best Management Practices for North Atlantic Right Whales During Offshore Wind Energy Construction and Operations Along the U.S. East Coast

North Atlantic right whales are at a critical moment. At their current rate of decline, and in the absence of immediate conservation measures, we will lose this majestic animal within only a few decades. Their most serious threats are fishing gear entanglement, including chronic entanglement where they may drag fishing gear for months or even years, and vessel collisions, one of the leading causes of mortality for all large whales. The probability of a whale suffering a serious injury or mortality from a vessel collision significantly increases when vessels of any length travel at speeds greater than ten knots. North Atlantic right whales are also subjected to numerous stressors during their annual migration along the eastern seaboards of Canada and the United States, including significant levels of noise pollution generated by human activities. Underwater noise can mask important communication calls and reduce foraging success as well as the ability to find mates. Science tells us that such additional stressors force whales to expend extra energy, which negatively affects their health and ability to reproduce successfully. For the North Atlantic right whale to survive and recover, threats must be avoided, minimized, and mitigated to the fullest extent possible.

Our organizations strongly support development of environmentally responsible offshore wind energy along the eastern seaboard of the U.S. as a key to the critical transition away from harmful fossil fuels to a clean energy economy. Offshore wind power provides a tremendous opportunity to fight climate change, reduce local and regional air and water pollution, and grow a new industry that supports thousands of well-paying jobs. While the need for this transition is only growing more urgent, we can and must ensure that all U.S. offshore wind development is guided by science-based measures to avoid, reduce, and mitigate impacts on valuable and vulnerable wildlife, such as the North Atlantic right whale.

Our organizations endorse the measures outlined below as Best Management Practices ("BMPs") for the protection of the North Atlantic right whale during wind energy construction and operations of fixed foundation offshore wind projects off the U.S. East Coast. The BMPs are designed to: (i) reduce co-occurrence of development activities with this sensitive species; (ii) minimize and mitigate any impacts that do occur to the maximum extent practicable, including the prevention of any injury to right whales during construction; (iii) reduce risk of vessel collisions throughout the life of an offshore wind project; and (iv) ensure effective long-term monitoring of the health of marine life present at an offshore wind site to help guide the development of the American offshore wind industry. The below measures are intended to ensure that we can advance imperative, large-scale clean energy solutions while conserving

the health of this iconic whale species. Note that as the science, technology, and regulations related to right whale protection and offshore wind power advance, our groups will periodically reexamine and update these BMPs.

1. Site selection
   Offshore wind projects should not be sited in, at minimum, federally designated North Atlantic right whale critical habitat, as defined under the Endangered Species Act, until: (i) peer-reviewed scientific research determines that offshore wind activities are not likely to jeopardize the continued existence of North Atlantic right whales or adversely modify their habitat; and (ii) research informs the development of comprehensive mitigation measures. However, understanding that designated critical habitat may not include all important foraging, calving, and migratory areas for right whales, care should be taken when siting to avoid and minimize use of areas with consistent seasonal right whale aggregations.

2. Seasonal and temporal restrictions on construction
   Construction activities, including any geophysical surveys necessary to advise final micro-siting decisions, with noise levels that could cause injury or harassment in marine mammals must not occur during periods of highest risk to North Atlantic right whales, defined as times of highest relative density of animals during their migration, and times when mother-calf pairs, pregnant females, surface active groups (indicative of breeding or social behavior), or aggregations of three or more whales (indicative of feeding or social behavior) are, or are expected to be, present, as supported by review of the best available science at the time of development.

   Pile driving and geophysical survey activities should commence, with ramp-up, only during daylight hours and good visibility conditions to maximize the probability that North Atlantic right whales are detected and confirmed clear of the exclusion zone before these activities begin (*see* also 3, below). The activity can then continue into nighttime hours. If the activity is halted or delayed because of documented or suspected North Atlantic right whale presence in the area, developers must wait until daylight hours and good visibility conditions to recommence.

3. Monitoring exclusion zones during construction
   For the North Atlantic right whale, a minimum exclusion zone of 1,000 meters should be established around all vessels conducting activities with noise levels that could result in injury or harassment to this species (*e.g.*, pile driving and geophysical surveys). The size of the exclusion zone should be extended during periods of highest risk to right whales. The activity must be halted or delayed if a North Atlantic right whale is detected in the exclusion zone unless it must proceed for human safety reasons or because, in certain cases, stopping the pile installation mid-way through would result in an unusable turbine foundation.

   To maximize the probability of detection of North Atlantic right whales, comprehensive exclusion zone monitoring is essential. At minimum, a combination of National Marine Fisheries Service ("NMFS") approved Protected Species Observers ("PSOs") to watch for whale presence and passive acoustic monitoring with underwater recorders located in proximity to the exclusion

zone to detect when animals are vocalizing nearby should be required at all times. Staffing and shift-schedules should allow for each PSO to monitor a maximum of 180° during daylight hours. Aerial surveys would also provide a useful supplement to increase detection probability. At night, a combination of night-vision, thermal imaging, and passive acoustic monitoring should be used.

4. Vessel speed restriction for the lifetime of the project
   All vessels operating within or transiting to/from lease areas should observe a speed restriction of ten knots during times when mother-calf pairs, pregnant females, surface active groups, or aggregations of three or more whales are, or are expected to be, present based on best available science. A compulsory vessel speed restriction of ten knots must be required of all industry vessels within any Dynamic Management Area ("DMA") established by NMFS. Crew transfer vessels may exceed a speed of ten knots only if additional monitoring measures are in place, including aerial surveys or a combination of vessel-based visual observers and passive acoustic monitoring. Any collision should be reported immediately following NMFS guidelines.

5. Reduction of underwater noise during construction
   During construction, developers should commit to minimizing impacts of underwater noise on the North Atlantic right whale to the full extent feasible through: (i) the consideration and use of foundation types and installation methods that eliminate or reduce noise; and (ii) the use of technically and commercially feasible and effective noise reduction and attenuation measures, including the use of the lowest practicable source level.

6. Commitment to scientific research and long-term monitoring
   Developers should commit to carrying out scientific research and long-term monitoring in lease areas to advance understanding of the effects of offshore wind development on marine and coastal resources, and the effectiveness of mitigation technologies (*e.g.*, noise attenuation and thermal detection). Science should be conducted in a collaborative and transparent manner, utilizing recognized marine experts, engaging relevant stakeholders, and making results publicly available. Developers should coordinate with state and regional scientific efforts to ensure results from individual lease areas can be interpreted within a regional context and contribute to the generation of regional-scale data, which is required to address questions related to population-level change and cumulative impacts across the geographic range of the North Atlantic right whale. Developers should engage in regional and state ocean planning efforts and contribute scientific analysis and data as appropriate, including contributions to the regional ocean data portals.

7. Contribution to species conservation efforts
   As a broad commitment to species conservation efforts, offshore wind developers should support mitigation approaches and strategies to reduce other stressors facing potentially affected species such as the critically endangered North Atlantic right whale (*e.g.,* incidental entanglement in fishing gear).

This is an exciting moment for offshore wind energy development along our Atlantic coast. Several states have adopted ambitious offshore wind goals, with a combined total of over 15,000 MW committed by 2035. Many large-scale offshore wind projects are now advancing through the permitting process and are expected to be built off the East Coast over the next ten years, providing enough clean renewable electricity to power at least 5 million homes. These protective measures will help advance the offshore wind energy industry in a responsible manner that protects vulnerable North Atlantic right whales, and we call on all developers to adopt them as they design, build, and operate offshore wind turbines in U.S. waters.

**Transportation – Chapter 5**

1. **Connecticut should increase zero-emission vehicle rebates for low and moderate-income residents.**

While electric vehicle adoption continues to grow, it is not increasing at rates necessary for Connecticut to achieve its commitment under the multi-state zero-emission vehicle ("ZEV") program of having 125,000-150,000 ZEVs on its roads by 2025.

To accelerate the adoption of electric vehicles ("EV") and give more drivers the opportunity to switch to cleaner vehicles, we urge Connecticut to increase the rebate levels to purchase new and used EVs for low- and moderate-income ("LMI") consumers, generally residents earning up to 120 percent of the statewide median income. Oregon offers LMI drivers who live in areas with elevated levels of air pollution an additional rebate of $2,500 to replace a car that is at least 20 years old.[1] More locally, Maine offers qualified low-income residents rebates of up to $3,000 for EVs.[2] Eighty percent of new EVs are leased, providing a growing secondary market for used electric vehicles and the opportunity to expand the consumer base.[3] Pre-owned EVs are affordable and while early generation EVs might have limited range, they are well-suited to cover the 29 miles that an average driver commutes every day.[4] Moreover, as battery range and performance of new EVs improve, so will the quality of vehicles available in the secondary market.

2. **Connecticut should ramp up its investment in EV charging infrastructure, particularly for LMI and environmental justice communities.**

Access to charging infrastructure, whether at home, at work, or on the go, remains a key barrier to the wider adoption of EVs. A recent report indicates that Hartford has less than 30% of workplace and public charging infrastructure needed by 2025 to sustain the transition to electric

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[1] Oregon Clean Vehicle Rebate Program, https://www.oregon.gov/deq/aq/programs/Pages/ZEV-Rebate.aspx.
[2] Efficiency Maine, Electric Vehicle Instant Rebates. https://www.efficiencymaine.com/ev/electric-vehicle-rebates/.
[3] Ryan Sclar and Emmett Werthman, "The $6,000 Electric Vehicle: The Power of the Used Car Market to Bring Electric Vehicles to Everyone," World Resources Institute, (August 12, 2019), https://www.wri.org/blog/2019/08/6000-electric-vehicle-power-used-car-market-bring-electric-vehicles-everyone.
[4] U.S. Bureau of Transportation Statistics, https://www.bts.gov/statistical-products/surveys/national-household-travel-survey-daily-travel-quick-facts.

vehicles.[5] Connecticut must accelerate the deployment of charging infrastructure in high priority locations like highways, workplaces, and multi-family residences. In addition, significant charging infrastructure is needed for transit buses and state, municipal, and corporate fleets of light, medium, and heavy-duty vehicles. Addressing this charging gap expeditiously will increase the number of people and fleet owners who switch to driving electric.

On average, residents of color in the northeast region are exposed to $PM_{2.5}$ concentrations from vehicle emissions that are 61 to 75 percent higher than the exposure of white residents.[6] In the United States, while communities of color bear the impact of air pollution, that same pollution is predominately caused by the consumption of goods and services by white residents.[7] As temperatures rise, so will rates of asthma and respiratory disease in neighborhoods through the state as increased heat exacerbates the impacts of air pollution.[8]

Connecticut should focus investments on charging infrastructure in LMI and environmental justice ("EJ") communities. Lack of access to charging infrastructure makes EVs less accessible to these communities, even as advances in technology, programs like CHEAPR, and the growing pre-owned market make EVs more affordable. While the barriers to individual EV ownership in LMI communities are likely to persist in the short term, expanding EV charging infrastructure in LMI and EJ communities ensures that freight, public transit buses, school buses, and other fleets can charge and benefit low-income communities and communities of color who are often burdened by high levels of transportation pollution. It is critical to facilitate the integration of EVs into commercial and industrial fleet operations, which will provide direct air quality improvement benefits to communities through which the EVs – particularly medium- and heavy-duty – operate and travel.

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[5] Michael Nicholas, Dale Hall, Nic Lutsey, "Quantifying the Electric Vehicle Charging Infrastructure Gap Across U.S. Markets," The International Council on Clean Transportation, (January 2019), https://theicct.org/sites/default/files/publications/US_charging_Gap_20190124.pdf.

[6] Union of Concerned Scientists: *Inequitable Exposure to Air Pollution from Vehicles in the Northeast and Mid-Atlantic: Fact Sheet*, 1 (June 2019), https://www.ucsusa.org/sites/default/files/attach/2019/06/Inequitable-Exposure-to-Vehicle-Pollution-Northeast-Mid-Atlantic-Region.pdf.

[7] *See generally* Christopher W. Tessum et al., *Inequity in Consumption of Goods and Services Adds To Racial–Ethnic Disparities in Air Pollution Exposure,* 116 Proceedings of the Nat'l Acad. of Sci. of the U.S. 6001 (2019).

[8] *See* H. Orru et al., *The Interplay of Climate Change and Air Pollution on Health*, 4 Current Envtl. Health Report 504, 504 (2017) ("In general, climate change is expected to worsen air quality in several densely populated regions by changing atmospheric ventilation and dilution, precipitation and other removal processes and atmospheric chemistry.")

3. **There need to be charging options for multifamily buildings and others without access to off-street parking and charging.**

Connecticut must adopt strong EV-ready standards that require all new multifamily homes, buildings, and parking lots to be equipped with the infrastructure needed to install EV charging stations, such as conduits, wiring, and electrical capacity. This will significantly lower costs to install charging stations for residents and businesses. Boston and Brookline in Massachusetts, Atlanta, and San Francisco are some cities that have strong EV infrastructure requirements.[9]

4. **Connecticut should commit to complete electrification of state and municipal fleets by 2035.**

Connecticut's cars, buses, trucks, and trains are the number one contributor of carbon emissions in the state. Public transit and school bus fleets have higher vehicle miles traveled ("VMT") than personal vehicles and therefore present the state with an opportunity to get *bang for its buck* in terms of electrification investments. In 2018, 16.2 percent of automobiles and 15.3 percent of light trucks sold in the U.S. were purchased for fleet use.[10] Such vehicles tend to have higher annual vehicle miles traveled than personal vehicles,[11] which is why targeting fleets is an important first step in the transition to electrification. For example, in 2017, fleet vehicles in the U.S. traveled between 20,000 and 25,000 vehicle miles per year,[12] while the average personal vehicle traveled only 13,476 miles annually.[13]

Electrifying transit and school bus fleets will work to advance and transform the market, thereby contributing to already sharply falling battery and electric bus costs. We urge Connecticut to commit to a transit and school bus fleet that is 50% electric by 2025, 75% by 2030, and 100% by 2035.

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[9]https://www.boston.gov/sites/default/files/file/2019/12/How%20To%20Install%20an%20EVSE.pdf; https://www.brooklinema.gov/DocumentCenter/View/13703/Transportation-Access-Plan-Guidelines-2018-PDF?bidId=; https://www.atlantaga.gov/Home/Components/News/News/10258/1338?backlist=%2fhome; https://sfmayor.org/article/mayor-lee-signs-new-ordinance-make-san-francisco-electric-vehicle-ready

[10] ZEV Task Force, *Multi-State ZEV Action Plan: Accelerating the Adoption of Zero Emission Vehicles*, 28 (2018).

[11] *Id.*

[12] Oak Ridge National Laboratory, *Transportation Energy Data Book, Edition 37*, 7-4 (April 2019) https://tedb.ornl.gov/wp-content/uploads/2019/03/Edition37_Full_Doc.pdf#page=194..

[13] U.S. Department of Transportation Federal Highway Administration, *Average Annual Miles per Driver by Age Group*, (March 29, 2018) https://www.fhwa.dot.gov/ohim/onh00/bar8.htm.

### *A. **Connecticut should establish a procurement plan that requires purchasing only electric transit buses beginning by 2025.***

Transit bus networks across the State transport the highest number of low-income riders dependent on transit, with many routes running through neighborhoods overburdened by air pollution. A recent study showed that on average, communities of color in the Northeast and Mid-Atlantic breathe 66% more air pollution from vehicles than white residents.[14] This health inequity makes it critical that the deployment of electric buses is prioritized in environmental justice communities and on routes most impacted by pollution.

Electric bus technology offers the most consequential reductions in NOx, carbon monoxide, and particulate matter emissions that have been linked to cardiovascular and respiratory illnesses. Electric buses are also four times more efficient than their fossil fuel counterparts and offer long-lasting financial benefits to transit agencies. For instance, the Chicago Transit Authority has saved more than $50,000 each year in fuel and maintenance costs on just two electric buses since 2014.[15]

Cities across the country are taking the lead on fleet electrification. All transit agencies in California will be required to procure fully electric buses starting in 2029.[16] New York City, Los Angeles, Chicago, and Seattle have all committed to go 100% electric with their bus fleets.[17] This year, 40 states received $130 million in funding through the Low-No competitive grant program for the deployment of zero emission buses and infrastructure, up from $85 million last year.[18] According to a recent study, investment in electric buses alone could create increased employment of as much as 6,800 additional job-years by 2030.[19]

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[14] https://www.ucsusa.org/resources/inequitable-exposure-air-pollution-vehicles

[15] https://masspirgedfund.org/sites/pirg/files/reports/ElectricBusesInAmerica/US_Electric_bus_scrn.pdf

[16] https://ww2.arb.ca.gov/news/california-transitioning-all-electric-public-bus-fleet-2040

[17] https://ny.curbed.com/2019/5/6/18533462/mta-retires-diesel-buses-rapid-transit-series-all-electric-fleet; https://la.streetsblog.org/2017/11/09/l-a-city-approves-full-ladot-transit-electrification-by-2030/; https://www.masstransitmag.com/bus/vehicles/hybrid-hydrogen-electric-vehicles/article/21076292/chicago-city-council-approves-transition-to-100-percent-renewable-energy; https://www.theurbanist.org/2020/01/31/king-county-purchases-40-battery-powered-buses-and-ponders-full-electrification-by-2035/

[18] https://www.transit.dot.gov/funding/grants/fiscal-year-2020-low-or-no-emission-low-no-bus-program-projects

[19] https://caletc.com/wp-content/uploads/2018/05/4-CalETC-MHDV-Draft-Report-20180410-Final.pdf

To increase the accessibility and usage of public transit, we also recommend increased frequency of buses serving communities with residents that are unable to telecommute because their jobs require them to attend in person, and dedicated bus lanes in congested corridors.

While we are encouraged that interest in fleet electrification in Connecticut continues to grow, we urge the State to move much more quickly and boldly to electrify all transit buses as required by climate laws, air quality inequities, and public health needs. This will include identifying additional funding sources and establishing a dedicated low-cost financing program to accelerate the procurement of electric buses and associated charging infrastructure.

### *B. Connecticut should establish a plan to ensure that municipalities own or operate electric school bus fleets by 2030.*

Most of the school buses on our roads run on diesel, a toxin known to be particularly harmful to children's health. In 2016, the CDC reported that one in 12 children have asthma and that it was most prevalent in black children and children from low-income households.[20] The electric school bus market has expanded to include a number of manufacturers including Lion, Thomas Built Buses, Starcraft, TransTech, and Blue Bird. As of today, there are numerous zero-emission buses manufactured and in operation throughout the United States, with numerous options for battery electric buses.[21] The lifecycle costs of electric buses are lower than that of diesel buses due to reduced fuel costs, fewer maintenance costs, and avoided healthcare expenses.[22] Not only are electric bus lifecycle costs lower, they also are quieter and produce zero tailpipe emissions. Earlier this year, Virginia in partnership with Dominion Energy launched an

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[20] Centers for Disease Control and Prevention, "Vital Signs: Asthma in Children, United States, 2001-2016, (February 9, 2018), https://www.cdc.gov/mmwr/volumes/67/wr/mm6705e1.htm.

[21] A Better City, "New MBTA Bus Maintenance Facilities & Evolving Battery Electric Bus Technology, Case Study: Albany Street Garage," at 5-9, March 2019, https://www.abettercity.org/assets/images/ABC%20--%20New%20MBTA%20Bus%20Maintenance%20Facilities%20&%20Evolving%20Battery%20Electric%20Bus%20Technology%20-%20Final%20Report_%20March_31_2019-compressed.pdf#:~:text=The%20Massachusetts%20Bay%20Transportation%20Authority%20%28MBTA%29%20has%20a,conducted%20by%20the%20Commonwealth%20and%20MBTA%20since%202003.

[22] U.S. PIRG, "Paying for Electric Buses: Financing Tools for Cities and Agencies to Ditch Diesel," at 7-8 (2018), https://uspirg.org/sites/pirg/files/reports/National%20-%20Paying%20for%20Electric%20Buses.pdf. See Environmental and Energy Study Institute, "Battery Electric Buses Fact Sheets: Benefits Outweigh Costs," (October 2018), https://www.eesi.org/files/FactSheet_Electric_Bus_Benefits_Outweigh_Costs_1018.pdf.

ambitious program to replace the entire fleet of ~1050 school buses in its service area to electric by 2030.[23]

5. **Connecticut should plan for vehicle to grid integration**

There is an opportunity to plan for vehicle to grid integration of EVs to maximize the grid reliability and cost-reduction benefits of distributed energy resources. Vehicle to grid integration is beneficial, in part, because it contributes to increased diversity of generation resources on the grid, and with this, increased reliability at lower cost.[24] The role of vehicle to grid integration is to alter the time, charging level, or location at which grid-connected EVs can charge or discharge to provide benefits to ratepayers, avoid distribution infrastructure upgrades, integrate renewable energy resources, reduce the cost of electric supply, and offer reliability options.

6. **Connecticut should prioritize expanding the CHEAPR program to provide rebates to private fleets that operate in LMI and EJ communities.**

As discussed above and in the Draft Report, LMI communities and communities of color are disproportionately impacted by air pollution from vehicles. We are therefore pleased to see that the Draft Report acknowledges the potential equity benefits of electrifying fleet vehicles, particularly in cities with low car ownership rates. We strongly agree with the Draft Report's recommendation that the CHEAPR program be expanded to include rebates that increase EV adoption rates for private fleet vehicles operating in such communities. Connecticut should prioritize electrification of private fleet vehicles in LMI and EJ communities, and should begin by working with environmental justice organizations and other stakeholders to identify the locations that are most in need of prioritized transportation fleet electrification by the end of 2021.

7. **Connecticut should add a displacement mitigation component to its Transit-Oriented Development program.**

Transit-oriented development ("TOD") is an important strategy for reducing VMT and making cities more walkable and accessible. But efforts to reduce emissions from vehicles must consider the history of highway development in reinforcing socioeconomic segregation, as well as the importance of reliable and affordable transportation in accessing economic opportunities and facilitating economic mobility. Connecticut should encourage TOD that disincentivizes private

[23] Clean Technica, "Largest Electric School Bus Program in United States Launching in Virginia, (January 12, 2020), https://cleantechnica.com/2020/01/12/largest-electric-school-bus-program-in-united-states-launching-in-virginia/..

[24] Grid Modernization Order, D.P.U. 12-76-B, at 12 (June 12, 2014).

vehicle use, prevents displacement, and provides greater access to public transit. TOD projects must also build and preserve affordable and family-oriented housing to ensure that those who would most benefit from improved access to transit can afford to live closest to it.

**Buildings – Chapter 2**

With respect to the Draft Report's recommendations regarding the Buildings Sector, CLF proposes the following modifications:

- CLF fully supports the Draft Report's recommendation of modernizing Connecticut's energy efficiency cost effectiveness test to provide a more holistic accounting of the benefits of energy efficiency programs.[25] However, an update of the cost-effectiveness test that places greater weight on the non-energy impacts of energy efficiency programs is relatively meaningless unless Connecticut's energy efficiency programs are required to achieve results at the scale needed to meaningfully impact carbon emissions in the state. Accordingly, in addition to modernizing the cost-effectiveness test, the Connecticut utilities should be strictly required to invest in all measures that are cost effective under that test.
- The Draft Report periodically refers to "renewable thermal technologies," but never defines this term.[26] CLF recommends that the GC3 define the term to mean all-electric heating and cooling equipment, such as air/ground source heat pumps and/or solar thermal for water heating, but excluding biomass, biofuels, renewable natural gas (RNG), and/or hydrogen technologies. Given that the renewable attributes and climate benefits of biomass, biofuels, RNG, and hydrogen are dubious,[27] it is crucial that "renewable thermal technologies" exclude these fuels and/or technologies.

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[25] Draft Report at 9-10.

[26] *See, e.g.*, Draft Report at 17-18, 34.

[27] *See* Chelsea Harvey and Niina Farah, *Congress calls biomass 'carbon neutral.' Scientists disagree*, E&E NEWS (March 23, 2018), https://www.eenews.net/stories/1060077233; Michael T. Ter-Mikaelian, Stephen J. Colombo, and Jiaxin Chen, *The Burning Question: Does Forest Bioenergy Reduce Carbon Emissions? A Review of Common Misconceptions about Forest Carbon Accounting*, 113 J. of Forestry 59 (Jan. 2015); Catherine Morehouse, *Renewable Gas of Electrification? Minnesota's High Stakes Experiment on Building Decarbonization*, UTILITY DIVE (Oct. 1, 2019) https://www.utilitydive.com/news/renewable-gas-or-electrification-minnesotas-high-stakes-experiment-on-bui/564065/; *Rhetoric vs. Reality: The Myth of 'Renewable Natural Gas' for Building Decarbonization*, EARTH JUSTICE & SIERRA CLUB

- In addition to Connecticut's traditional energy efficiency program, which is administered by the Connecticut utilities and funded by the systems benefit charge, and Conservation Adjustment Mechanism, as well as revenues from both ISO-NE's Forward Capacity Market and the Regional Greenhouse Gas Initiative, CLF recommends that the Connecticut Public Utilities Regulatory Authority (PURA), or another appropriate entity, issue an RFP for energy efficiency programs that go beyond the savings provided in Connecticut's typical energy efficiency program. In such an innovative, market-based approach, entities would submit bids to provide enhanced energy efficiency savings for specific programs, potentially bearing the financial risk of such investments. For example, PURA could issue an RFP for entities to install electric heat pumps in multi-unit dwellings. This program would complement, rather than substitute, Connecticut's traditional energy efficiency program.

**Electricity – Chapter 3**

CLF proposes the following modifications to the Draft Report's recommendations for the Electricity Sector:

- Regarding the suggestion that biomass be phased out as a Class I renewable energy source,[28] due to the non-renewable attributes of biomass,[29] CLF recommends that biomass be phased out of Connecticut's Renewable Portfolio Standard (RPS) by 2022, at the latest.
- CLF also recommends that "trash-to-energy" be phased out of Connecticut's RPS. "Trash-to-energy" involves the incineration of solid municipal waste containing many materials derived from fossil fuels. Because the incineration of materials containing fossil fuels releases greenhouse gases into the atmosphere,[30] there is nothing renewable about "trash-to-energy" and, thus, it should not be entitled to RPS

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(July 2020), https://earthjustice.org/sites/default/files/feature/2020/report-decarb/Report_Building-Decarbonization-2020.pdf

[28] Draft Report at 43.

[29] *See supra* note 27.

[30] *See* Tellus Institute, Assessment of Materials Management Options for the Massachusetts Solid Waste Master Plan Review 9, 11 (2008), https://www.tellus.org/pub/Final_Report-Materials_Management_Options_for_MA_SW_Master_Plan_Review_-_With_Appendices_-_12-08.pdf. See also U.S. EPA, Solid Waste Management and Greenhouse Gases, a Life-Cycle Assessment of Emissions and Sinks 76 (3d ed. 2006) ("Combustion of plastics results in substantial net [greenhouse gas] emissions. . . . This result is primarily because of the high content of nonbiomass carbon in plastics."); EPA, Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990–2016, 3-51–3-53 (2018).

subsidies resulting from the sale of renewable energy certificates. Trash incineration facilities also result in significant levels of toxic pollutants to nearby communities. Because the largest trash incineration facilities in Connecticut are located in low-income, marginalized communities in Hartford and Bridgeport, these communities are forced to endure the negative impacts of other communities' waste. Given the Draft Report's focus on equity and environmental justice considerations and the fact that low-income, marginalized communities bear the brunt of the negative health and environmental consequences of trash incineration, the inclusion of "trash-to-energy" facilities in the RPS must be discontinued. CLF recommends that "trash-to-energy" be phased out of the RPS by 2022, at the latest.

- Currently, Connecticut law mandates the procurement of offshore wind projects up to 2,000 MW by 2030. In order for Connecticut to achieve at least 66% percent zero-carbon electricity generation by 2030 and 100% by 2040, as outlined in the Draft Report, CLF recommends that Connecticut mandate procurements of offshore wind projects totaling at least 4,000 MW by 2030.
- The Draft Report suggests a new strategy of addressing the role of new transmission or transmission constraints.[31] While CLF approves of such a strategy, CLF specifically recommends that the GC3 pursue an offshore wind transmission strategy coordinated with the other New England states. This would avoid redundancy and waste in the development of transmission lines, offshore substations, and onshore interconnections points associated with offshore wind and avoid or minimize environmental impacts.
- The Draft Report also states that DEEP should ensure that offshore wind has equal access to the power markets that are controlled by ISO-NE, including fair consideration of true costs, fees, and other measures associated with selection of new energy sources to fulfill power requirements and reliability.[32] Rather than only ensure that offshore wind has equal access to ISO-NE markets, CLF recommends that DEEP work to ensure that *all renewables* have equal access to ISO-NE markets.
- The Draft Report states that effort should be made with federal, state, and other partners to pro-actively establish environmental standards for offshore wind that protect marine life and provide clarity and consistency to energy developers, thereby helping to expedite environmentally sound offshore wind development. Offshore wind development is expected to occur in the important feeding habitat of the North Atlantic right whale (NARW). Given that the NARW is a critically endangered species, with approximately 400 individuals remaining, it is crucial that offshore wind developers take proactive actions to protect NARW during offshore wind site

[31] Draft Report at 48.
[32] Draft Report at 49.

assessment, construction, and operations. Accordingly, CLF recommends that offshore wind developers entering into power purchase agreements with Connecticut electric distribution companies be required to undertake robust protections for NARWs that are consistent with (1) the recommendations to protect NARWs during site characterization activities contained in the attached letter to the National Marine Fisheries Service regarding incidental harassment permits and the attached best management practices for construction and operation developed by CLF and its partners;[33] and (2) that are similar to the NARW protections established for the Vineyard Wind project as part of the groundbreaking agreement between Vineyard Wind, CLF, the National Wildlife Federation, and the Natural Resources Defense Council.[34] In addition, developers should be required to engage in robust wildlife and habitat monitoring before, during, and after construction and to contribute to regional research on the impacts of offshore wind on ocean wildlife and habitat to inform strategies to avoid and mitigate any impacts to the marine environment.

**Non-energy GHG Emissions – Chapter 4**

- The Draft Report urges the replacement of old, leak prone natural gas pipes.[35] Instead of defaulting to the replacement of natural gas infrastructure in all circumstances, which will increase future stranded costs for gas utility customers in the transition to a decarbonized Connecticut, CLF recommends a repair, replace, and retire strategy that considers holistically whether a segment of pipe should be retired and current service customers transitioned to electric heating and appliances before making replacement investments for leak prone natural gas distribution lines.
- Under the strategy for reducing emissions from agriculture, the Draft Report encourages improved predictability of revenue streams from "renewable natural gas" and discusses House Bill 5350, which would have authorized solicited proposals from anaerobic digestion facilities that produce biogas of a quality suitable for injection into the natural-gas distribution system.[36] CLF recommends that the Draft Report clarify the goals for this strategy. CLF believes that this strategy should focus solely on reducing methane emissions from animal waste and should not encourage the injection of biogas into the natural-gas distribution system. Increased reliance on and an induced market for biogas could prove detrimental for CT's overall greenhouse gas emission reduction strategy.

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[33] *See* CLF Comments, Attachments 1-2.
[34] *See* Vineyard Wind—NGO Agreement, January 22, 2019, https://vineyardwind.app.box.com/s/po4b624anvqraghgadm11k7cipjc16r3, last visited October 19, 2020
[35] Draft Report at 60.
[36] Draft Report at 62.

- Regarding the strategy to develop markets for beneficial use of wood and woody waste,[37] CLF recommends that this strategy focus only on local markets and preferably non-combustion end uses for utility trimming and storm residue woody biomass.
- The Draft Report includes a strategy of working with land trusts, forest owners, and working lands managers to adopt carbon-accounting methodologies that further support sustainable land-use practices.[38] While CLF supports this strategy, CLF recommends that the Draft Report also emphasize developing ways to incentive carbon sequestration, as well as enforcement methodologies for entities receiving compensation for carbon sequestration.

**Cross-Sector – Chapter 6**

- The Draft Report recommends implementing an economy-wide carbon fee that assesses the carbon content of fossil fuels and sets a price per ton of carbon emitted. CLF recommends that polluters pay for their emissions and public health harm by establishing a price on carbon (CO2e) in accordance with the social cost of carbon and invest both resources and revenue in the communities most vulnerable to the effects of climate change and most at risk from pollution, displacement, energy burden, health impacts, and other systemic inequities.

[37] Draft Report at 63.
[38] Draft Report at 64.

CLF appreciates the Committee's consideration of its comments and looks forward to issuance of the final report by the Governor's Council on Climate Change.

Sincerely,

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Climate Change Public Comment

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 8:58 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Pallavi Menon <pall.menon@gmail.com>
**Sent:** Wednesday, October 21, 2020 8:53 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Climate Change Public Comment

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To Whom It May Concern:

As a Hartford resident, I write to express my support for the protection of public natural resources in CT. It is my understanding that only 1% of the lush nature in this state is currently protected. This number is disturbing low.

I understand this commission to be working on issues of science, climate change, food, health, and equity, and I urge those involved to consider seriously the importance of preserving our forests, rivers, parks, and trees. As countless studies have shown, our environment affects so many of us in profound and unequal ways. I remain hopeful that CT will take decisive and exemplary action on this front.

Thank you very much for your consideration and work on this important matter.

Pallavi Menon

UCONN
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**Alec Shub <alec.shub@uconn.edu>**

# FW: public comments - protecting nature in CT

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 8:09 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Nahorniak, Pamela <Pamela.Nahorniak@coherent.com>
**Sent:** Wednesday, October 21, 2020 8:06 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** public comments - protecting nature in CT

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

I am writing concerning protecting nature in CT. It is my understanding only 1% of CT is protect for nature. I found this shocking considering we think of ourselves as a 'science believing', intellectual state with many outdoor enthusiasts who is concerned for the community's, the state's and global health. If we want to protect this state for future generations and make it a place worth living we need to protect more than 1% of our beautiful lands for nature. This is critical on so many levels. Please protect nature preserves for the public, for science, for health, for the future, for everything we and the earth need… Thank you.

**Pamela Nahorniak**

Quality Manager, CQE, CQA

Fiber, Fiber Components & Sensors

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Patrice P. Gillespie
258 Silver Spring Road • Wilton CT 06897-1024

October 21, 2020

Dr. Rebecca A. French, Director
CT Office of Climate Planning
CT Dept. of Energy & Environmental Protection
c/o deep.climatechange@ct.gov

RE: Refrigerants Management and the Draft Report of the Mitigation Strategies Working Group[1]

Dear Dr. French,

The following comments are respectfully submitted in reference to the Governor's Council on Climate Change and the work that has been done to date by the GC3's "Progress on Mitigation Strategies" Working Group. I am a member of that working group, and assisted the Non-Energy / Cross-Sector team in compiling two of the recommendations described in the Draft Report dated September 2020.

Note that refrigerants are *not* among the subjects I am familiar with personally. But having learned some new-to-me information[2] just this month about the very dangerous Global Warming Potential of these lesser known greenhouse gases, I reached out to Michal Helme, a refrigerants expert associated with Sustainable Hudson Valley. Michael is a co-founder of the group known as New Yorkers for Cool Refrigerant Management. He was kind enough to review our Draft Report and provide some amplification to our team's recommendations on hydroflourocarbons (HFCs), as follows.

**==========**

***As a member of the United States Climate Alliance, Connecticut should aim to reduce hydrofluorocarbons (HFCs) 40% from 2018 levels by 2030.***

While our national government has abandoned efforts to address climate change, Connecticut joined with other states to form the United States Climate Alliance (USCA), which in 2018 published "*From SLCP Challenge to Action; a roadmap for reducing short-lived climate pollutants to meet the goals of the Paris Agreement*" (a copy of which can be downloaded here). Page 19 of the roadmap says:

*States could take steps to support the global transition away from HFCs, detect and repair leaks, and collect and destroy used refrigerants. By addressing all three areas, states can reverse trends in emissions from this fast-growing sector and reduce them by as much as 40-50 percent by 2030.*

Historically, the United States led global transitions away from ozone depleting substances (ODSs), but in the current transition away from HFCs our country is giving up that leadership. Even so, our country has never been very strong about detecting and repairing leaks or about collecting and destroying used refrigerants. According to a 2016 study prepared by Navigant for the Air-Conditioning, Heating, & Refrigeration Institute, the United States trails Japan, Australia, the UK, the EU, Canada and even California in systematically addressing refrigerants.

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[1] See Chapter 4 in the "Progress on Mitigation Strategies" Draft Report, pages numbered 60-62.

[2] https://drawdown.org/drawdown-review , pages 86, 88 and other references to refrigerants throughout the 2020 publication.

A comprehensive refrigerant management program should emphasize three things:

First, a rapid transition to refrigerants with low global warming potentials (GWPs) that is hastened with incentives for early adoption

Second, strong leak detection and repair programs.

Third, rebates for capturing refrigerants at end of life, and enforcement of penalties for end-of-life emissions. ***A multi-state extended producer responsibility program would be a great way to start this work.***

If DEEP were to investigate the cost effectiveness and green jobs associated with these policies, we believe they would uncover a program that could give Connecticut a huge opportunity to quickly prevent a large amount of greenhouse gas emissions very inexpensively. The target of reducing HFC emissions 40% by 2030 in Connecticut should be part of our larger strategy of addressing the climate crisis, one that we should work toward with other states in the USCA.
=========

I have thanked Michael Helme for sharing the above info and other thoughts with me about how various jurisdictions can implement best practices around the handling of HFCs. Today I passed along some initial ideas to a staff member at Sustainable CT, in hopes that perhaps the exchange of information along these lines could result in a new Refrigerants Management action being designed for Sustainable CT's 2022 Certification program.

Please feel free to contact Michael directly if he can answer any questions about his comments.

Sincerely,

Patrice Gillespie
Board member, Wilton Go Green, Inc.
patricegillespie@mac.com

cc: Michael Helme, Lead Volunteer, Sustainable Hudson Valley; Sustainable Warwick (NY)
Jeff Howard, Ph.D., DEEP Environmental Analyst, Office of Climate Change
Thomas Swarr, co-author of the Mitigations Strategies Draft Report
Charles Rothenberger, Save the Sound; Mitigation Strategies committee co-chair

October 21, 2020

**Comments of the Connecticut Audubon Society on the Governor's Council on Climate Change Draft Working Group Reports.**

Thank you so much for the opportunity to participate in and provide input to the Governor's Council on Climate Change (GC3) Draft Working Group Reports. The reports are extremely thorough and well thought out. The outreach to the environmental community was extensive and participation was impressive. Some of the best conservation minds in the region and in some cases, the world were involved in this process. The daunting challenge will be to compile and prioritize the overwhelming number of recommendations that have come out of the process.

Climate change poses an existential threat to Connecticut's birds, other wildlife and their habitats and to the residents of our state. We must however keep in mind that many of the mitigation strategies that are currently available to us also come with a heavy environmental price tag and we have to be sure that wildlife, disadvantaged communities and even ordinary residents of the state do not bear an unacceptably heavy share of the burden of carbon mitigation efforts. There is an unquestionable need to reduce and eventually eliminate our reliance on fossil fuel-derived energy while also avoiding drastic reductions in the quality of life and massive negative impacts to our fragile ecosystems.

Unfortunately, there is no "free lunch" card when it comes to energy and climate. We have not found an acceptable solution to the matter of nuclear waste nor the inherent local thermal pollution and fish mortality associated with nuclear power cooling systems. We begin with mention of nuclear power because of Connecticut's heavy reliance on the Millstone power plant for our electrical energy needs. Eventually this plant will come offline, making our renewable energy goals even more difficult to achieve without significant negative impacts to ecosystems and the wildlife that depend upon them. This effect is multiplied when one considers the additional electricity that will be needed to enact a transportation transition from gasoline and diesel powered vehicles to electric vehicles.

Offshore wind is an attractive solution, but there are still environmental costs, including disruption to sensitive bottomland habitats for transmission infrastructure, collision hazards and avoidance behaviors with birds of global conservation concern and damage to marine mammals from acoustic impacts of construction, particularly to the critically endangered Northern Right Whale. Hydro power severely impacts riparian health and aquatic habitat connectivity. Solar power has a large footprint impact and can have a devastating fragmentation impact on habitats. The negative impacts of such alternative energy sources needs to be fully considered, minimized and mitigated if we are to achieve our renewable energy goals without unacceptably high ecological costs. The impacts must be considered to not only state and federally listed species and their habitats, but also to species that are considered of global conservation concern on the IUCN (formerly the International Union for the Conservation of Nature) RedList. Minimization of the negative environmental and social impacts of renewable energy and proper siting of such facilities needs to be front and center in the final report.

We firmly believe that the scale of the problem we are facing requires a level of investment only achievable thorough bold action on the federal or even global scale. The most important thing we can do as a state is to join with other like-minded states to work with our federal elected officials to push for bold federal action and investment on research into innovative strategies and technologies for both mitigation and adaptation. A "Manhattan Project" scale investment is required to achieve new and innovative technologies if we hope to be successful.

As to the specific information in the subgroup reports, again we feel that the biggest challenge will be to prioritize and condense the overwhelming number of recommendations. We do feel that there is too little emphasis on active management in the Forests Sub-Group Draft Report. Yes, natural sequestration and carbon storage are an important piece of the equation for our mitigation (and adaptation) strategies, but one cannot dismiss the need to offer private landowners economic incentives to keep their land undeveloped. A robust forest products industry must be a goal of any pathway to maintaining our forests as undeveloped habitat and effective carbon sinks. This will help to provide a myriad of economic incentives to keep private forestlands as undeveloped habitats. Many of the products derived from our forests are of a durable nature and continue to store carbon, while residual tress and the regenerating forests continue to act as sponges to absorb atmospheric carbon. Even non-durable forest products such as locally used firewood can act as a replacement for the release of archeo-carbon through the use of fossil fuels with recently sequestered carbon. Lack of successional diversity in our forests is

a big problem for our wildlife and while old-growth does need to be a goal for some areas, we are equally lacking in the earlier successional stages on both private and public lands. These successional states are management/disturbance dependent and many of them are attractive targets for development and/or for the siting of renewable energy production and infrastructure. A well thought-out, sensible, and appropriate mix of old growth reserves and active management areas needs to be a goal of our overall forest planning and management activities in the state.

Under the Wetlands Sub-Group Draft Report we would like to see an additional recommendation included: Sea level rise and marsh migration should be incorporated into future transportation planning efforts. This would help to minimize the negative impacts to tidal wetlands resulting from transportation adaptation strategies and may offer an opportunity to improve marsh resilience and migration capabilities.

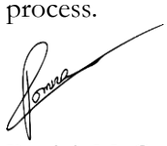
Under the Rivers Sub-Group Draft Report. There should be mention of the Silvio O. Conte National Fish and Wildlife Refuge and how the legislated purposes of the Refuge can assist with adaptation and mitigation efforts within the Connecticut River Watershed. The legislated purposes of the refuge are as follows:

- Protect species listed as endangered or threatened, or identified as candidates for listing, pursuant to the Endangered Species Act of 1973, as amended.
- Conserve, protect, and enhance the Connecticut River watershed populations of Atlantic salmon, American shad, river herring, shortnose sturgeon, bald eagles, peregrine falcons, osprey, black ducks, and other native species of plants, fish, and wildlife.
- Conserve protect, and enhance the natural diversity and abundance of plant, fish, and wildlife species and the ecosystems upon which these species depend within the refuge.
- Restore and maintain the chemical, physical, and biological integrity of wetlands and other waters within the refuge.
- Fulfill the international treaty obligations of the United States relating to fish and wildlife and wetlands.
- Provide opportunities for scientific research, environmental education, and fish and wildlife-oriented recreation and access to the extent compatible with the other refuge purposes.

These legislated purposes offer many tools for watershed protection beyond the scope of an ordinary National Wildlife Refuge and could perhaps be a model for other efforts to conserve the various watersheds of Connecticut. Additionally, there are existing memorandums of understanding between the Department of the Interior, the Department of Defense and Department of Agriculture that could be very useful for implementing adaptation and mitigation strategies.

In general there is too little emphasis on protecting undeveloped components of watersheds, which provide innumerable ecological services, including drinking water protection, wildlife habitat and water quality protection for Long Island Sound. We also need to undertake more aggressive and targeted conservation in headwater areas as an adaptation strategy (building on the 2011 findings and recommendations). Headwaters were seriously underrepresented in the current draft report, with a major focus on waters in urban and suburban areas.

Thank you again for the opportunity to participate and provide input to this important process.



Patrick M. Comins, Executive Director

*Founded in 1898, the Connecticut Audubon Society is an independent organization that conserves Connecticut's environment through science-based education and advocacy focused on the state's bird populations and habitats. We own and manage 20 preserves covering almost 3,300 acres in all areas of the state, and we work with landowners to help them manage their land for the benefit of birds and other wildlife.*

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Concerns

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 11:39 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

---

**From:** Peg Palmer <pegpalmer20@comcast.net>
**Sent:** Wednesday, October 21, 2020 11:21 AM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Concerns



To It May Concern:

As a Haddam and Westbrook resident, I write to express my support for the protection of public natural resources in CT. It is my understanding that only 1% of the beautiful nature in this state is currently protected — a number that is shockingly low.

Since I understand this commission to be currently working on issues of science, climate change and health, I urge those involved to seriously consider the importance of preserving all of our precious natural resources, including forests, rivers, parks, and trees.

As scientific studies have shown, our larger environment affects so many of us in profound ways, and I certainly hope that a state like CT will take swift and decisive action on this important front.

Thank you very much for your consideration and work on this important matter.

Peg Palmer

Sent from my iPhone

To: Connecticut Department of Energy and Environmental Protection
From: Peter Shattuck
Date: October 21st, 2020
RE: Governor's Council on Climate Change Draft Report of the Progress on Mitigation Strategies Working Group

---

Anbaric Development Partners (Anbaric) appreciates the opportunity to provide comments on the Governor's Council on Climate Change Draft Report of the Progress on Mitigation Strategies Working Group ("Draft Report"). Anbaric develops clean energy projects that supply renewable energy to customers and projects that optimize the power grid using energy storage. Anbaric is developing multiple projects in the Northeast, including two projects to interconnect offshore wind directly into Connecticut. Anbaric is additionally exploring development of energy storage projects in Connecticut to integrate renewables and replace peaking power plants.

The Draft Report makes important note of the need for new transmission and energy storage, and these comments elaborate on specific transmission and storage needs and deployment mechanisms.

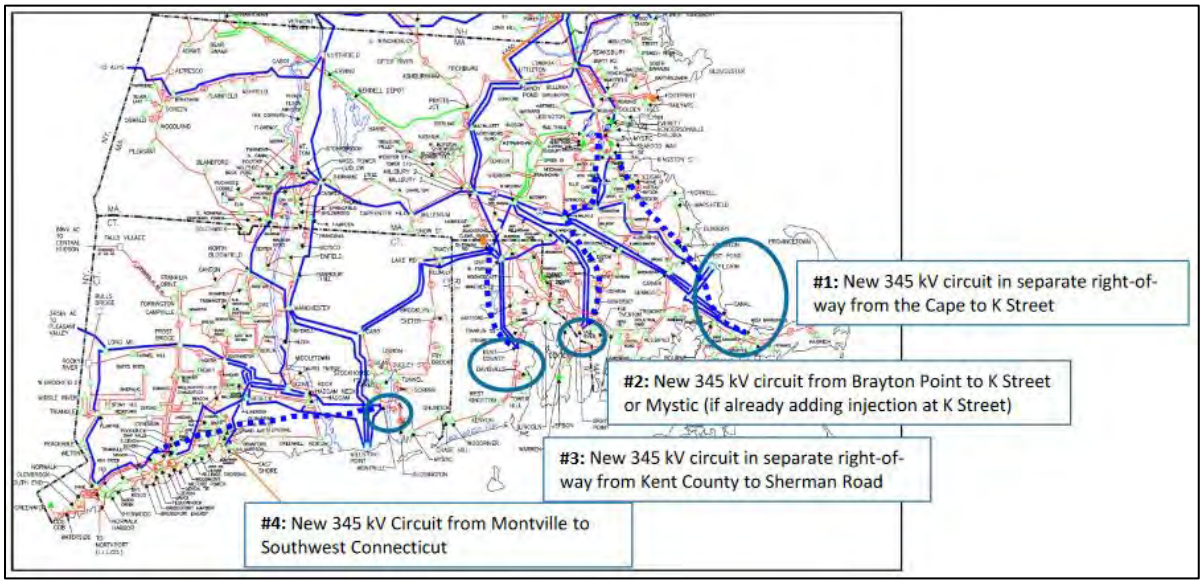
Meeting Connecticut's Energy and Climate Objectives

Enhancing grid infrastructure is central to achieving Connecticut's energy and climate objectives cost effectively. Reaching a 100% zero carbon electric sector by 2040 while accounting for electrification will require a significant increase in non-emitting generation sources. Initial analysis in Connecticut's Integrated Resource Planning (IRP) process finds a need for 28GW of resource additions to enable electrification of heating and transportation and meet 2040 decarbonization goals.[i] These resource additions include 14GW of offshore wind and 5GW of energy storage.[ii]

Upgrading the energy grid in Connecticut and the region is critical to achieving high levels of renewable resource deployment at lowest total cost. Investments in transmission can enable Connecticut to access world-class offshore wind resources and other renewables located distant from load centers. Investments in transmission will also reduce congestion and make better use of renewable resources that might otherwise be curtailed. Better access and utilization will drive down the cost of renewable energy.

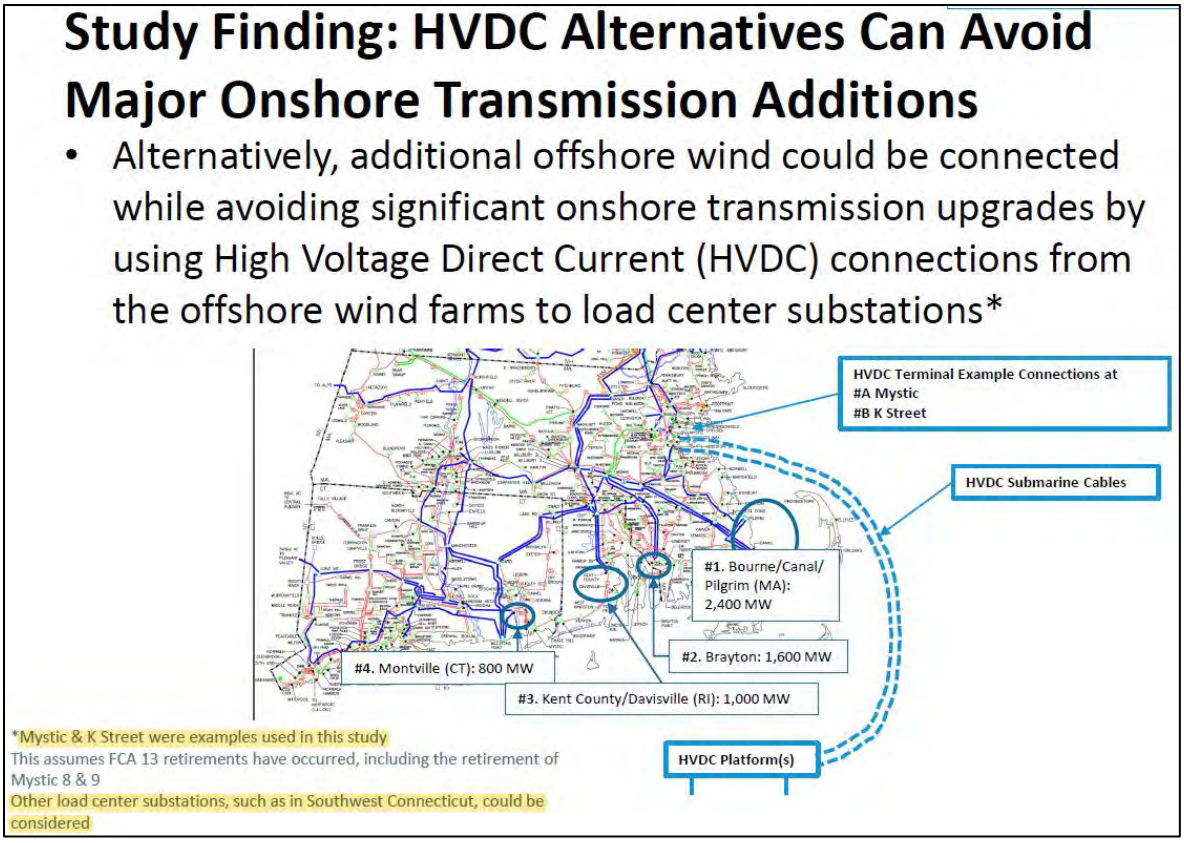
Recent analyses show that strategically developed transmission will enable Connecticut to most cost effectively achieve levels of offshore wind deployment at scale. ISO-NE's Economic Study carried out for Connecticut and other members of the New England States' Committee on Electricity (NESCOE) found that major transmission upgrades would be required to interconnect more than 5,800MW of offshore wind to nearshore locations under the approach pursued to-date by wind farm developers (see Figure 1).[iii]

**Figure 1**: ISO-NE Depiction of New High Voltage Transmission Rights of Way Needed to Connect Over 5,800MW of Offshore Wind to Nearshore Locations




ISO-NE's analysis additionally found that routing offshore wind directly to load centers could avoid the need for major new overland high voltage transmission corridors (see figure 2).

**Figure 2**: ISO-NE Depiction of Direct Offshore Wind Connection to Load Centers (highlight added)



Similar analysis by the Brattle Group found that a planned approach to developing transmission for the next round of offshore wind procurements could avoid over $1.1 billion in onshore grid upgrades and significantly reduce the risk associated with major onshore transmission projects.[iv] These risks of major onshore upgrades are already confronting projects that states have selected, and will likely increase as accessible POIs with available interconnection capacity are used up. Specifically, ISO-NE has estimated upgrade costs of up to $786,883,800 to interconnect 2,400MW of capacity from already-selected projects into Cape Cod,[v] and the grid operator has recently initiated a "cluster study" to determine the significant transmission upgrades needed to connect multiple additional projects to Cape Cod.[vi]

Mitigation Strategies

Connecticut can realize the full potential of offshore wind and overcome grid constraints by procuring independent transmission for offshore wind. The Draft Report recommends that "DEEP should actively address grid constraints to OSW by exploring, assessing and pursuing the most appropriate and feasible solution or solutions (e.g. open ocean grid)." The Draft Report additionally recommends competitive procurements for zero carbon energy through competitive bidding. Anbaric fully supports these recommendations. Absent a solicitation of independent offshore transmission, generators are unlikely to propose injections to locations such as Southwest Connecticut or Boston, as routing longer distances would make their bids more costly than other generator lead line bids connecting to nearshore locations. This reality is reflected in the absence of any interconnection requests by offshore wind generators for either Southwest Connecticut or Boston.

Continuing with the status quo carries risks. ISO-NE's aforementioned cluster study for offshore wind projects connecting to Cape Cod will result in the Mayflower Wind project under contract to Massachusetts being bundled with other uncontracted projects and made responsible for major upgrades to the terrestrial grid. In 2015 Connecticut experienced a similar outcome for a contracted onshore wind project in Maine, which received a project award from Connecticut and then failed for lack of adequate transmission. Earlier Anbaric comments on Connecticut's IRP included a procurement framework[vii] for independent offshore transmission which can be used to inform the path ahead for offshore wind.

Competitive procurement will additionally provide benefits for deployment of energy storage projects needed to decarbonize the electricity system. Competitive procurements drive down costs and reduce risks to ratepayers in comparison to utility rate-basing of storage projects. Private developers can additionally bring technological and commercial innovation to energy storage projects to access multiple revenue streams and reduce costs. Anbaric recommends that Connecticut follow numerous states including California, New York and others that have benefitted from competitive procurements for energy storage.

Additional Benefits

Independent offshore transmission will increase competition between offshore wind developers, leveling the field between leaseholders nearer and farther from shore and driving down prices. (It is worth noting that in the recent Connecticut and Massachusetts offshore wind procurements one of the leaseholders with a lease area farther from shore declined to bid, reducing competition between developers.) In Europe, strategic investments in transmission have enabled countries such as the Netherlands to deploy offshore wind without subsidies or utility-backed contracts.[viii]

Planned transmission can additionally serve as a platform for third-party purchases of renewable energy through power purchase agreements (PPAs), enabling financing and deployment of offshore wind

without relying entirely on state-led procurements. In Texas, strategic investments in transmission through the Competitive Renewable Energy Zone (CREZ) program have enabled over 2,000MW of onshore wind energy PPAs from 22 corporate buyers.[ix] In the Netherlands planned transmission has enabled corporate PPAs for offshore wind.[x] Strategic investment in transmission can enable market-driven offshore wind deployment by large corporate and non-profit entities in the Northeast seeking local renewables to meet sustainability commitments.[xi] For offshore wind in particular it is worth noting that independent, planned transmission is a necessary platform to enable small and mid-sized procurements pursued by third-party buyers. High voltage alternating current (HVAC) transmission systems are most economical in the 300MW to 500MW range, and high voltage direct current (HVDC) systems are most economical in the 1000MW to 1400MW range, both of which are far larger than most third-party buyers can support. However, by making transmission available to serve as a platform for procurement, states can enable third-party purchases and unlock a large source of demand.

Regional Collaboration

Transmission is a shared regional resource, and multi-state collaboration can achieve a scale and impact that no one state can achieve alone. The Northeast States Committee on Electricity recent issued a Vision Statement that calls for regional planning and collaboration on transmission.[xii] Connecticut's leadership in this effort is noted and appreciated. Connecticut should pursue this ambitious effort while pursuing targeted development of transmission to achieve know needs in the near term.

Thank you for the opportunity to comment, and we look forward to continuing engagement in Connecticut's analysis of mitigation strategies.

Peter Shattuck
President, New England
pshattuck@anbaric.com

End notes:

[i] Presentation for *Connecticut Integrated Resources Plan Preliminary Modeling Results Technical Meeting, s*lide 12

[ii] Id., slide 13.

[iii] Available at: https://www.iso-ne.com/static-assets/documents/2020/06/a4_2019_economic_study_offshore_wind_transmission_interconnection_analysis.pdf

[iv] Commissioned by Anbaric, *Offshore Transmission in New England: The Benefits of a Better-Planned Grid* builds on ISO-NE's Economic Studies to calculate costs and evaluate risks associated with two scenarios: 1) the current offshore transmission approach of connecting generator lead lines to nearshore locations, and 2) a planned approach utilizing HVDC to route offshore wind to load centers and robust grid connections. For the next 3,600MW of capacity (approximate demand from CT, MA, RI and other interested states and third parties), the planned approach cost 10% less overall, avoided $1.1 billion in onshore grid upgrades, and significantly reduced risk of cost overruns and delays experienced by recent onshore transmission projects in New England. Study available at: http://ma.anbaric.com/brattlereport/. In public comments to the ISO-NE Planning Advisory Committee Al McBride, Director of Transmission Strategy and Services at ISO-NE stated that the findings of the Brattle report are consistent with ISO-NE's findings.

[v] ISO-NE's Feasibility Study for QP 828 identifies $226,949,000 in upgrade costs with a -50% to +200% range ($113,474,500 to $680,847,000) to interconnect three projects planning to connect to Cape Cod. QP 829 estimates $35,345,600 in upgrades with a -50% to +200% range ($17,672,800 to $106,036,800), in addition to upgrades from QP 828.

[vi] See: https://www.iso-ne.com/static-assets/documents/2020/10/a6_initiation_of_the_cape_cod_resource_integration_study.pdf

[vii] Available at: http://www.dpuc.state.ct.us/DEEPEnergy.nsf/c6c6d525f7cdd1168525797d0047c5bf/6a0b0824b70e311f8525859d001fb8aa?OpenDocument

[viii] See https://www.government.nl/latest/news/2019/07/10/vattenfall-to-build-second-unsubsidised-dutch-offshore-wind-farm

[ix] See *Corporate Renewable Procurement and Transmission Planning,* 2019, available at: https://windsolaralliance.org/wp-content/uploads/2018/10/Corporates-Renewable-Procurement-and-Transmission-Report-FINAL.pdf

[x] See: https://cleantechnica.com/2019/05/28/microsoft-announces-new-offshore-wind-energy-agreement-in-the-netherlands/

[xi] Anbaric has been approached by large energy consumers to explore the potential of enabling third-party PPAs for offshore wind through strategic transmission investments.

[xii] Available at: http://nescoe.com/resource-center/vision-stmt-oct2020/

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 2:27 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: priscilla.dannies@everyactioncustom.com <priscilla.dannies@everyactioncustom.com>
Sent: Wednesday, October 21, 2020 1:54 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Rebecca French,

There are many important problems that need to be tackled after the election, but one that must not be postponed is climate change. I appreciated the chance to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation. Natural climate solutions are an important component of any plan

Thank you again for the opportunity to submit comments.

Sincerely,
Priscilla Dannies
299 Edwards St New Haven, CT 06511-3719 priscilla.dannies@yale.edu

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 5:31 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: tosimaidment@everyactioncustom.com <tosimaidment@everyactioncustom.com>
Sent: Wednesday, October 21, 2020 3:34 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Rebecca French,

Connecticut Department of Energy & Environmental Protection Office of Climate Planning
79 Elm Street
Hartford, CT 06106-5127

Dear Sir/Madam,

I appreciate your collecting comments concerning the GC3 reports. As a citizen of the town of Pomfret, CT, I am most concerned about our state being able to attain Governor Lamont's oft-stated policy of Connecticut reaching 100% zero emissions in electricity as well as other sectors by 2040. This goal will not be attainable if the State allows the NTE Killingly fossil fuel plant to be built. All approvals requested by NTE must be denied. Construction of this plant flies in the face of the Governor's goals. Any policy purporting to address climate change in our region cannot allow the building of new fossil fuel plants.

As I learned from a recent Zoom where PURA director Marissa Gillett appeared, ISO-New England does not make decisions based on the effect of fossil fuel energy in our region and its role in worsening our climate. If our state government cannot force ISO to make climate change the driving factor in its decisions, then Connecticut should withdraw from it. There is no time for ISO to perhaps gradually adapt to the reality of the climate crisis.

As has been often noted, clean energy, transportation, and buildings are the future for our state. The well-paid jobs and encouragement of the required industries will be of great benefit to the Connecticut economy for citizens of all income levels.

Lastly, a greater emphasis on protecting open space, salt-water marshes, and forest through outright purchase, buying development rights, and cooperation with the many non-profits that share conservation goals can be a major part of the mitigation of climate change. We as citizens are called to protect our environment for future generations.

Please accept my comments in the spirit they are intended, as a call to action to keep Connecticut a beautiful place to live both now and in the future.

Thank you.

R. Paul Maidment
P.O. Box 335/263 Drown Road
Pomfret Center, CT 06259

Sincerely,
R. Paul Maidment
263 Drown Rd  Pomfret Center, CT 06259
tosimaidment@charter.net

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Comments on GC3 Working Group Reports

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 2:57 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Rachel Scott <rachel.scott@ccfj.org>
**Sent:** Wednesday, October 21, 2020 2:40 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Cc:** Dwayne Paul <dwayne@ccfj.org>
**Subject:** Comments on GC3 Working Group Reports



Dear Governor's Council on Climate Change Working Group Members:

We write from the Collaborative Center for Justice, a faith-based advocacy organization based in Hartford. We are sponsored by six Congregations of Women Religious across the state. Advocating for policies that protect our common home and advance environmental justice have been focus areas for our work for many years.

We write with comments and recommendations on the work of the Governor's Council on Climate Change as a whole, as well as with a few comments specific to several of the working groups' reports. Thank you for the work of the Council so far, and thank you for the opportunity to comment on these reports.

Our comments on the reports as a whole:

- We believe that Connecticut must go beyond a transition to 100% zero-carbon electricity by 2040, by also including the transportation and building sectors in this goal.
- We believe that Connecticut should abandon plans for the construction of a 650 MW gas power plant in Killingly, and should institute a full ban on the construction of new fossil-fuel infrastructure statewide.
- We believe that equity and environmental justice should continue to be central in the discussions and policy recommendations of all the working groups and throughout the policy-making process. We encourage a robust

public participation process that draws on the experiences and expertise of communities who have been most impacted by pollution and other environmental injustices.

- Connecticut should prioritize a just transition to 100% renewable energy.

Comments on the Science and Technology Working Group report:

- When discussing the future of public transportation, we urge you to include a transition to electric public buses and school buses within the next few years. In addition to climate benefits, this transition would have important public health benefits.

- We appreciate that your report emphasizes the need to increase clean, carbon-free community-based energy. We are supportive of this goal, and also believe the working group should include a more explicit goal of a statewide ban on new fossil-fuel infrastructure.

- We agree that biomass should no longer be considered a renewable energy source. Burning wood or other biomass for energy produces significant carbon emissions and also creates air pollution that is harmful to human health.

- On page 16 of your report, you note that “New England’s forests are recognized globally for their role in climate stabilization.” With this important point in mind, the state should increase formal protections of forests across the state, particularly old growth forests, and make a proactive, funded plan for widespread proforestation efforts.

- Through collaboration with local stakeholders and DEEP, Connecticut should also engage in widespread urban tree planting efforts.

Comments on the Infrastructure and Land Use Working Group report:

- We strongly support the establishment of an Energy Efficiency and Healthy Homes Equity Fund to assist low and moderately low-income households with increasing energy efficiency.

Comments on the Equity and Environmental Justice report:

- We appreciate the emphasis of looking at mitigation and adaptation strategies through an equity lens, as well as prioritizing vulnerable communities in the implementation processes. We were also pleased to see the emphasis on including voices from environmental justice communities, and we urge continued commitment to including meaningful opportunities for public participation throughout the policy making process.

- We support, and would encourage, the implementation of your example of an equitable solar energy project on page 10 of your report. We advocate expansion of community solar projects across the state that will benefit all residents, particularly low- and moderate-income households.

- We are pleased that the subcommittee recognizes green jobs as a potential growth area in the economy. We strongly recommend that women and people of color be prioritized for these well-paying green jobs. This is especially important as Black and brown communities, disproportionately living in urban areas, pay a unique health toll for the state’s pollution.

Thank you again for the opportunity to comment.

Respectfully,

Dwayne David Paul – Director

Rachel Lea Scott, MSW – Associate Director

October 21, 2020

Connecticut Department of Energy & Environmental Protection
Office of Climate Planning
79 Elm Street
Hartford, CT 06106-5127
deep.climatechange@ct.gov

Thank you for providing the public an opportunity to submit comments on the Governor's Council on Climate Change (GC3) working group draft reports.

I believe the Forests report in particular should include more information about the importance of protecting and promoting biodiversity. For example, according to Jones et al. [https://www.nature.com/articles/nature06536], the majority of emerging infectious diseases since 1940 are zoonotic. That is, they travel from animals to people. These diseases include Lyme disease, swine flu, and the novel coronavirus. Here in Connecticut, about half of the ticks carrying Borrelia burgdorferi (the pathogen that causes Lyme disease) pick it up by biting infected white-footed mice. The loss of predators in our forests have allowed these mice to thrive. Protecting our forests and allowing biodiversity to naturally flourish within them will help future generations of Connecticut residents live healthier lives.

To that end, I recommend adopting a more robust "no net loss of forest" policy that formally establishes green corridors within our state that stretch from Long Island Sound to the Massachusetts border. These corridors could provide a framework for defragmenting stretches of our forests and protecting many of our natural ecosystems. They would also allow the plants, animals, and other organisms living in these corridors to migrate north in response to warming temperatures.

Thank you again for welcoming my input.

Sincerely,

Raymond Hinchcliffe
92 Cottage St
East Berlin, CT 06023

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 8:49 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

**From:** Richard Stanley <rjacksonstanley@yahoo.com>
**Sent:** Wednesday, October 21, 2020 8:42 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change, Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit. Nature is essential for the future, for evolution and for everything we need, and serves the public good now and for the long term. We have so many beautiful natural areas, and some need to be protected for nature study, hiking, and places that people can count on. This has never been more important. Meanwhile - we are burning and exporting our public forests? Who benefits? This is beyond disturbing. We need systems that support good jobs, local resource use, AND natural areas. Our public land is held in the public trust. We need your leadership. Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 10:49 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: richard.walser@everyactioncustom.com <richard.walser@everyactioncustom.com>
Sent: Wednesday, October 21, 2020 10:31 AM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant. Battery storage is already replacing power plants across the country and needs to be considered for here in Connecticut.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Richard Walser
53 Woodbine St Hamden, CT 06517-2026
richard.walser@gmail.com

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 6:20 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: rdeglau@everyactioncustom.com <rdeglau@everyactioncustom.com>
Sent: Wednesday, October 21, 2020 5:46 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Rita Deglau
58 Fairview St  Milford, CT 06460-4124
rdeglau@optonline.net

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 5:32 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

**From:** robert burton <rsburton06092@yahoo.com>
**Sent:** Wednesday, October 21, 2020 4:34 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change, Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit. Nature is essential for the future, for evolution and for everything we need, and serves the public good now and for the long term. We have so many beautiful natural areas, and some need to be protected for nature study, hiking, and places that people can count on. This has never been more important. Meanwhile - we are burning and exporting our public forests? Who benefits? This is beyond disturbing. We need systems that support good jobs, local resource use, AND natural areas. Our public land is held in the public trust. We need your leadership. Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Comments on the Working & Natural Lands Working Group & Subgroups Reports

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 10:48 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** LaFrance, Robert <robert.lafrance@audubon.org>
**Sent:** Wednesday, October 21, 2020 10:03 AM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Comments on the Working & Natural Lands Working Group & Subgroups Reports



Dear Dr. French:

In response to DEEP's request for comments to the reports of the Working & Natural Lands Working Group & Subgroups reports, I am sharing some important (and recently released) information concerning the Saltmarsh Sparrow.

An all-hands-on-deck approach to conservation is needed to fully achieve the many objectives laid out in the Saltmarsh Sparrow Conservation Plan.

We hope the GC3 will consider the important recommendations of the this Saltmarsh Sparrow Conservation Plan (as pulled together by the Atlantic Coast Join Venture) as it takes action on Governor Lamont's Executive Order No. 3.

Best,

~Robert

Robert LaFrance

Director of Policy

Audubon Connecticut

National Audubon Society

Robert.LaFrance@Audubon.org

Cell: 203.668.6685

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 11:39 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: rgaxelson@everyactioncustom.com <rgaxelson@everyactioncustom.com>
Sent: Wednesday, October 21, 2020 11:18 AM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

We must aggressive move to renewable energy before it's too late and climate mitigation is the only option. We are too far down that path now. The four recommendations/priorities listed above are a pathway to renewable energy, a safer and more healthy environment, and a world /country that when I'm no longer here, my five grandchildren will have a "chance" to live a life in an environment they deserve so that they can thrive and have the opportunities I have had.

Thank you again for the opportunity to submit comments.

Sincerely,
Roland Axelson
503 Main St  Wethersfield, CT 06109-1850 rgaxelson@gmail.com

American Lung Association.

October 21, 2020

Governor's Council on Climate Change
c/o Department of Energy and Environmental Protection
79 Elm Street
Hartford, CT 06106

Distinguished Members of the Governor's Council Climate Change:

Thank you for the opportunity to weigh in on the GC3 Working Group Draft Reports. The American Lung Association is the oldest voluntary health organization in the country and our mission is to save lives by improving lung health and preventing lung health disease through education, advocacy, and research. It is clear that there has been an impressive level of work and collaboration in creating these reports. Congratulations to you all and thank you. The American Lung Association views climate change as public health emergency and commends the Council for making health and equity priorities within these reports.

As the Lung Association, we are very concerned about the quality of air we all breathe. For over twenty years we have been releasing our "State of the Air" Report which looks at two dangerous pollutants – ozone pollution and particulate matter pollution – to track our progress in cleaning up our air and educating the public about the health risks of exposure to poor air quality. While we have seen great progress throughout our country since the enactment and implementation of the Clean Air Act, climate change is threatening our progress and makes the job of cleaning our air more difficult. It is clear that not only do we need to continue to protect gains made under the Clean Air Act, as states we have a lot more to do.

As air pollution does not recognize state boundaries, efforts on the local, state, regional and national level are all necessary to improving public health. In addition to commenting on the Working Group Draft Reports, we are regularly engaged in the development of the multi-state Transportation Climate Initiative and believe that Connecticut's role in that process is a critical opportunity to continue leading on programs and projects to protect public health locally and inform regional policies to achieve the same.

***Dangerous Air Pollutants***

Ground-level ozone levels are addressed often in these workgroup reports. This is an area the Lung Association has prioritized as well and we recognize the real health risks heightened levels of ozone present, particularly for many at-risk individuals. Ozone pollution, sometimes called "smog," forms in the atmosphere when gases that come from tailpipes, smokestacks, oil and gas extraction and other sources react in the presence of sunlight. Ozone levels most often rise between May and October when temperatures, increased sunlight and stagnant

atmospheric conditions transform air pollutants into ozone. When a person inhales ozone pollution it reacts chemically with the body's internal tissues, causing inflammation — like a sunburn of the lung. Ozone acts as a powerful respiratory irritant at unhealthy levels frequently found across the nation and our state. Ozone pollution causes respiratory harm, early death, and cardiovascular harm, and may cause harm to the central nervous system and reproductive and developmental harm.[1] Rising temperatures from climate change are making it harder to reduce ozone.

Currently, Connecticut's ozone levels are too high. In fact, we have some of the worst ozone levels in the Eastern half of the country. The 2020 "State of the Air" report gave all of Connecticut's eight counties failing grades for ozone levels.[2]

Another air pollutant we focus on is particle pollution – which refers to a mix of tiny solid and liquid particles that are in the air we breathe. Our natural defenses help us to cough or sneeze larger particles out of our bodies. But those defenses don't keep out smaller particles. These particles get trapped in the lungs, while the smallest are so tiny that they can pass through the lungs into the bloodstream, just like the essential oxygen molecules we need to survive. Particle pollution is a known carcinogen and has many other dangerous health impacts including premature death in people with heart and lung disease, nonfatal heart attacks, aggravated asthma, decreased lung function, and increased respiratory symptoms.[3]

Particle pollution also comes from many sources. Factories, power plants, diesel- and gasoline-powered motor vehicles (cars and trucks) and equipment generate a large part of the raw materials for fine particles. Other sources include burning wood in residential fireplaces and wood stoves or wildfires, which also contribute to climate change in the form of black carbon.

It is important to point out that the current National Ambient Air Quality Standards (NAAQS) for ozone and particle pollution are too weak and do not sufficiently protect Americans, so the Air Quality Index likely underestimates the impacts to health of elevated levels of these pollutants. The Environmental Protection Agency (EPA) held hearings in late August and September on their proposal to maintain their inadequate NAAQS for both particle pollution and ozone. The Lung Association has advocated that the EPA follow the science and set a level no higher than 60 parts per billion in order to adequately protect human health.

***Climate Change and Health***

From the direct impact of the temperature and weather changes to the special burdens these changes place on the most vulnerable communities, climate change seriously threatens our wellness – especially our lung health. The science is clear – communities across the nation are experiencing the health impacts of climate change now, which makes the commitment to both mitigation and adaptation key. Many of the sources of climate pollution – including power plants, oil and gas operations, and cars and trucks – also produce pollution that harms health at the same time, such as ozone precursors and particle pollution. The good news is that cleaning up these sources is a win-win for health.

In 2019, the American Lung Association worked with other public health, environmental health, patient advocacy, healthcare, nursing and medical organizations to release A Declaration on Climate Change and Health. As part of this we recognize that children, seniors, pregnant women, low-income communities, communities of color, people with disabilities and people with chronic disease disproportionately bear the health impacts of climate change. The prioritization of environmental justice and equity within the working group draft reports and the specific report on this issue is significant.

The Lung Association supports policies aiming to help Connecticut residents breathe healthy air and reduce the burden of lung disease that air pollution places on our residents and our health care system. The health benefits of emissions reductions are well documented, as are the serious health risks to so many in exposure to air pollution. By moving forward on climate mitigation strategies like improving energy efficiency, increasing and diversifying our renewable portfolio and reducing a wide range of harmful emissions, we can protect public health particularly for the hundreds of thousands in our state at risk for poor health outcomes because of poor air quality.

In addition to our broader support of the concepts raised in these reports, we would like to offer a few specific comments on particular reports and sections.

***Progress on Mitigation Strategies Draft Report***

It is clear from the ideas put forth in this report that we have similar goals for Connecticut to move toward cleaner energy and transportation systems for Connecticut's residents and businesses. The American Lung Association believes that protection of lung health and a sound U.S. energy policy are compatible goals that require an emphasis on energy conservation, energy efficiency, and the transition to non-combustion renewable resources. Our overarching principles call for the implementation of effective air quality programs and standards, transitioning to a clean energy future, with a commitment to promote environmental justice.

Within the ***Buildings*** chapter, we would like to address the goal of energy efficiency funds and a potential lockbox. These goals are aligned with the American Lung Association's policy goals of significantly reducing the demand for energy by increasing the efficiency of homes and businesses. We support programs and policies to encourage consumers and utility companies to expand investment in energy efficiency and energy conservation measures to reduce air pollution emissions, to reduce household energy expenses and to stimulate new economic opportunities and job creation.

When we look at the potential for a lockbox, we recommend using very strong language to protect these funds. Unfortunately, in Connecticut we are all too familiar with seeing funds designated for one purpose being rerouted to the General Fund. We can use lessons learned from another issue integral to our mission – tobacco cessation and prevention work. The Master Settlement Funds and the Tobacco and Health Trust Fund offers a cautionary tale. According to the most recent Tobacco and Health Trust Fund report, "since the inception of

the Trust Fund, slightly over $277 million of the Trust Fund's monies have been statutorily transferred without Board input or approval… The majority of funds have been transferred to the General Fund with the remainder transferred to other programs." This is just from what was initially deposited into the trust fund; this does not address the times that the transfer was never made.[4] Please ensure that ratepayer funds collected for energy efficiency are used for those programs.

Regarding the chapter on ***Electricity***, the American Lung Association supports policies that will drive the deployment of clean, non-combustion energy. The goals establishing targets for off-shore wind, expanding solar and the state's Renewable Portfolio Standards are all policies we support. However, the American Lung Association does not support the use of biomass burning or trash incineration for electricity production because of the dangerous emissions these processes create, and oppose their inclusion in renewable portfolio standards. One major pollutant produced from burning biomass is also one of the most dangerous: particle pollution. Burning biomass also releases carbon monoxide, nitrogen oxides (like nitrogen dioxide) and cancer-causing chemicals, including benzene and formaldehyde. While these pollutants are harmful to us all, they pose even greater health risks for millions of more vulnerable Americans, such as infants and children, older adults, individuals with respiratory or cardiovascular disease, and diabetics.

The goals to implement a shared clean energy program and to identify ways to increase local involvement in energy decision making such as targeting energy efficiency dollars based on local priorities and increasing local government ability to procure zero carbon energy underscore that these workgroups have put some real energy and focus on the equity priority; we support these suggestions.

Within the chapter on ***Non-energy GHG emissions***, specifically methane, the Lung Association supports protective regulations and state-of-the-art pollution controls, including leakage detection and emissions monitoring, throughout the entire system during the exploration, production, transmission, transport, refining and use of oil and natural gas. Reducing methane leakage is critical in our fight against climate change. Methane is extremely effective at retaining heat, fostering the warmer temperatures that have brought us longer and hotter heat waves, increased wildfires and drought and greater risk of ground-level ozone formation. Methane is a greenhouse gas more than 80 times more potent than carbon dioxide in the short term.

The ***Transportation Section*** within this document is significant, as it should be. The transportation sector in Connecticut generates a significant share of our greenhouse gas emissions. We simply cannot ensure clean air and a livable climate for all Americans without addressing transportation in terms of vehicle technologies, aligning transportation funds with meeting clean air and climate standards and ensuring safe, practical and affordable mobility options for all residents. This air pollution threatens the health and lives of so many of our residents, including those who are most vulnerable to harm. We support measures to reduce the air pollution caused by cars, trucks, and other mobile sources. The Lung Association recommends that the state maintain a comprehensive approach to reducing harmful

transportation pollution through a hierarchical approach that includes reducing vehicle miles traveled through prioritization of active transportation (*e.g.* walk, bike), transit investments, and supporting the widespread transition to zero emission technologies that match with local needs so that all residents have access to the most efficient option for each trip. These strategies must remain central to Connecticut's approach to confronting climate change in an equitable, health-protective and sustainable way. Similarly, the Transportation Climate Initiative must be designed to ensure that funding is available to support the transition to more sustainable transportation choices, zero-emission infrastructure and other initiatives that support cleaner air in our most impacted communities.

With that said, all of these have opportunities to reduce emissions and improve health. In September 2020, the American Lung Association released a report entitled "The Road to Clean Air." Our report is grounded in a scenario wherein electric vehicles account for 100 percent of new passenger vehicle sales by 2040 and of heavy-duty truck sales by 2045 -- with other heavy-duty vehicle classes advancing along the way. The report highlights what is possible if immediate actions are taken to support the transition to a zero-emission transportation sector – and target solutions in ways that ensure *all* communities and people benefit, beginning today and into the future.

The report projects that Connecticut could realize a $637 million health benefit in 2050.[5] Too many communities across the United States deal with excessive doses of dangerous pollution from highways and trucking corridors, ports and warehouses and other pollution hot spots. Low-income communities and many communities of color too often bear a disproportionate burden from transportation pollution.

Key policies recommended via our "Road to Clean Air" report include:

- The federal government must also allow states to protect their residents. State authority to adopt and implement the more protective vehicle standards established by California under the Clean Air Act must be defended and maintained, not rolled back.
- Use Clean Air Act authority to adopt the California zero-emission standards for passenger vehicles and medium- and heavy-duty trucks.
    - We strongly support Connecticut's continued adherence to California's more protective vehicle standards and are pleased with Connecticut's endorsement of the 15-state Memorandum of Understanding to pursue the transition to zero emission medium and heavy duty trucks by 2050.
- Pursue fully electric public fleets and support zero-emission infrastructure including in all public buildings and garages.
- Support accelerated fleet turnover through incentive programs targeting older vehicles, consumer purchase decisions via point-of-purchase rebates and non-financial incentives.
- Ensure vehicle registration fees are structured to support electric vehicle deployment and complement —rather than counteract—consumer incentives.
- Invest in publicly available charging infrastructure along major highways and roads to ensure both personal and commercial charging opportunities exist.

In addition to the widespread transition to zero emission technologies, sustained progress toward meeting health-protective climate goals requires reducing the growth in vehicle miles traveled (VMT). As noted on page 89 of the Mitigation Strategies Document, "reducing GHG emissions in the transportation sector will be achieved in part by replacing ICE vehicles with ZEVs in all vehicle categories…Reducing VMT is equally important, especially in passenger vehicles." The document appropriately calls for new actions to support the reductions in VMT growth at the state, regional and local levels, including on page 92, as follows:

- strategy in long-range state and regional transportation plans to reduce vehicle miles traveled and rural sprawl;
- disincentivizing sprawl to inhibit land uses that increase VMT; and
- inclusion of goals for revitalizing transit and transit ridership (a critical strategy for reducing VMT) in COVID-19 recovery plans.

Also noted in the document, there is not a clear benchmark or target in place for VMT reductions over the coming decades in Connecticut. Aligning state and regional transportation strategies toward specific targets would help maintain progress, and should be coupled with regular tracking to allow for course corrections as needed.[1] The benefits of healthy, active transportation strategies were recently highlighted by a multi-university evaluation of TCI investment scenarios which noted that a strong cap on emissions and a strong focus on investment in active transportation and transit could yield the most substantial health benefits, and yield the strongest results in terms of reducing disparities in air pollution exposures.[6]

As noted above, Connecticut has a long history of partnership with California and other states in pursuing more health-protective vehicle emissions and technology standards. The July Memorandum of Understanding between 15 states and Washington DC also sets the pathway to the transition to heavy duty zero emission technologies. As this sector moves forward, it is important to consider the opportunities for other segments of the transportation sector to also be cleaned up, including the on- and off-road freight systems. Under the freight strategies section of the Mitigation strategies, we recommend noting that the shift from trucks to rail and ports must be accompanied by corresponding upgrades to port and rail technologies as the truck fleets move toward zero emission technologies.[2]

[1] As an example of tracking progress toward greenhouse gas reductions via changes in land use and transportation strategies, the California Air Resources Board's 2018 Progress Report on Sustainable Communities Strategies implementation found "that California is not on track to meet the greenhouse gas reductions expected under SB 375 for 2020, with emissions from statewide passenger vehicle travel per capita increasing and going in the wrong direction…" October 2018. https://ww2.arb.ca.gov/resources/documents/tracking-progress

[2] For example, research underway by the California Air Resources Board in the context of policies to clean up the trucking section (including the Advanced Clean Truck and Low NOx Omnibus rules adopted in 2020), indicates that future truck fleets could yield greater reductions in emissions that than rail transportation. California Air Resources Board. DRAFT Truck vs. Train Emissions Analysis. https://ww2.arb.ca.gov/resources/fact-sheets/draft-truck-vs-train-emissions-analysis

***Public Health and Safety***

We are pleased to see continued ozone forecasting and community education included in the report. As part of work with the State Health Improvement Plan, a subgroup on Air Quality and Health was able to get a question included on the state 2018 Behavioral Risk Surveillance Survey to ask about the public's awareness of air quality and whether or not these forecasts impact individual behavior to help protect their health.[7] This provides important baseline data. It is important to note that it can be difficult to get a question like this on the BRFSS, but we should try to get another follow-up question included in a few years. The Lung Association works hard to increase public awareness about air quality and we are happy to help partner with state agencies and community partners on this work. Another resource to look to with this strategy could be the EPA's Air Quality Flag program. Within Connecticut, the Stratford Health Department did extensive work to create a great model for community air quality awareness and education. http://www.townofstratford.com/health/airnow

When it comes to the goal about airborne allergen monitoring, we know that warmer weather from climate change contributes to longer pollen seasons, more pollen and more powerful pollen. The Lung Association supports efforts to further monitor airborne allergens and to increase public awareness of the presence of these allergens and the health risks associated with them.

The one other thing that we want to comment on within this report is the recommendation to establish a Climate and Health Position at the Department of Public Health (DPH). We support this recommendation. While clearly climate change is a significant public health issue, much of this work has traditionally been housed within the Department of Energy and Environmental Protection (DEEP). DPH has a strong interest in this work but lacks the staff and resources to engage as they could. Having a bridge between the health and environment is incredibly important to ensuring proper evaluation — and prioritization — of proposed strategies based on the potential for positive or negative impacts to health.

***Equity and Environmental Justice***

The Lung Association is committed to dismantling systemic racism in public health, healthcare and pollution exposures, advancing health equity and protecting segments of the population who are particularly vulnerable including people disproportionately exposed to causal factors of disease, such as environmental exposures and social stressors, as well as those with less access to quality and affordable health care.

We support the protection of all people from the harm of air pollution, especially those who suffer disproportionate exposure from local sources of emissions. The American Lung Association recognizes that major sources of air pollution are often located near where many communities of color or families with lower income levels live and work, which means their exposure to pollutants emitted can be more immediate and harmful. The American Lung Association recognizes that, for many reasons, people in those communities also face a greater burden of lung disease, making them even more vulnerable to these pollutants.

The American Lung Association recognizes that many factors have contributed to the disproportionate levels of exposure in these communities, including missing or weak limits on emissions, poor enforcement of existing regulations, inadequate monitoring of pollutants and limited scientific research. The American Lung Association supports greater research focus on disparities in pollution burdens, the formulation, execution and enforcement of health and environmental laws and policies to address these factors, clean up contributing sources and reduce such exposures. As we transition to cleaner sources of electricity and healthier modes of transportation, disproportionately burdened communities should be prioritized for clean-up and investment.

The American Lung Association supports regular, thorough assessments of the impacts to nearby communities of sources of dangerous air pollutants, including highways, ports, industrial boilers, power plants, and other sources of air pollution. The American Lung Association supports the aggressive targeting of these sources for cleanup. The American Lung Association is working to reduce the disproportionate health burdens borne by historically marginalized, economically disadvantaged, and politically disenfranchised communities.

We should also note that emissions trading schemes can lead to disproportionate outcomes and extend the life of local pollution burdens. If, for example, a polluting facility purchases carbon pollution credits under a trading scheme rather than cleaning up, the community nearby could continue to bear the burden of toxic air emissions, even as the facility is in compliance with overall carbon emissions standards. It is critical that trading or pricing schemes take proactive design steps to promote health equity, including by directing funds from the purchase of emissions credits to address health in communities near polluting sources, or adapting the program to require more directed reductions if unintended health impacts occur.

These reports demonstrate a commitment to equity. We applaud you and ask that this commitment remain a priority throughout the Governor's Council on Climate Change work. As you know, proactive and meaningful engagement of the communities most impacted by air pollution and climate change is critical to addressing these issues. We also encourage you to ensure a focus on reducing the cumulative impacts of exposure to multiple pollutants that many communities near polluting sources experience.

Thank you to all of the subcommittees for this comprehensive work and for your clear commitment to health equity and climate justice. We appreciate the opportunity to engage in this process and work towards the opportunity for all Americans to breathe healthy air.

Sincerely,

Ruth Canovi, MPH
Director, Advocacy
American Lung Association in Connecticut

[1] Health Effects of Ozone Pollution. Environmental Protection Agency. https://www.epa.gov/ground-level-ozone-pollution/health-effects-ozone-pollution Accessed October 21, 2020.
[2] 2020 State of the Air Report. American Lung Association. www.lung.org/sota Accessed October 20,2020.
[3] Health and Environmental Effects of Particulate Matter (PM). https://www.epa.gov/pm-pollution/health-and-environmental-effects-particulate-matter-pm Accessed October 19, 2020.
[4] Annual Report of the Tobacco and Health Trust Fund Board of Trustees. January 2018. https://portal.ct.gov/-/media/OPM/2017THTFBoardAnnualReportpdf.pdf
[5] The Road to Clean Air. Benefits of a Nationwide Transition to Electric Vehicles. American Lung Association Report. 2020. https://www.lung.org/getmedia/99cc945c-47f2-4ba9-ba59-14c311ca332a/electric-vehicle-report.pdf
[6] Harvard TH Chan School of Public Health, et al. Transportation, Equity, Climate & Health (TRECH) program. Project Research Update Preliminary Results of Five Illustrative TCI Policy Scenarios. October 2020. https://cdn1.sph.harvard.edu/wp-content/uploads/sites/2343/2020/10/TRECHResearchUpdate10.20.pdf
[7] Connecticut Behavioral Risk Factor Survey. Prevalence Estimates for Risk Factors and Health Indicators. Selected Summary Tables. 2018. State of Connecticut Department of Public Health. October, 2019. https://portal.ct.gov/-/media/Departments-and-Agencies/DPH/BRFSS/CTBRFSS2018_Summary_Tables.pdf

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**Alec Shub <alec.shub@uconn.edu>**

# FW: RNG Coalition Feedback on GC3 Working Group Reports

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 1:42 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Sam Lehr <sam.lehr@rngcoalition.com>
**Sent:** Wednesday, October 21, 2020 1:41 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** RNG Coalition Feedback on GC3 Working Group Reports

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Good Afternoon,

Please see attached comments from the Coalition for Renewable Natural Gas (RNG Coalition) containing feedback on the current draft GC3 Working Group reports. We appreciate the comprehensiveness of these reports and the time spent by GC3 in working through the breadth of issues within. Please reach out if we can provide any clarification regarding our feedback or additional information pertaining to RNG.

Thanks,

Sam

**Sam Lehr**

Manager of Sustainability and Markets Policy

*Coalition for Renewable Natural Gas*

O: 916.588.3033

C: 302.757.0866

Web: RNGCoalition.com

Twitter: @CoalitionForRNG

THE COALITION FOR
RENEWABLE
NATURAL GAS

**201021 RNG Coalition on Connecticut GC3 Working Group Reports Final.pdf**
321K

**October 21, 2020**

Governor's Council on Climate Change
Office of Climate Planning
Connecticut Department of Energy and Environmental Protection
79 Elm Street, Hartford, CT 06106-5127

**Feedback on Governor's Council on Climate Change Working Group Recommendations**

To Whom It May Concern:

The Coalition for Renewable Natural Gas (RNG Coalition)[1] offers this letter regarding the draft strategies and framework proposed by the Governor's Council on Climate Change (GC3) working groups pursuant to the development of Connecticut's Climate Action Plan (CAP). Our comments below discuss the potential for Renewable Natural Gas (RNG) to provide greenhouse gas (GHG) reduction and other environmental and economic benefits in Connecticut, with particular focus on the working groups' recommendations.

**About the RNG Coalition and the RNG Industry**

The RNG Coalition is the trade association for the RNG industry in the United States and Canada. Our diverse membership is comprised of leading companies across the entire RNG supply chain, from RNG producers to end-users of the commodity, including waste collection, waste management and recycling companies, engineers, financiers, labor, technology and service providers, manufacturers, law firms, energy marketers and transportation companies, fueling stations and fleets, public and investor-owned utilities, academic institutions and retailers. Together we advocate and educate for the sustainable development, deployment and utilization of RNG, so that present and future generations have access to domestic, renewable, clean fuel and energy in Connecticut and across North America.

The RNG industry is nascent relative to other renewables industries but has shown extraordinary growth in recent years driven by policies designed to promote environmental and economic goals—including but not limited to clean air, improved waste management, increased job development, energy independence, and resource diversity. Most of the RNG projects developed since 2011 have been incentivized by transportation decarbonization programs, including the Unites States Environmental Protection Agency's (U.S. EPA) Renewable Fuel Standard (RFS) program and California, Oregon, and British Columbia's Low Carbon Fuel Standard (LCFS) programs. RNG-fueled natural gas vehicles are currently one of the cleanest technologies commercially available for the medium- and heavy-duty transportation sector[2] and, in the long term, waste- or RNG-derived renewable hydrogen (RH2) is poised to become an increasingly available option for use in fuel cell electric vehicles. RNG is also increasingly used to decarbonize natural gas end-use applications in stationary sectors, marked by the emergence of

[1] For more information see: http://www.rngcoalition.com/

[2] UCR CE-CERT, Ultra-Low NOx Natural Gas Vehicle Evaluation Fact Sheet, 2018
https://www.ngvamerica.org/wp-content/uploads/2018/04/NOx-Fact-Sheet.pdf

new programs such as Oregon's recently adopted RNG procurement requirement (similar to a thermal renewable portfolio standard (T-RPS)).[3]

Today, RNG projects are largely underwritten by the monetization of tradeable credits, such as Renewable Identification Numbers (RINs) that RNG-sourced transportation fuel generates under the federal RFS program.[4] Given the success of these programs in promoting decarbonization through RNG in other jurisdictions, we are excited by Connecticut's recent efforts to establish RNG-specific pipeline interconnection standards and a Thermal Renewable Portfolio Standard.

**RNG Potential in Connecticut**

RNG Coalition supports the use of renewable gases as an important climate change mitigation strategy for Connecticut, and appreciates the dialogue surrounding many topics of relevance to RNG and renewable hydrogen in GC3's recommendations thus far.[5] Areas of concern highlighted by GC3 provide significant potential for the use of renewable gases in decarbonizing Connecticut's economy—both as an organic waste emissions mitigation strategy and a compliment to other renewable energy sources in decarbonizing both gas and electricity sectors.

Conventional or geologic natural gas is currently Connecticut's largest single source of energy, accounting for 34.3% of total energy consumption in the state—including 30.1% of commercial sector use, 31.5% of industrial sector use, and for home heating in 36.1% of households.[6] Accordingly, incentivizing RNG as a substitute for geologic natural gas is a natural near-term strategy. Furthermore, even in the long-run, electricity-based technologies may not be attractive for all applications—especially where very high temperatures are required—necessitating the continued use of renewable gaseous fuels if deep decarbonization is to be achieved.[7] Indeed, studies outlining gas sector decarbonization in other jurisdictions show significant end-use demand for natural gas remaining through 2050, even in high-electrification scenarios.[8]

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[3] See Oregon Public Utilities Commission's adoption of RNG procurement rules under Oregon Senate Bill 98 here: https://apps.puc.state.or.us/orders/2020ords/20-227.pdf

[4] RNG has grown substantially thanks to the RFS program, making up over 95 percent of the lowest-GHG-emission cellulosic biofuel production category and generation of D3 RINs (given for fuels that create at least a 60% reduction in lifecycle greenhouse gases). https://www.epa.gov/renewable-fuel-standard-program/renewable-fuel-annual-standards

[5] Our comments broadly reference all relevant material provided in the GC3 Working Group Reports, with certain areas of focus discussed more specifically at a later point in this document.

[6] EIA estimates Connecticut's 2018 total energy consumption by type here, 2018 commercial and industrial energy consumption here, 2018 total natural gas use by sector here, and % of home reliant on natural gas here. Note that values are approximate due to variations between data sets.

[7] Bataille et al., *A Review of Technology and Policy Deep Decarbonization Pathway Options for Making Energy-Intensive Industry Production Consistent with the Paris Agreement* https://www.sciencedirect.com/science/article/abs/pii/S0959652618307686

[8] For example, see pg. 35 of the California Energy Commission report entitled *The Challenge of Retail Gas in California's Low Carbon Future,* which finds that natural gas in California's residential, commercial, and industrial sectors is still ~1,000 tBtu in 2050 in the high-building-electrification case: https://ww2.energy.ca.gov/2019publications/CEC-500-2019-055/CEC-500-2019-055-F.pdf

RNG Coalition is supportive of all sustainable methane-to-energy projects, particularly those that capture and convert waste emissions for the production of RNG, RNG-derived renewable hydrogen, and RNG-based electricity generation. Processing waste biogas into RNG or renewable hydrogen is a crucial component of a circular economy, creating a versatile resource that can be used to decarbonize any conventional natural gas or hydrogen end-use application. RNG deserves particular near-term attention because the primary method of generating RNG today[9]—biomethane from anerobic digestion (AD)—is a well-proven, cost-effective technology available at commercial scale. Increased availability of renewable hydrogen—including both biogas-derived and electrolytic hydrogen—will lead to the development of hydrogen infrastructure and end-use applications throughout the economy, ultimately contributing greatly to decarbonization of both thermal and power applications. Feedstocks used to produce RNG today can be shifted toward renewable hydrogen in the long run—a carbon-negative process when paired with carbon capture and sequestration.[10]

ICF estimates that Connecticut's potential to produce RNG from anaerobic digestion sources (landfills, animal manure, wastewater treatment, and food waste) is on the order of 3.219-5.668 tBtu/year, and total New England potential at 24.2-42.4 tBtu/y.[11] This regional supply potential could satisfy 14.8% of Connecticut's total current natural gas demand—79.9% of residential demand, 72.9% of commercial demand, or 172.4% of industrial demand and pipeline-connected RNG projects could be shifted between these demand categories over time if needed.[12] This ICF work reinforces the fact that Connecticut can deploy a significant amount of RNG. Supporting the growth of proven technologies like RNG as part of the state's climate change mitigation strategy will help to position Connecticut as a leader in decarbonization.

**Environmental and Economic Benefits of RNG Development and Utilization**

In addition to the potential for reduction of GHG emissions through waste emission capture and fossil fuel displacement, the implementation of RNG projects provide other important environmental and economic benefits. Given concerns regarding potential displacement of climate-sensitive jobs and the resiliency of Connecticut's most vulnerable communities and systems, it is important to consider the substantial economic benefits realized with increased development, deployment and utilization of

[9] The vast majority of RNG available commercially today is created by capturing and processing raw biogas generated at sites with aggregated organic matter—such as landfills, wastewater treatment plants, and agricultural operations—and then upgrading this gas to meet pipeline quality standards. In the absence of the RNG project this biogas is often flared, or worse, is uncollected and escapes fugitively into the atmosphere as a short-lived climate pollutant (methane) that, according to the Intergovernmental Panel on Climate Change, is 84 times as potent a greenhouse gas (GHG) as carbon dioxide.[9]

[10] LLNL, *Getting to Neutral: Options for Negative Carbon Emissions in California*, Baker et al., January, 2020, Lawrence Livermore National Laboratory (LLNL) https://www-gs.llnl.gov/content/assets/docs/energy/Getting_to_Neutral.pdf

[11] American Gas Foundation, *Renewable Sources of Natural Gas: Supply and Emissions Reduction Assessment*, 2019 https://gasfoundation.org/wp-content/uploads/2019/12/AGF-2019-RNG-Study-Full-Report-FINAL-12-18-19.pdf

[12] EIA estimates Connecticut's 2018 total energy consumption by type here and 2018 total natural gas use by sector here.

RNG—including millions of dollars in capital investment per project and the creation of thousands of clean energy sector jobs.[13]

RNG production from wastewater treatment plants can provide revenue to municipalities for use in financing improvements which increase the resiliency of wastewater treatment plants and other water infrastructure vulnerable to sea level rise, significant storm events, and other impacts of climate change. With the potential to utilize RNG from all types of aggregated organic matter, these dual resiliency benefits can also be realized for food waste, solid waste, and agricultural systems. RNG production from such resources also serves to increase the resiliency of Connecticut's energy systems by providing renewable distributed generation of fuel or electricity—additionally applicable to GC3's concerns regarding the resiliency of essential infrastructure.

RNG development also supports the protection and improved monitoring of natural and working lands while serving as a component of Connecticut's natural resource economy. In the agricultural sector, RNG provides a source of revenue to farmers which can be used to finance infrastructural improvements; helps to facilitate improvements in air and water quality through better waste management practices; and can provide monitoring data for use in tracking GHG emissions. In all cases, RNG production and utilization helps to create a circular economy, increasing the sustainability of organic waste processing systems.

**Feedback on GC3 Working Group Recommendations**

Methane produced by anthropogenic waste provides us with an ongoing opportunity to reduce GHG emissions through the creation of RNG and renewable hydrogen. Economy-wide decarbonization will require drastic changes in our energy supply, demand, transmission, and related infrastructure. Accordingly, RNG Coalition appreciates the challenge of finding the best use for waste-derived gaseous resources, which is sure to vary between the near and long term. We encourage GC3 to consider the potential for RNG and renewable hydrogen in all sectors, and to keep in mind the flexibility of these renewable gases as a key part of their decarbonization benefit. Although RNG and renewable hydrogen can be utilized in a variety of applications, this section will focus on GC3's draft recommended strategies which are currently most relevant to the RNG growth and utilization in Connecticut.

RNG Coalition supports the implementation of a T-RPS as part of Connecticut's climate change mitigation plan. T-RPS policies incentivize the rapid decarbonization of existing infrastructure through the use of drop-in fuels along with simultaneous end-use fuel switching. Importantly, a T-RPS can be designed to include hard-to-electrify sectors, increasing the benefit beyond policies which focus solely on electrification. Within the GC3 work, most of the discussion on thermal decarbonization can be found within material drafted by the Progress on Mitigation Strategies Working Group (PMS). Notably, PMS discusses support of "a Renewable Thermal Portfolio Standard that comprehensively investigates and develops all practical pathways to zero- or low-GHG thermal energy, including biodiesel" on page 21 of

[13] ICF, *Economic Impacts of Deploying Low NOx Trucks fueled by Renewable Natural Gas*, 2017 https://static1.squarespace.com/static/53a09c47e4b050b5ad5bf4f5/t/59077544ebbd1ad192d13ff6/1493660998766/ICF_RNG+Jobs+Study_FINAL+with+infographic.pdf

their recent report.[14] Efforts by the Department of Energy and Environmental Protection (DEEP) regarding a T-RPS have similarly been focused primarily on biodiesel and electrification thus far. In line with our previously submitted comments,[15] RNG Coalition urges DEEP and PMS to more thoroughly consider the benefits of RNG in thermal applications given its unique ability to both mitigate waste emissions and serve as a drop-in replacement for conventional natural gas. Through the use of biodiesel, electrification, RNG, and other resources, a T-RPS will serve to promote decarbonization of all thermal applications in the most rapid manner possible.

GC3's Science and Technology Working Group, as discussed specifically on Draft Report page 33,[16] recommends supporting Connecticut-based agriculture through the promotion of regenerative and sustainable agricultural practices and increased farm revenue. The Agriculture and Soil Sub-Group also addresses a number of areas which could benefit from RNG production including but not limited to reducing fossil fuel use in on-farm equipment and petroleum-based fertilizers (pages 34 and 35); utilization of methane digesters, etc. to reduce emissions (page 35); diversifying farm enterprises (page 36); engaging in farm planning and adaptive management (pages 36 through 37); water resource management (page 37); creating funding for methane digesters, etc., including for food waste management (page 38); and extensive discussion on the potential benefit of anaerobic digestion (AD) (pages 45 and 46).[17] The agricultural sector is of particular interest to the RNG industry as we see the potential for a wide range of benefits in line with Connecticut's climate goals including renewable energy production, GHG reduction, non-GHG air quality improvements, water quality improvements, improved waste management, food waste management, production of sustainable by-products such as fertilizer and animal bedding, creation of clean energy sector jobs, and increased revenue for farmers. Accordingly, we recommend that all agriculture facing GC3 groups look more closely at these benefits as part of the CAP.

RNG also has the ability to benefit key water infrastructure—a point of discussion among a number of GC3 working groups. For example, RNG should be considered as part of the Infrastructure and Land Use group's recommendation to assess the viability and future needs for wastewater reuse strategies as found on page 20 of their report.[18] On page 69 of the Public Health working group is a recommendation for energy efficiency audits in the water industry.[19] This section in particular should also look at the feasibility of RNG to reduce GHG emissions, substitute for fossil fuel use, and provide income to

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[14] Progress on Mitigation Strategies Working Group Draft Report: https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3-Progress-mitigation-strategies-REVISED-draft-report-public-comment-093020.pdf

[15] https://files.constantcontact.com/10eac86b501/b6e138be-b158-4674-9da7-2682a9513a9b.pdf

[16] Science and Technology Working Group Draft Report: https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_ScienceTech_draft_report_public_comment_092220.pdf

[17] Agriculture and Soils Sub-Group Draft Report: https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_WNL_Agriculture_soils_draft_report_public_comment_092120.pdf

[18] Infrastructure and Land Use Adaptation Working Group Draft Report: https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_Infrastructure_LandUse_draft_report_public_comment_092120.pdf

[19] Public Health and Safety Working Group Draft Report: https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_Public_health_safety_draft_report_public_comment_092120.pdf

wastewater treatment plants. RNG Coalition additionally recommends that the Financing Adaptation and Resilience group assess the potential financial benefits of RNG facilities at wastewater treatment plants, food waste digesters, and agricultural operations as a means of reducing GHGs from these sectors in tandem with the energy sector.

GC3's Science and Technology Working Group, on report pages 12 and 36,[20] recommends the removal of biomass as an eligible Class 1 renewable energy source. RNG Coalition supports the exclusion of unsustainable biomass feedstocks from this category. We strongly encourage GC3 and the State of Connecticut to make science-based decisions regarding the sustainability criteria of bioenergy resources. Notably, RNG is classified as a biofuel, but is sometimes conflated with unsustainable biomass sources, even though current RNG is primarily derived from waste gas feedstocks. The use of lifecycle accounting (LCA) that properly captures total GHG impacts should be employed to evaluate the sustainability of biofuels such as RNG. In the electricity generation sector, renewable gases serve as important sources of dispatchable clean power, complementary to intermittent renewable power resources. Utilization of RNG and renewable hydrogen will help to ensure an adequate and affordable clean energy supply, encourage electricity sector decarbonization where feasible, and deployment of highly efficient combined heat and power (CHP) facilities.

**Utilizing Lifecycle Accounting in State-level Policies Driving GHG Reduction from RNG**

If Connecticut wants to maximize the use of RNG and other biofuels to help with decarbonization, including through the adoption of a T-RPS, lifecycle accounting is a key program design feature to ensure the sustainability of all included energy sources. Greenhouse gas accounting using lifecycle accounting (LCA)—sometimes called carbon intensity (CI) when expressed on an emissions per unit energy basis—is a key tool to ensure the development of sustainable biofuels. Full LCA has already been successfully included in multiple demand-side policies for transportation. For example, the California Low Carbon Fuel Standard and Oregon Clean Fuels Standard programs are largely[21] responsible for the current incentive structure governing project development and subsequent RNG utilization in North America. Oregon's recently finalized renewable gas standard for gas utilities—the first of its kind—will also utilize LCA accounting. Under these programs, projects with the lowest CI scores receive the greatest incentive.[22]

Project-specific CI scores under the aforementioned policies are calculated via LCA accounting, which factors in GHG emissions and reductions from every step of fuel production and utilization.[23] Each project-specific LCA is modelled using a version[24] of the Greenhouse Gases, Regulated Emissions, and

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[20] Science and Technology Working Group Draft Report: https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-working-group-reports/GC3_ScienceTech_draft_report_public_comment_092220.pdf

[21] As layered atop the Federal Renewable Fuels Standard.

[22] Voluntary programs for RNG—and the tools built to support such markets—are considering adopting the same general CI approach. See: https://www.green-e.org/renewable-fuels and https://www.mrets.org/m-rets-renewable-thermal-tracking-system/

[23] CI inputs include but are not limited to feedstock production, fuel production (upgrading and processing), fuel transport, and fuel combustion.

[24] The CA GREET (used by California LCFS) and OR GREET (used by Oregon CFS) are versions of Argonne National Lab's GREET model which have been modified to include parameters specific to each jurisdiction.

Energy Use in Transportation Model (GREET)[25] created by Argonne National Lab, which is widely accepted among regulatory agencies and the scientific community. Given the comprehensive and established nature of these tools, RNG Coalition strongly supports using LCA accounting and the GREET model in assessment of biofuels under similar programs. To the extent that Connecticut chooses to develop incentives for RNG procurement, we recommend they build upon this framework.[26]

Registries supporting tradeable credit systems and LCA for thermal energy are emerging, such as the Midwest Renewable Energy Tracking System (M-RETS). The use of such registries and harmonization with other jurisdictions undertaking similar policies could also be helpful to promote RNG projects.[27] Such systems increase market confidence about the environmental benefits claimed by low-carbon and carbon-negative fuels. Oregon's new RNG procurement regulation will require the use of M-RETS in RNG procurement and compliance and we recommend that Connecticut consider the use of this system as a registry for the T-RPS.

**Conclusion**

The RNG Coalition appreciates the opportunity to participate and provide comment on Connecticut's CAP development process. Production and utilization of RNG has the potential to contribute significantly toward the realization of Connecticut's climate goals, including creating jobs and economic opportunity; reducing Connecticut's GHG emissions; increasing the resiliency of a variety of systems which will prepare Connecticut residents, businesses, and communities for the impacts of climate change; and ensuring that Connecticut's climate strategies are equitable.

The Climate Action Plan represents an exceptional opportunity to create a framework for RNG use and development, positioning Connecticut as a leader in GHG mitigation. Accordingly, our members look forward to investing in and constructing new methane-capturing and RNG production facilities that create clean energy sector jobs in Connecticut. We thank GC3 for their leadership in development of a smart CAP as such dialogue benefits the environment and the economy, energy consumers, and policymakers interested in decarbonization across North America.

Sincerely,

/s/

**Sam Wade**
Director of State Regulatory Affairs
Coalition for Renewable Natural Gas
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Sacramento, CA 95814
530.219.3887
sam@rngcoalition.com

[25] More information about Argonne National Lab's GREET model can be found here.

[26] While existing state-level low carbon fuel standard policies target the vehicle sector, this LCA framework can easily be adapted to other end uses (e.g., stationary thermal applications in a T-RPS).

[27] https://www.mrets.org/m-rets-renewable-thermal-tracking-system/

***Connecticut Chapter***
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***West Hartford, Connecticut 06127***
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October 20, 2020

Connecticut Department of Energy & Environmental Protection
Office of Climate Planning
79 Elm Street
Hartford, CT 06106-5127
Via email: deep.climatechange@ct.gov

On behalf of Sierra Club's more than 40,000 members and supporters in Connecticut, thank you for providing this opportunity to comment on the Governor's Council on Climate Change (GC3) Working Group Draft Reports.

The consensus of climate scientists is that urgent action must be taken by 2030 to avoid the worst impacts of climate change. Connecticut statute mandates a 45% reduction in greenhouse gas emissions from 2001 levels by 2030 and an 80% reduction by 2050. Business as usual is not an option. Neither is incremental change. Connecticut needs to take bold and urgent action to achieve these reductions and do our part to ensure a livable planet for future generations.

We want to thank Governor Lamont for reconvening the GC3 through Executive Order 3, and applaud the emphasis on centering equity and environmental justice. As you revise the individual work group drafts and pull them together into a cohesive and actionable plan, Sierra Club Connecticut offers the following comments for the report as a whole and on individual recommendations in the work group draft reports.

<u>Sierra Club urges the addition of two recommendations:</u>

> **Set a goal of 100% zero-emission electricity, transportation and buildings that centers distributed equity and creates good jobs (GC3 Mitigation Work Group).** This recommendation would tie together the various sectors and set a clear and bold direction for the state. Connecticut would join with other states and cities that have committed to a just and equitable transition to clean and renewable energy.
>
> Distributed equity, as noted in the Equity & Environmental Justice Draft Report, is defined as "Placing the most vulnerable communities at the forefront of any potential benefits a policy might create; ensuring that the distribution of the benefits and burdens of climate change mitigation and adaptation are equitably distributed." We suggest that at least 40% of Connecticut investment in clean and renewable energy and the jobs associated with those investments benefit vulnerable communities including low-income communities, Black,

Indigenous and people of color (BIPOC) communities, people with disabilities and low-income populations in rural Connecticut.

The workforce employed to achieve this goal must have access to labor protections and the recommendation should be explicit about it. All construction and related contracts should include requirements for Davis Bacon prevailing wages, project labor agreements, a neutrality policy on collective bargaining, and use of registered apprenticeship programs; in addition to preferences for local hire, community-based businesses, and worker cooperatives.

**Suspend any further approvals for the 650 MW fossil gas power plant yet to be constructed in Killingly (GC3 Mitigation Work Group Electricity Committee)**. Connecticut has produced more electricity than it needs since 2009. The excess power is sent to other states.[1] And, over the last 10 years fossil gas generation has more than doubled. In the face of the climate crisis, building Killingly is a disastrous mistake. With Governor Lamont's goal of zero carbon electricity by 2040, a brand new fossil power plant in Killingly makes no sense. None of the draft GC3 reports address this issue; the GC3 should make a recommendation to stop this unnecessary and destructive dirty power plant from moving forward.

Furthermore, Sierra Club Connecticut strongly supports and recommends prioritizing the following recommendations in the draft reports:

**Develop a strategic plan for transitioning from fossil fuels to renewable thermal technology.** *(Mitigation Work Group - Buildings Report page 20)* Sierra Club supports this planning to create an orderly, just and equitable transition from fossil fuels to zero emission all-electric heat pumps. It should be noted that we have grave concerns about strategies centered around so-called "renewable natural gas" and other fossil gas alternatives, which lack the demonstrated emissions, availability, and cost benefits of electric heat pumps. Other states have also recognized the need to do this transition planning including California and New York, and California has recognized the insufficiency of biogas as a long-term solution to the state's climate goals.

**Set end dates for expansion of the gas grid and new gas installations on the existing grid.** (*Mitigation Work Group - Buildings Report page 22*) In order to meet our climate goals we must decrease the use of fossil fuels, yet state policy actively promotes the expansion of gas. Utilities have and continue to push these policies so they can profit off the destruction of the planet. Sierra Club supports this recommendation and urges that gas expansion policies should end immediately, and Connecticut should plan to fully transition off fossil gas by 2050 or sooner with interim targets that align with the GWSA.

**Improve the ability of efficiency programs to overcome health, safety, and legal barriers** (*Mitigation Work Group - Buildings Report page 7, Public Health and Safety Working Group page 24, Infrastructure and Land Use Adaptation Working Group page 17*) We recommend[2]

[1] U.S. EIA, Connecticut Electricity Profile, 2018, Table 10, Supply and disposition of electricity, 1990 through 2018

[2] https://66f28e57-02e8-44f5-8613-feb302092242.usrfiles.com/ugd/66f28e_7cbac376d92142fb918518beac823206.pdf

that DEEP improves the ability to overcome barriers by integrating the various programs for homes, especially low-income programs, into a comprehensive approach through the CL & M Home Energy Solutions and Home Energy Solutions Income-Eligible programs. An integrated, comprehensive program would couple energy efficiency retrofits with removal of health and safety barriers, and replacement of fossil fuel burning equipment and appliances with high efficiency electric alternatives. A comprehensive program that combines energy efficiency and weatherization with these measures will address equity issues while aligning with the climate goals of the state.

**Create stretch codes, carbon codes, and all-electric options** (*Mitigation Work Group - Buildings Report page 8).* Improving Connecticut's building codes ensure that new buildings, expected to last many decades, are better for the planet and more comfortable, cost-effective, and safer. California's net-zero building code requires all new residential buildings in the state to be net zero by 2020, and all commercial buildings to be net zero by 2030. It is anticipated to reduce energy use by 50% compared to the previous code. Connecticut should move quickly to implement stronger codes to reduce greenhouse gas emissions from buildings.

**Strengthen alignment between state decision making and GHG emissions-reduction goals** (*Mitigation Work Group - Cross-sector Report page 127*) This goal includes strategies to ensure that regulatory programs and state decision-making take into account their impact on meeting Connecticut's GHG emissions-reduction goals, and that they account for health and social cost impacts, including co-benefits of non-CO2 pollutants. (A modernized cost effectiveness test is also recommended in the *MItigation Work Group - Buildings Report page 10*). Notably, neighboring New York has enacted the Climate Leadership and Protection Act that includes a provision (Section 7(2)) that requires all state agency decision-making to ensure consistency with the state's climate commitments.

**Establish statewide goals for zero-emission medium- and heavy duty trucks and for school transportation** (*Mitigation Work Group - Transportation Report page 84*) As a signatory of the multi-state memorandum of understanding committing to truck electrification and eliminating toxic air pollution from medium and heavy-duty trucks and buses by 2050, Connecticut should develop an action plan that emphasizes reducing pollution in overburdened communities and strive for a more ambitious timetable than the MOU's objectives of at least 30 percent of new truck and bus sales to be zero-emission by 2030, and 100 percent zero-emission by 2050.

**All proceeds from the state's GHG emissions-reduction vehicle registration fee should be allocated to CHEAPR** (*Mitigation Workgroup - Transportation Report page 85*) Currently $3 million of the $8.5 million collected through the GHG emissions-reduction vehicle registration fee is directed to the CHEAPR program. Based on data presente https://www.insureourfuture.us/ct-insurance-reportd at recent meetings of the newly formed CHEAPR Board, meeting the state's zero-emission vehicle goals under the multi-state ZEV agreement - 125,000 ZEVs by 2030 - will require an increased investment for rebates near equivalent to the $8.5 million collected by the fee. Sierra Club urges that additional funds from

a full allocation of the GHG fee should be directed to additional incentives for the low income market.

**Promote responsible and just materials management** (*Mitigation - Non-energy GHG emissions page 67*) Incineration is an unacceptable approach to waste management. We must end incineration and replace it with better solutions like recycling, food waste diversion, composting, and other beneficial waste reduction measures. Sierra Club Connecticut supports the closure of trash incinerators and the adoption of the Zero Waste hierarchy[3] and Zero Waste policies to eliminate the need for incineration or landfilling.

We DO NOT support replacing incinerators with gasification or pyrolysis; these are just incinerators in disguise. We urge removing this language from this recommendation.

Sierra Club also recommends caution in how methane from anaerobic digesters to generate electricity is used. Methane produced from anaerobic digesters should not be injected into our inherently leaky gas pipeline system, but instead be located near and used for applications that are difficult to electrify. We urge the work group to provide clarity that methane from anaerobic digestion should not be incorporated into the gas system. (*The Working & Natural Lands Working Group Agriculture/Soils Working Subgroup* - should also note this caution.)

**Establish/transform plans of conservation and development as sustainability plans** (*Mitigation - Non-energy GHG emissions page 65*) Sierra Club supports this recommendation to align local, regional and state planning to achieve the goals of the GWSA.

**Conservation of spaces accessible to Environmental Justice communities.** Several reports (*Science and Technology Working Group, Working & Natural Lands Working Group Rivers Sub-Working Group, and Working & Natural Lands Working Group Forest sub group*) highlight the need to protect forests and ecosystem connectivity along waterways, especially the last landscapes that surround urban-suburban riparian corridors. Connecticut should prioritize conservation in our cities, and promote decision making that is rooted in those communities. Remington Woods in Bridgeport is an example of an urban forest that must be preserved.

Finally, Sierra Club Connecticut has concerns about the following areas:

**Mitigation Electricity Sector Report must be proactive on the issue of retiring fossil fuel generation.** While the narrative of this report outlines Connecticut's fossil fuel generation problems, the recommendations are largely silent on retiring fossil fuel generation. As noted above, recommendations should include stopping Killingly from being built, and retirement of fossil generating facilities should be a top priority particularly the closure of fossil-fueled power plants in vulnerable communities with high rates of asthma.

**Mitigation - Non-energy GHG emissions report must be stronger on retiring gas.** In its recommendation, the Non-energy GHG emissions work group calls for reduced methane

[3] http://zwia.org/zwh/

emissions from natural gas distribution. The best way to reduce emissions and meet our climate goals is to retire the gas system and transition to clean, safe and reliable electric heat pumps. We urge the Non-energy GHG workgroup to incorporate two recommendations noted above from the *Mitigation Work Group - Buildings Report* to achieve this: Develop a strategic plan for transitioning from fossil fuels to renewable thermal technology (*page 20*) and Set end dates for expansion of the gas grid and new gas installations on the existing grid (*page 22*).

The **GC3 Financing and Funding Adaptation and Resilience Working Group** report completely ignores the role insurance companies are playing in fueling the climate crisis. Connecticut insurers invest over $247 billion in fossil fuels and insure untold numbers of fossil fuel projects.[4] Even more troubling, this working group is making recommendations to allow insurance companies to profit from the very climate crisis they are financing. Those recommendations are: Incentivize Connecticut's Insurance Industry to Promote and Grow the Catastrophe Bond Market and Pilot a Resilience Bond Program (*page 42*); Build Outreach and Capacity and Tracking for the Increased Uptake of Flood Insurance (*page 30*).

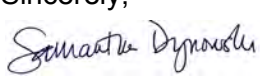
We urge the insurance industry to:

a) Immediately cease insuring new coal projects and coal companies, unless they are engaged in a rapid transition process away from coal to clean energy of no more than two years.
b) Immediately cease insuring new oil or gas expansion projects.
c) Commit to phasing out insurance for oil and gas companies in line with a 1.5ºC pathway.
d) Divest all assets from coal companies and oil and gas companies that are not in line with a 1.5ºC pathway, including assets managed for third parties.
e) Bring stewardship activities, membership of trade associations and public positions as a shareholder and corporate citizen more broadly in line with a 1.5ºC pathway in a transparent way. This must include forceful advocacy for a green and just recovery from COVID-19.

We also urge that equity be prioritized in all recommendations of this workgroup. At least 40% of all new programs should benefit low-income communities and communities of color that have suffered from decades of intentional structural racism, disinvestment, red lining, discrimination, segregation, and many other injustices.

Thank you for consideration of our comments.

Sincerely,



Samantha Dynowski, State Director
Sierra Club Connecticut

[4] https://www.insureourfuture.us/ct-insurance-report

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 draft report comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 7:53 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: sandrakopell@everyactioncustom.com <sandrakopell@everyactioncustom.com>
Sent: Wednesday, October 21, 2020 7:35 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 draft report comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Climate Change Bureau CT DEEP Climate Change Bureau,

Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals.

I particularly support these recommendations, and urge their inclusion in the final reports:

- Strengthen alignment between the state's decision-making and its greenhouse gas reduction goals. All regulatory decisions should be evaluated for consistency with meeting Global Warming Solutions Act targets.

- Move climate adaptation and resiliency measures—like nature-based solutions, forest and wetland protection, urban green infrastructure and tree planting, and making low/moderate income housing energy efficient and healthy—from demonstration project scale to widespread adoption and protection.

- Support robust, equitable state funding and financing (leveraged and matched by federal and local sources) for emissions reduction and adaptation programs. This is a large ($150-600 million/year) investment. Promising sources include:
  a) adopting the Transportation & Climate Initiative (up to $250 m/yr) and increasing the petroleum gross profits tax (~$100 m/yr). Connecticut can help ensure robust TCI implementation that drives down emissions while reinvesting auction proceeds in other high-impact and equitable programs;
  b) increasing or re-directing state bonding (up to $70 m/yr);
  c) adopting the Maryland "flush tax" model (up to $75 m/yr).

- Reduce stormwater pollution and flooding, and help municipalities afford green infrastructure and resiliency investments, by passing statewide enabling legislation for stormwater authorities.

- Target future building projects to already-developed areas, and prioritize the conservation and preservation of naturally-resilient coastal marsh, dunes, and forests.

- Develop and fund a community engagement strategy to inform the 2021 GC3 process and implementation, including grants for community-based NGOs partners and ensuring environmental justice perspectives are integral to the process.

The reports could be made even stronger. Please consider these additions and modifications to build the ambitious climate mitigation, resilience, and justice plan Connecticut needs:

- Emphasize the importance and urgency of strong climate mitigation action, by:
  a) highlighting the current and projected impacts of climate change in Connecticut, including health and economic impacts;
  b) identifying the greenhouse gas reduction potential of suggested projects;
  c) prioritizing, among the many valuable ideas in the reports, the highest-impact polices that will be most effective in driving down emissions and transitioning to a carbon-free economy.

- Eliminate, not just “phase down,” biomass as an eligible resource in the Renewable Portfolio Standard (RPS). If we are to achieve our climate goals, we can’t keep subsidizing dirty energy sources.

- Add dams to the proposed statewide GIS database of culverts, flood gates, tide gates, and other water control structures, and create a dynamic list that prioritizes structures for replacement, removal, and/or modification—including identifying dams that are vulnerable to our changing climate, and ensuring culverts can handle 100-year floods and allow migratory fish to pass.

- Encourage municipalities to adopt green infrastructure as a first-choice solution to flooding and stormwater pollution.

Together, this suite of policies can reduce Connecticut’s contribution to climate change and help our region adapt to the changes that are already occurring—while protecting public health, generating good jobs, and protecting vulnerable communities from storms, flooding, and air pollution.

Thank you for your consideration.

Sincerely,
Ms. Sandra A Kopell
412 Arbutus St  Middletown, CT 06457-5121 sandrakopell@comcast.net

UCONN
UNIVERSITY OF CONNECTICUT

**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 1:41 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: tosimaidment@everyactioncustom.com <tosimaidment@everyactioncustom.com>
Sent: Wednesday, October 21, 2020 1:20 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Rebecca French,

Thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) Working Group Draft Reports.

Please consider including the recommendation that any further approvals for the NTE Killingly dual fossil fuel power plant be suspended. This plant will add 5% to the state's carbon emissions at a time when we should be doing everything possible to cut emissions. It will be impossible to reach the governor's goal of a 100% zero carbon electric grid by 2040 if this unnecessary plant is built.

Also, reform or replace the ISO New England market system. Currently, the grid is not taking into account the clean energy goals that the state is working hard to advance. If we are going to have a 100% zero carbon electric grid by 2040, our outdated grid operator needs to participate in that goal.

Finally, invest in natural climate solutions such as forest, river, and wetland conservation. Protecting natural areas is a low cost, low tech, easily maintained solution to help mitigate the climate crisis. It also enhances the quality of our lives in Connecticut.

Thank you for the opportunity to submit comments on this vitally important document.

Sincerely,
Ms. Sandy Tosi
263 Drown Rd Pomfret Center, CT 06259
tosimaidment@charter.net

UCONN
UNIVERSITY OF CONNECTICUT

**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 6:43 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Sarah Soffer <sarah.soffer@gmail.com>
**Sent:** Wednesday, October 21, 2020 6:37 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change,

Please keep in mind that once we lose the natural world, we can never get it back. That alone should inspire you to act CONSERVATIVELY by CONSERVING public land right now. We can always cut down the forests later if it turns out that that is actually a good idea. But we can never get them back once they are lost.

Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit.

Nature is essential for the future, for evolution and for everything we need, and serves the public good now and for the long term.

We have so many beautiful natural areas, and some need to be protected for nature study, hiking, and places that people can count on. This has never been more important.

Meanwhile - we are burning and exporting our public forests? Who benefits? This is beyond disturbing.

We need systems that support good jobs, local resource use, AND natural areas.

Our public land is held in the public trust.

We need your leadership.

Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

UCONN
UNIVERSITY OF CONNECTICUT

**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 5:38 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Shari Specland <slspecle@yahoo.com>
**Sent:** Wednesday, October 21, 2020 5:20 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change, Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit. Nature is essential for the future, for evolution and for everything we need, and serves the public good now and for the long term. We have so many beautiful natural areas, and some need to be protected for nature study, hiking, and places that people can count on. This has never been more important. Meanwhile - we are burning and exporting our public forests? Who benefits? **This is beyond disturbing.** We need systems that support good jobs, local resource use, AND natural areas. Our public land is held in the public trust. **Protect the Natural World for future Generations**. **We need your leadership. Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.**

Thank you,

Shari Specland

UCONN
UNIVERSITY OF CONNECTICUT

**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:44 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: shawnophoto@everyactioncustom.com <shawnophoto@everyactioncustom.com>
Sent: Wednesday, October 21, 2020 10:17 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Rebecca French,

I want to thank you for the opportunity to submit comments on the Governor's Council on Climate Change (GC3) reports. The reports draw on the most relevant policies Connecticut can enact to mitigate and adapt to climate impacts in our state. While I agree with many of the recommendations in the reports, I wanted to draw specific attention to four actions Connecticut can take now to drastically reduce climate disaster.

1. Connecticut needs to set a goal of 100% zero-emission electricity, transportation, and buildings that focuses on equity and creates good jobs for low-income and BIPOC communities.
2. Suspend any further approvals for the 650 MW Killingly fossil fuel power plant.
3. Reform or replace the ISO-New England market system to take into account our clean energy goals.
4. Invest in natural climate solutions such as forest, river, and wetland conservation.

Thank you again for the opportunity to submit comments.

Sincerely,
Ms. Shawn O'Sullivan
1161 Melville Ave  Fairfield, CT 06825-2057 shawnophoto@gmail.com

October 21, 2020

Via email: deep.climatechange@ct.gov
Connecticut Department of Energy and Environmental Protection
Office of Climate Planning
79 Elm Street
Hartford, CT 06106-5127

Re: Governor's Council on Climate Change (GC3) Draft Working Group Reports

Dear G3Council,

Thank you for your hard work and forward-thinking planning. I am so impressed by your efforts to consider and combat climate change.

I feel that land conservation is the most important thing we can do right now to address the twin emergencies of climate change and loss of biodiversity. I work with several land trusts in the northwest corner of Connecticut to help them preserve our outstanding landscape and wildlife habitat.

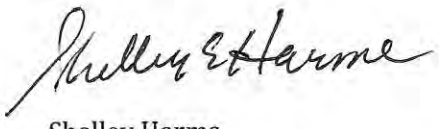
I strongly support the recommendations of your working groups that prioritize preserving forests. Forests are working hard for us, to sequester and store carbon, purify the water we drink, purify the air we breathe, and provide habitat for diverse plants and animals.

I firmly believe that a reasonable portion of state forests and other state lands should be designated as natural areas where the only removal of vegetation allowed should be the removal of invasive species. Old growth forests sequester and store more carbon and support more wildlife. And people should be able to see large trees and complex old growth again. What better place than on our public lands? There is plenty of land for forest "management;" the forestry industry does not need it all.

Land protection funding is absolutely crucial to help land trusts acquire important forests and farmland and save them from development. The state's goal of protecting 21% of the state's area is woefully inadequate – it should be at least 1/3. The Open Space and Watershed Land Acquisition program makes the difference between preserving key parcels and having them sold for development. The program should be liberally funded and strengthened.

Thank you for your leadership in this significant work, and for providing this opportunity to present comments on the recommendations.

Sincerely,



Shelley Harms
10 Schoolhouse Road
Norfolk, CT 06058
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183 Guinevere Ridge
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(203) 271-1949

sigrun.n.gadwa@sbcglobal.net

Oct 21, 2020

Forest Subgroup
GC3 Working and Natural Lands Working Group
deep.climatechange@ct.gov.

**RE:** ***Public comment***
Draft Report of the Forest Subgroup

Dear Commissioners:

After reviewing your well-researched and thorough draft report, I suggest that two other important categories of benefits conferred by forest cover, should be included: uptake of nutrients and pollutants in groundwater and attenuation of flooding. These benefits also have significant economic ramifications, which should help your worthy goals ("No Net Forest Loss") to be attained.

100 feet of mature forest downgradient of a septic system is able to take up all the nitrogen in leachate released by a normally functioning septic system (about 50% of the nitrogen inputs), combining it with CO2 and converting it to biomass, so that it does not seep into a stream, and discharge towards a water body or Long Island Sound. (I researched this topic thoroughly several yers ago, and attach the references compiled.) Could your report recommend a return to the CTDEEP's recommended practice of leaving a 100-foot buffers to perennial streams? This would be a useful way to conserve forest, with additional benefits to water quality. This was standard practice by Connecticut IWA'a 15 to 20 years ago, but has become less and less common in permitted site plans. The Draft Report of the Forest Subgroup covers the filtering of air pollutants by foliage, but might also mention that tree roots also take up dissolved nutrients, metals and a other soluble toxicants, protecting the groundwater and surface waters fed by groundwater discharge. .

As a consulting wetland scientist and field ecologist/botanist, with over 30 years of experience, I often assess the functions and values of forested wetlands and riparian buffers. Prevention of flooding is a major function. Regardless of soil drainage, interception of rainfall by tree foliage and branches is key in preventing hillside erosion, which creates gullies and reduces infiltration, also worsening flooding. In winter, a thick layer of leaf litter also helps protect soil and prevent flooding. Afterall,

runoff calculations by engineers assign coefficients to different land covers, and forest cover always has the lowest coefficient.

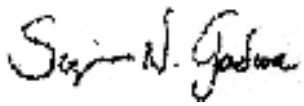
I have also often witnessed exacerbated flooding and tree mortality after nearby clear-cutting. The concept is simple enough. In a forest with a shallow water table, nearby clearcutting causes the water table to rise, by eliminating 1) uptake of water by tree roots, 2) transpiration, and 3) interception of precipitation by foliage and branches. This leaves a shallower aerated zone which may longer support tree roots. The ground becomes saturated sooner in a storm event. Runoff begins earlier, and total runoff volume is higher. After the clearcutting, trees in adjacent remaining forest also become stressed, more susceptible to disease, with slower growth rates, impaired regeneration, and they are blown over more frequently; flooding problems typically ensue, often expensive. Cover type often changes from forested to meadow-scrub, which further reduces carbon sequestration, beyond the losses caused by the initial clear-cutting. Several references on hydraulic impacts to forests from clearcutting are attached.

Again, this kind of "watering up" problem would be prevented, by recommending wider forested upland buffers between forested wetlands and proposed activities necessitating clearcutting.

Thank you for the opportunity to comment on this important topic, and for all your work in compiling this draft report.

Respectfully submitted,

CARYA ECOLOGICAL SERVICES, LLC



Sigrun N. Gadwa, MS, PWS
Ecologist, Professional Wetland Scientist
Registered Soil Scientist

***VIA FIRST CLASS MAIL***

*Attachments:* List of references pertaining to forest uptake of nutrients; article and article excerpts pertaining to forest hydrologic function

References


Carpenter, S. R., Caraco, N. F., Correll, D. L., Howarth, R. W., Sharpley, A. N., & Smith, V. H. (1998). Nonpoint pollution of surface waters with phosphorus and nitrogen. *Ecological Applications, 8*(3), 559-568. doi:10.2307/2641247

Hanson, G. C., Groffman, P. M., & Gold, A. J. (1994). Symptoms of nitrogen saturation in a riparian wetland. *Ecological Applications, 45*(4), 750-756.

Hefting, M. M., & de Klein, J. J. M. (1998). Nitrogen removal in buffer strips along a lowland stream in the Netherlands: a pilot study. *Environmental Pollution, 102*(S1), 521-526.

Hefting, M. M., Bobbink, R., & de Caluwe, H. (2003). Nitrous oxide emission and denitrification in chronically nitrate-loaded riparian buffer zones. *Journal of Environmental Quality, 32*, 1194-1203.

Hefting, M. M., Clement, J., Bienkowski, P., Dowrick, D., Guenat, C. Butturini, A.…Verhoeven, J. T. A. (2005). *Ecological Engineering, 24*, 465-482. doi: 10.1016/j.ecoleng.2005.01.003

Hill, A. R. (1996). Nitrate removal in stream riparian zones. *Journal of Environmental Quality, 25*, 743-755.

Lowrance, R., Altier, L. S., Newbold, J. D., Schnabel, R. R., Groffman, P., M., Denver, J. M.,…Todd, A. H. (1997). *Environmental Management, 21*(5), 687-712.

Mayer, P. M., Reynolds, S. K., Canfield, T. J., & McCutchen, M. D. (2005). *Riparian buffer width, vegetative cover, and nitrogen removal effectiveness: A review of current science and regulations*. Washington, D. C.: U. S. Environmental Protection Agency. EPA/600/R-05/118

Mayer, P. M., Reynolds, S. K., McCutchen, M. D., & Canfield, T. J. (2007). Meta-analysis of nitrogen removal in riparian buffers. *Journal of Environmental Quality, 36*, 1172-1180. doi: 10.2134/jeq2006.0462

Sabater, S., Butturini, A., Clement, J., Burt, T, Dowrick, D, Hefting, M, Maître, V., Pinay, G.,…Sabater, F. (2003). Nitrogen removal by riparian buffers along a European climatic gradient: patterns and factors of variation. *Ecosystems, 6*, 20-30. doi: 10.1007/s10021-002-0183-8

Truax, B., Gagnon, D., Lambert, F., & Fortier, J. (2017). Riparian buffer growth and soil nitrate supply are affected by tree species selection and black plastic mulching. *Ecological Engineering, 106*, 82-83. http://dx.doi.org/10.1016/j.ecoleng.2017.05.037

# Effect of vegetation–water table feedbacks on the stability and resilience of plant ecosystems

Luca Ridolfi
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Paolo D'Odorico
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Received 19 July 2005; revised 18 October 2005; accepted 1 November 2005; published 7 January 2006.

[1] The interaction of vegetation with the groundwater is one of the key mechanisms affecting the dynamics of wetland plant ecosystems. The main feature of these interactions is the feedback between the downward shift of the water table caused by riparian vegetation and the emergence of soil aeration conditions favorable to plant establishment, growth, and survival. We develop a conceptual framework to explain how vegetation–water table feedbacks may lead to the emergence of multiple stable states in the dynamics of wetland forests and riparian ecosystems. This framework is used to investigate the sensitivity of these ecosystems to vegetation disturbances and changes in water table depth. As a result of these feedbacks, such ecosystems are prone to catastrophic shifts to an unvegetated state. Because of their competitive advantage, water-tolerant and shallow-rooted species can replace the original vegetation, contributing to the occurrence of vegetation succession in riparian zones and to the existence of alternative vegetation states between areas with shallow and deep water tables.

**Citation:** Ridolfi, L., P. D'Odorico, and F. Laio (2006), Effect of vegetation–water table feedbacks on the stability and resilience of plant ecosystems, *Water Resour. Res.*, *42*, W01201, doi:10.1029/2005WR004444.

## 1. Introduction

[2] Riparian and wetland ecosystems are known for their environmental and economical value, as they are among the most productive terrestrial ecosystems [*Naiman and Decamps*, 1997], provide habitat to a diverse animal population [*Le Maitre et al.*, 1999], and offer important resources for logging [e.g., *Dubé et al.*, 1995; *Roy et al.*, 2000] and livestock grazing [*Wright and Chambers*, 2002]. Understanding the response of riparian and wetland forests to anthropogenic and natural disturbances (e.g., wood harvesting, fires, and changes in water table depth) is of foremost importance to the management and restoration of these ecosystems [*Wright and Chambers*, 2002]. In what follows, we will denote "wetland ecosystems" plant ecosystems in areas with shallow water tables, and consider riparian forests as a particular case of these ecosystems.

[3] The two-way interaction between vegetation and groundwater is one of the key mechanisms affecting the dynamics of wetland vegetation. There is broad experimental evidence that phreatophyte vegetation, i.e., plants relying on water from the phreatic aquifer, affects the average depth and the diurnal fluctuations of the local water table, as suggested by significant increases in water table elevation (or "watering up" [*Dubé et al.*, 1995]) subsequent to the removal of riparian vegetation [e.g., *Wilde et al.*, 1953; *Peck and Williamson*, 1987; *Borg et al.*, 1988; *Riekerk*, 1989] and by the opposite effect observed after planting vegetation in areas with relatively shallow water tables [*Wilde et al.*, 1953; *Chang*, 2002]. Vegetation–water table interactions occur also in forested wetlands [*Dubé et al.*, 1995; *Roy et al.*, 2000], and salt marshes [*Dacey and Howes*, 1984; *Ursino et al.*, 2004]. The water table drop caused by the presence of vegetation is generally attributed to lower recharge rates due to rainfall interception and plant transpiration [e.g., *Wilde et al.*, 1953; *Borg et al.*, 1988; *Riekerk*, 1989; *Dubé et al.*, 1995], and to uptake by "taproots" extracting water directly from the (unconfined) aquifer [e.g., *Le Maitre et al.*, 1999].

[4] Waterlogging conditions resulting from post-clear-cut water table rise may, in turn, inhibit seedling establishment and growth [*Wilde et al.*, 1953], thereby preventing the regeneration of forest stands (Figure 1). In fact, the anaerobic conditions existing in saturated soils are detrimental to the root system and reduce both the productivity and the rate of survival of new seedlings [*Roy et al.*, 2000, and references therein; *Chang*, 2002]. As a result, the clear-cut of riparian and other wetland vegetation may lead to ecosystem conversion, i.e., to the encroachment (Figure 1) of water-tolerant or of shallow-rooted invasive species [*Chambers and Linnerooth*, 2001; *Wright and Chambers*, 2002; *Roy et al.*, 2000].

[5] These experimental results suggest that, by increasing the depth of the water table, phreatophytes are able to


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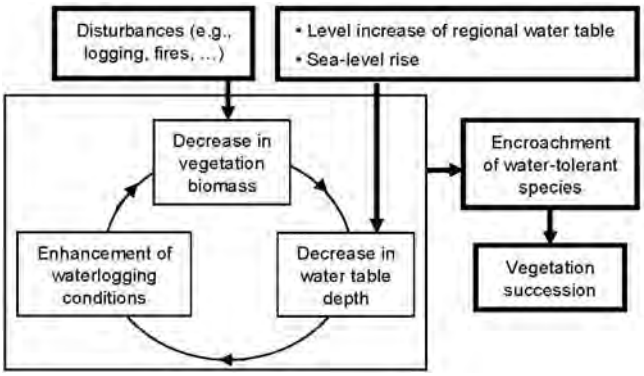


**Figure 1.** Scheme of the processes resulting from vegetation–water table interactions in wetland ecosystems.

maintain sufficient aeration of the root zone, thereby providing favorable conditions for their own survival. Thus, in some riparian and wetland environments a positive feedback exists between vegetation establishment (or removal) and the occurrence (or disappearance) of water table depths tolerable by vegetation [*Wilde et al.*, 1953; *Chang*, 2002] (Figure 1). This type of feedback mechanism can be associated with the possible emergence of multiple stable states in vegetation dynamics [e.g., *Walker et al.*, 1981; *Scheffer et al.*, 2001].

[6] A conceptual model is here developed to explain the possible existence of two preferential states in the dynamics of some wetland ecosystems [e.g., *Roy et al.*, 2000; *Chambers and Linnerooth*, 2001; *Wright and Chambers*, 2002; *Schroder et al.*, 2005]. This framework is here used to investigate the susceptibility of wetland vegetation to catastrophic shifts [*Scheffer et al.*, 2001] to the other stable state, and to provide qualitative indications on the possible response of riparian environments to management strategies and restoration projects.

## 2. Modeling Framework

[7] We propose a model for vegetation–water table interactions, which accounts for the demographic dynamics of only one dominant species. The model mechanistically relates plant–water table feedbacks to the emergence of multiple stable states in vegetation density. Because no other species is included in the system, the model does not account for the likely occurrence of ecological succession in response to the loss of the original vegetation. It will be shown that both complete vegetation cover and unvegetated conditions can turn out to be stable states of the system. However, the unvegetated state is seldom observed in riparian areas or wetlands because water-tolerant species are commonly found to replace the original vegetation, leading to ecosystem conversion in response to water table rise. Thus, in what follows the occurrence of "unvegetated states" does not imply that the system will ultimately remain with no vegetation. Rather, the loss of the original vegetation suggests the occurrence of conditions favorable to ecosystem conversion, leading to a new stable vegetated state.

[8] Changes in riparian vegetation can be modeled through a growth-death process in which the net growth rate is expressed by the logistic curve [e.g., *Noy-Meir*, 1975; *Tsoularis and Wallance*, 2002], i.e., is taken proportional to the existing biomass, $V$, and to the available resources, $V_{cc} - V$, with $V_{cc}$ being the ecosystem carrying capacity. $V_{cc}$ is the maximum amount of vegetation sustainable with the available resources (e.g., water, light, etc.) and the existing disturbance regime, including the occurrence of waterlogging conditions. Thus vegetation dynamics are expressed as

$$\frac{dV}{dt} = \alpha V(V_{cc} - V) \tag{1}$$

where $\alpha$ regulates the temporal response of the system.

[9] To account for the vegetation–water table feedback we express the depth, $d$, of the water table as a (linear) function of $V$ (see inset of Figure 2), $d = d_0 + \beta V$, with $d_0$ representing the water depth in the absence of vegetation and $\beta$ the sensitivity of the water table to the presence of vegetation. The change in water table depth between vegetated ($V = V_{cc}$) and unvegetated ($V = 0$) conditions may range between 20 and 50 cm [e.g., *Riekerk*, 1989; *Dubé et al.*, 1995; *Roy et al.*, 2000], and more than a meter [*Wilde et al.*, 1953; *Peck and Williamson*, 1987]. The parameter $d_0$ depends on hydrologic conditions dictated by "external" factors (i.e., not inherent to vegetation dynamics), such as the stage in an adjacent river or lake, or the sea level. Here we consider $d_0$ as a (constant) deterministic variable, though in some cases it could be treated as a random variable to account for hydrologic fluctuations.

[10] The effect of the water table on vegetation dynamics is complex and difficult to quantify. Experimental evidence suggests that the emergence of waterlogging conditions increases the mortality rate and decreases the rate of

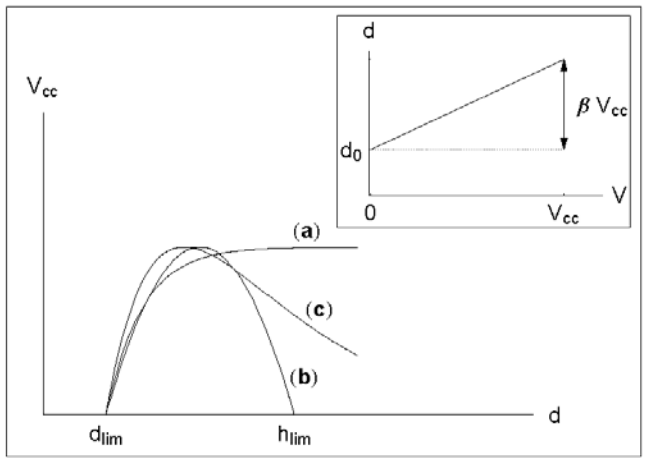


**Figure 2.** Dependence ($V_{cc} = f(d)$ for $d \geq d_{lim}$), between ecosystem carrying capacity and water table depth: line a, the case of mesophyte vegetation extracting water from the vadose zone ($f(d) = (1 - \exp[-a_1(d - d_{lim})]$); line b, the case of phreatophyte vegetation relying on water uptake from the groundwater ($f(d) = a_2(d - d_{lim})\,(d_{lim} + h_{lim} - d)\,H(d_{lim} + h_{lim} - d)$, with $H(\,)$ being the Heaviside's function); line c, the case of vegetation partly relying on uptake by roots reaching the water table ($f(d) = a_4(d - d_{lim})\exp[-a_3\,(d - d_{lim})]$). Inset shows dependence of water table depth, $d$, on vegetation biomass, $V$.

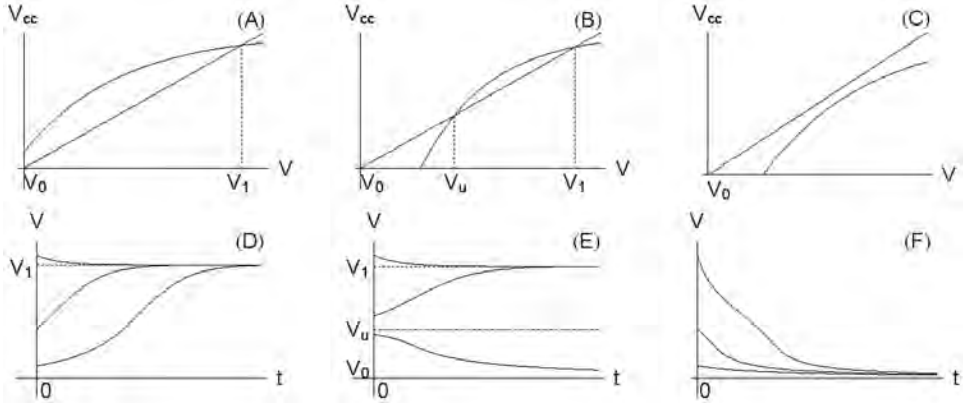


**Figure 3.** Stable and unstable states of vegetation dynamics resulting from interactions with the water table. Figures 3a–3c give graphical solutions of $V_{cc}(V) = V$ shown as intersections between the curve $V_{cc}(V)$ (equation (2); see Figure 2) and the line $V_{cc} = V$. In Figures 3a and 3d, because $d_0 > d_{\lim}$, the system has only one stable state, $V_1$, and an unstable state $V_0 = 0$ (not shown). $V$ always tends to $V_1$, regardless of its initial value (Figure 3d). In Figures 3b and 3e, $d_0 < d_{\lim}$, and there are three solutions of $V_{cc}(V) = V$ (i.e., equation (1) has three equilibrium states). The system has two stable states (i.e., attractors), $V_0$ and $V_1$, and an unstable state $V_u$. Depending on whether the initial value of $V$ is larger or smaller than $V_u$ the system tends to $V_1$ or $V_0$, respectively (Figure 3e). In Figures 3c and 3f, because there are no solutions of $V_{cc}(V) = V$, equation (1) is zero only for $V = V_0$, which is the only stable state. Regardless of the initial condition, the system always tends to the unvegetated state, $V_0$ (Figure 3f).

seedling establishment, thereby reducing the ecosystem productivity [e.g., *Roy et al.*, 2000]. These effects translate into a reduction in ecosystem carrying capacity, $V_{cc}$ (equation (1)). To investigate the qualitative properties of vegetation dynamics emerging from these interactions with the water table we express $V_{cc}$ as a function of $d$

$$V_{cc} = \begin{cases} 0 & (if \quad d < d_{\lim}) \\ f(d) & (if \quad d \geq d_{\lim}) \end{cases} \tag{2}$$

with $d_{\lim}$ representing the threshold of vegetation tolerance to shallow water tables and to the consequent insufficient aeration of the root zone. In these conditions the ecosystem carrying capacity can be assumed to be zero. We stress that while $d_0$ depends on the hydrologic conditions, $d_{\lim}$ is a function of plant physiology, in that it expresses vegetation tolerance to waterlogging. The function $f(d)$ in equation (2) accounts for the dependence of $V_{cc}$ on the water table depth. Three different types of relations are here considered depending on the type of vegetation (Figure 2).

[11] 1. Vegetation adapted to moderate levels of soil moisture (mesophytes) extracts water from the unsaturated zone without requiring uptake from the water table. Mesophytes grow on well-aerated soils and with adequate supply of moisture. In this case, $f(d)$ increases with $d$ to account for the decrease in productivity and ecosystem carrying capacity associated with waterlogging conditions (i.e., with shallow water table), while it remains constant for high values of $d$, as shown in Figure 2 (line a).

[12] 2. Plants with tap roots rely on water from the saturated zone (phreatophytes). These plants are stressed both when the water table is too shallow (waterlogging) and when it is relatively deep (i.e., out of the reach of taproots). In this case $V_{cc}$ depends on $d$ as qualitatively shown by line b in Figure 2.

[13] 3. Intermediate conditions are represented by vegetation types that partly rely on water from the underlying aquifer (line c in Figure 2).

[14] The overall net growth of vegetation (equation (1)) tends to a maximum value of biomass ($V_{cc}$) allowed by the available resources and the water table conditions. There is a two-way interaction of vegetation with the groundwater, in that plants affect the water table depth, which, in turn, determines the ecosystem carrying capacity. Equation (2) combined with the dependence of $d$ on $V$ provides a relation, $V_{cc} = V_{cc}(V)$, between vegetation biomass, $V$, and its upper bound, $V_{cc}$. Because vegetation biomass increases with time for $V < V_{cc}$ and decreases for $V > V_{cc}$ (equation (1)) the dependence of $V_{cc}$ on $V$ provides useful indications on some general properties of the dynamics. In particular, three different behaviors (Figures 3a, 3b, and 3c) can be observed, depending on the sign of $d_0 - d_{\lim}$ and the number of equilibrium states, i.e., of states in which $dV/dt = 0$. Because $V = V_0 = 0$ is always an equilibrium state of the system (see equation (1)), the existence of multiple equilibrium states depends on the existence of real, nonnull roots of the equation $V_{cc} = V$, with $V_{cc}$ being a function of $V$ given by equation (2) with $d$ depending on $V$ as shown in the inset of Figure 2. In what follows we discuss the possible equilibrium states and their stability through the analysis of the intersections of the curve $V_{cc}(V)$ with the line $V_{cc} = V$. The following cases can occur:

### 2.1. Case A

[15] If $d_0 > d_{\lim}$, the water table is always deeper than the minimum depth required for plant establishment and survival. In these conditions the system has only one equilibrium state ($V = V_1$ in Figure 3a), which is stable. In fact, vegetation biomass decreases (i.e., $dV/dt < 0$, see equation (1)) when $V$ exceeds $V_1$. Conversely, $V$ increases when $V < V_1$ as shown in Figure 3d.

### 2.2. Case B

[16] If $d_0 < d_{\lim}$ the water table prevents vegetation encroachment starting from unvegetated initial conditions.

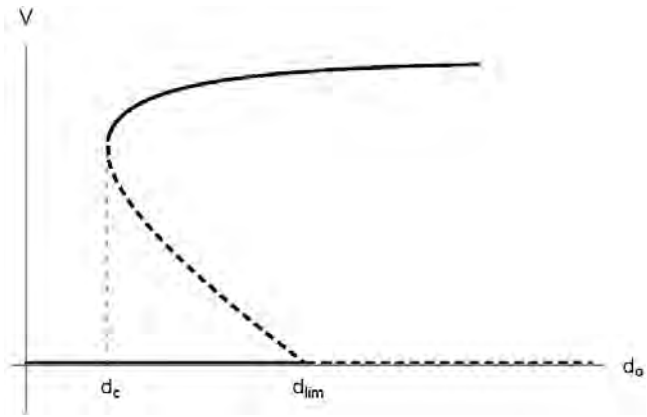


**Figure 4.** Stable (solid line) and unstable (dashed line) states of the system as a function of the undisturbed depth, $d_0$, of the water table.

However, in this case vegetation, if present, is able to keep the water table below the maximum elevation tolerable by plants. Thus the system has three equilibrium states, shown as intersections in Figure 3b. Two of these states are stable, i.e., $V = V_0$ and $V = V_1$, while the third one ($V = V_u$) is unstable. The unstable state marks the transition between the domains of attraction of $V_0$ and $V_1$, corresponding to bare ground and vegetated conditions, respectively. As $V$ drops below (grows above) $V_u$, $V$ evolves toward $V_0$ ($V_1$) (Figure 3e).

### 2.3. Case C

[17] If $d_0 < d_{lim}$ and plants are not sufficiently effective at decreasing the water table elevation to a point that is suitable for the stable occurrence of vegetated conditions, the only stable state corresponds to unvegetated conditions (i.e., $V = V_0 = 0$) as shown in Figures 3c and 3f. As mentioned before, the loss of the original vegetation is likely followed by the growth of water-tolerant species.

## 3. Discussion and Conclusions

[18] The roots of the right-hand side of equation (1) represent equilibrium states of the system. One of them is always $V = V_0 = 0$; this state may turn out to be stable or unstable depending on the values of $d_0$, $d_{lim}$ and the shape of the $V_{cc}(V)$ curve. For a given vegetation type (i.e., $d_{lim}$ and $V_{cc}(V)$) $d_0$ is the only environmental variable determining the stable states of the system. For $d_0 > d_{lim}$ the system has one stable vegetated state (Figure 4), while bare soil conditions are unstable. Thus, if disturbed, the dynamics evolve always toward this stable state. As $d_0$ decreases below $d_{lim}$ the unvegetated state $V = V_0$ becomes stable. In these conditions the system has two stable states. One of them (i.e., $V = V_1$) is associated with the existence of vegetation, while the other (i.e., $V = V_0$) corresponds to bare soil conditions. As $d_0$ decreases below a critical value, $d_c$, the stable vegetated state disappears (i.e., there are no intersections of $V_{cc} = V$ with $V_{cc}(V)$ other than $V_0$). In this case the only equilibrium state, $V = V_0$ is stable.

[19] Ecosystems with multiple stable states are often analyzed using the concept of resilience. Ecosystem resilience is usually defined [*Holling*, 1973] as the minimum magnitude of disturbances able to cause phase transitions to the other stable state. For example, the resilience of the equilibrium state, $V_1$, can be measured by the distance between $V_1$ and $V_u$ (i.e., $|V_1 - V_u|$): when $V_1$ is close to $V_u$ the vegetated state has low resilience, in that a relatively small disturbance is able to shift the ecosystem to the alternative stable state $V = V_0$. Thus the resilience of $V = V_1$ is zero when $d_o = d_c$ (Figure 4). Conversely, a small resilience of the unvegetated state suggests that vegetation restoration may be feasible.

[20] The emergence of multiple stable states is of great importance to our understanding of wetland ecosystems, in that the disturbance of the stable vegetated state may lead the system away from its initial conditions and change the vegetation in riparian zones. In fact, if $V$ is reduced below $V_u$ vegetation dynamics evolve toward the unvegetated state ($V = V_0$) and remain locked therein. This suggests that because of the vegetation–water table feedback, the system would not revert back to its stable vegetated state unless a change in the hydrologic conditions controlling the water table depth destabilizes the unvegetated state by increasing $d_0$ above $d_{lim}$. Indeed, soil drainage is a relatively frequent management practice to restore wetland vegetation in boreal regions (e.g., Finland) where forested wetlands are intensively used for wood harvesting [*Dubé et al.*, 1995].

[21] Thus wetland ecosystems are vulnerable to disturbances and may respond to biomass losses with highly irreversible catastrophic shifts to unvegetated conditions. Recovery from this stable state with no change in the externally driven hydrologic controls (i.e., of $d_0$) is not likely to occur. However, water-tolerant and shallow-rooted species (i.e., with different $V_{cc}(V)$ curves and values of $d_{lim}$) can colonize the systems thanks to their competitive advantage in waterlogged soils. Interesting dynamics may arise from the interaction of these water-tolerant species with the water table: if the water table depth increases sufficiently to favor the reestablishment of the original vegetation, the ecosystem reverts back to its initial state; otherwise the system undergoes a permanent conversion to a different vegetated state. Thus the catastrophic shift to the unvegetated state is likely followed by important changes in the composition and structure of vegetation. On the basis of this reasoning we interpret the frequent occurrence of vegetation succession in riparian environments [*Chambers and Linnerooth*, 2001; *Wright and Chambers*, 2002] as a possible sign of alternative stable states (e.g., shallow-rooted grasses in shallow-water table sites and shrubs in deep water table areas [*Chambers and Linnerooth*, 2001]), resulting from water table–vegetation feedbacks.

[22] The understanding of these dynamics of disturbance, response, and succession is relevant to the correct management of wetland ecosystems, in that it may provide useful indications on the possible occurrence of abrupt and irreversible changes in vegetation and on the feasibility of vegetation restoration projects in wetland environments. In addition to disturbance-induced vegetation losses, wetland ecosystem may experience the transition to (stable) unvegetated conditions as a result of water table rise due to changes in groundwater resources management. In fact, as $d$ decreases below $d_c$ (Figure 4) the equilibrium state $V = V_1$ disappears and the system catastrophically shifts to the stable state, $V = 0$. Similar changes could occur in salt

marsh vegetation [e.g., *Dacey and Howes*, 1984; *Ursino et al.*, 2004], under the long-term effect of a sea level rise, though other processes not included in our simplified framework (e.g., sediment deposition, marsh erosion, vegetation burial) are known for adding more complexity to the dynamics of marsh ecosystems [e.g., *Allen*, 1997; *van de Koppel et al.*, 2005].

[23] **Acknowledgment.** This research was funded by the Fondazione CRT, Cassa di Risparmio di Torino.

## References

Allen, J. R. L. (1997), Simulation models of salt marsh morphodynamics: Some implications for high intertidal sediment couplets related to sea-level change, *Sediment. Geol.*, *113*(3–4), 211, 223.

Borg, H., G. L. Stoneman, and C. G. Ward (1988), The effect of logging and regeneration on groundawater, streamflow and stream salinity in the southern forest of Western Australia, *J. Hydrol.*, *99*, 253–271.

Chambers, J. C., and A. R. Linnerooth (2001), Restoring riparian meadows currently dominated by *Artemisia* using alternative state concepts—The establishment component, *Appl. Veg. Sci.*, *4*, 157–166.

Chang, M. (2002), *Forest Hydrology: An Introduction to Water and Forests*, CRC Press, Boca Raton, Fla.

Dacey, J. W. H., and B. H. Howes (1984), Water uptake by roots controls water table movement and sediment oxidation in short *spartina* marsh, *Science*, *224*, 487–489.

Dubé, S., A. P. Plamondon, and R. L. Rothwell (1995), Watering up after clear-cutting on forested wetlands of the St. Lawrence lowland, *Water Resour. Res.*, *31*(7), 1741–1750.

Holling, C. S. (1973), Resilience and stability of ecological systems, *Annu. Rev. Ecol. Syst.*, *4*, 1–23.

Le Maitre, D. C., D. F. Scott, and C. Colvin (1999), A review of information on interactions between vegetation and groundwater, *Water SA*, *25*(2), 137–152.

Naiman, R., and H. Decamps (1997), The ecology of interfaces: Riparian zones, *Annu. Rev. Ecol. Syst.*, *28*, 621–658.

Noy-Meir, I. (1975), Stability of grazing systems: An application of predator-prey graphs, *Annu. Rev. Ecol. Syst.*, *6*, 459–481.

Peck, A. J., and D. R. Williamson (1987), Effects of forest clearings on groundwater, *J. Hydrol.*, *94*, 47–65.

Riekerk, H. (1989), Influence of silvicultural practices on the hydrology of pine flatwoods in Florida, *Water Resour. Res.*, *25*(4), 713–719.

Roy, V., J.-C. Ruel, and A. P. Plamondon (2000), Establishment, growth and survival of natural regeneration after clearcutting and drainage on forested wetlands, *For. Ecol. Manage.*, *129*, 253–267.

Scheffer, M., S. Carpenter, J. A. Foley, C. Folke, and B. H. Walker (2001), Catastrophic shifts in ecosystems, *Nature*, *413*, 591–596.

Schroder, A., L. Persson, and M. D. De Roos (2005), Direct experimental evidence for alternative stable states: A review, *Oikos*, *110*(1), 3–19.

Tsoularis, A., and J. Wallance (2002), Analysis of logistic growth models, *Math. Biosci.*, *179*, 21–55.

Ursino, N., S. Silvestri, and M. Marani (2004), Subsurface flow and vegetation patterns in tidal environments, *Water Resour. Res.*, *40*, W05115, doi:10.1029/2003WR002702.

van de Koppel, J., D. Van der Wal, J. P. Bakker, and P. M. J. Herman (2005), Self-organization and vegetation collapse in salt-marsh ecosystems, *Am. Nat.*, *165*(1), E1–E12.

Walker, B. H., D. Ludwig, C. S. Holling, and R. M. Peterman (1981), Stability of semi-arid savanna grazing systems, *J. Ecol.*, *69*, 473–498.

Wilde, S. A., E. C. Steinbrenner, R. S. Pierce, R. C. Dosen, and D. T. Pronin (1953), Influence of forest cover on the state of the ground water table, *Soil Sci. Soc. Proc.*, *17*, 65–67.

Wright, J. M., and J. C. Chambers (2002), Restoring riparian meadows currently dominated by *Artemisia* using alternative state concepts—Above-ground response, *Appl. Veg. Sci.*, *5*, 237–246.

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***Northern Forested Wetlands: Ecology and Management***
Editor: Carl C. Trettin (1997, pages 239-247)

It has been demonstrated in an extensive review of watershed studies by Bosch and Hewlett (1982) that tree felling reduces the evapotranspiration loss. The increased amount of water available on the site has considerable consequences in forested wetlands since the hydrological regime is the main environmental driving force (Verry, 1988; Lugo, 1990; Bridgham et al., 1991). The major change following clearcutting is the rise of the water table, referred to as "watering-up", which may delay regeneration (Bolghari, 1986) and reduce productivity of the site by decreasing the depth of the aerated zone for tree root exploitation (Heikurainen et al., 1964 in Mannerkoski, 1985)…

Hydrological studies to investigate watering-up have been conducted in many countries. An extensive review can be found in Dubé et al. (1995). The general conclusions from these studies are that decreases in the rate of transpiration and interception are responsible for the watering-up (Heikurainen, 1967). Also, the magnitude of the rise is directly related to the percentage of wood cut (Heikurainen and Pâivànen, 1970; Pâivànen, 1980), to the depth of the original water table (Heikurainen, 1967; Pâivànen, 1980), and to the time water is available near the soil surface (Verry, 1980). Recently, Dubé et al. (1995) confirmed that clearcuttings, even on 1 ha, caused rises of the water table in the St. Lawrence Lowlands and that reduced interception appeared to be the most important parameter responsible…

After cutting, the water table in the clearcut treatment on all lines rose in comparison to their respective controls (Figure 4).

…mean water table levels were elevated by 5, 4, and 6 cm after clearcutting on lines 1, 2, and 3 respectively (Table 4). This is in agreement with Heikurainen and Pâivànen (1970), who found a rise of 5 cm after clearcutting when the control water table was 25 cm deep…

…observation agrees with Verry (1980, 1988), who suggested that when the water table is within 30 cm of the surface, harvesting will increase the fluctuations of the water table. The proportion of net precipitation reaching the water table is probably responsible for these increased fluctuations…

In the undrained plots, the water table levels after both thinnings were higher by 8 and 10 cm (Table 7), which is comparable to results from Heikurainen and Pâivànen (1970) for the same level of thinning intensity…

**Effect of vegetation–water table feedbacks on the stability and resilience of plant ecosystems**
Authors: Luca Ridolfi; Paolo D'Odorico; Francesco Laio (2006)

[3] The two-way interaction between vegetation and groundwater is one of the key mechanisms affecting the dynamics of wetland vegetation. There is broad experimental evidence that phreatophyte vegetation, i.e., plants relying on water from the phreatic aquifer, affects the average depth and the diurnal fluctuations of the local water table, as suggested by significant

increases in water table elevation (or ‘‘watering up’’ [Dubé et al., 1995]) subsequent to the removal of riparian vegetation [e.g., Wilde et al., 1953; Peck and Williamson, 1987; Borg et al., 1988; Riekerk, 1989] and by the opposite effect observed after planting vegetation in areas with relatively shallow water tables [Wilde et al., 1953; Chang, 2002]. Vegetation–water table interactions occur also in forested wetlands [Dubé et al., 1995; Roy et al., 2000], and salt marshes [Dacey and Howes, 1984; Ursino et al., 2004]. The water table drop caused by the presence of vegetation is generally attributed to lower recharge rates due to rainfall interception and plant transpiration [e.g., Wilde et al., 1953; Borg et al., 1988; Riekerk, 1989; Dubé et al., 1995], and to uptake by ‘‘taproots’’ extracting water directly from the (unconfined) aquifer [e.g., Le Maitre et al., 1999].

[4] Waterlogging conditions resulting from post-clear-cut water table rise may, in turn, inhibit seedling establishment and growth [Wilde et al., 1953], thereby preventing the regeneration of forest stands (Figure 1). In fact, the anaerobic conditions existing in saturated soils are detrimental to the root system and reduce both the productivity and the rate of survival of new seedlings [Roy et al., 2000, and references therein; Chang, 2002]. As a result, the clear-cut of riparian and other wetland vegetation may lead to ecosystem conversion, i.e., to the encroachment (Figure 1) of water-tolerant or of shallow-rooted invasive species [Chambers and Linnerooth, 2001; Wright and Chambers, 2002; Roy et al., 2000].

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Comments on the Forests Sub Group GC3 Draft Report

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 5:29 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Star Childs <eecostar@aol.com>
**Sent:** Wednesday, October 21, 2020 3:05 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Comments on the Forests Sub Group GC3 Draft Report

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To the Authors and Forest Group Study committee,

I commend you all on a most thorough and excellent draft report to the Governor on how vital a role our Connecticut forests and urban tree cover

play in maintaining some balance against and offsets to our still far outsized carbon footprint for such a little state. Long have I been hyper-aware of the myriad

ecosystem services that our state and private woodlands provide well in excess of their perceived stumpage value to the wood products industry. In fact,

due to reduced market valuations for so much of our high quality timber over recent years and the influx of destructive forest pests, my management focus long

ago began to shift towards the management of forest resources with a more weighted approach to carbon sequestration in retained larger trees, longer rotations, and mixed age

class stands as opposed to the even aged, mature forest stands as most of CT's woodlands are becoming.

Therefore I applaud your efforts to refocus the dialogue around, wildlife habitat, forest and soil carbon, and watershed protection as a means to an end. To advocate for No Net Loss of Forest(NNLF) is an aspirational

goal worthy of our state's efforts and eventual enactment into law. That we have a template to follow from Maryland whose leadership in this regard seems to have been working since its passage, I would support that

goal with all my heart. Our core forests are being whittled away at the edges or threatened with fragmentation ironically by developers of renewable energy(wind and solar) in addition to wealthy developers looking to

establish "kingdom lots" in upland, remote forests. I agree that CT Siting Council must consider such forest destructive siting plans under a different and more restrictive set of rules for all

of the environmental impacts that these land conversions and access road construction will cause in the loss of those unique habitats and old forests. Likewise, forest losses to any conversion and development

have long needed to be mitigated and offset by an NNLF statute which would require at a minimum reforestation or additional forest protections through mitigation elsewhere.

That our southern New England forest species mixes provide for ample carbon uptake and storage comes as no surprise to me and in fact, I was able to successfully move our board of directors to

agree to the California Air Resources Board's (CARB) terms for the first Improved Forest Management (IFM) Carbon Offset project for our 6000 acre Great Mtn Forest lands in Canaan and Norfolk. Your report suggests that as a part

of our involvement with RGGI that we should "should study forest carbon offset allowances available through compliance and voluntary markets for reforestation, improved forest management, avoided conversion,

and proforestation". Rather than study CARB's already effective landowner payments program for aggregating carbon sequestration in forests, we should seek to implement a similar program across the RGGI compact

which would provide the needed incentives and funding to accomplish so many other noble goals that are outlined in your report. Time is of the essence and studying is hardly needed. payments for ecosystem services is an

effective incentive tool.

There is so much in this wonderful draft report that I could go on at length myself, but there is little that I would change. I will say this in closing. It is all well and good to advocate for NEFF's Exemplary Forests standards and

HVA's Follow the Forest guidelines to achieve forest landowner uptake and implementation, but without realistic commitments to establishing wood utilization markets concurrent with more enlightened and professional forest

management, we will devolve, as we have, back to "high grading" and "selective" harvesting that impoverishes our oak rich forests. Connecticut still needs a Forest Practices Code or Law. We got close years ago, but left

that well-intentioned legislation (award winning, I believe) waiting at the alter. We also need better and closer to the source market outlets for low grade timber and cull wood from the otherwise "well managed or adaptively managed" forests that your report envisions.

It has been an exercise in absurdity to watch as highway after highway and power line R.O.W. after R.O.W. are cleared of trees that threaten transportation or transmission only to see the woody materials ground up and left to waste or worse landfilled.

Storm debris and urban wood waste could be generating thermal energy for school offsetting fossil fuels. Our neighbors to the north have long been using woody biomass, sourced from from silvicultural stand thinning, clearing

of take downs, and clean sorted construction and demolition wood for the benefit of schools, hospitals, and public spaces. Not only do the dollars for this heating material stay local, the modern carbon released is amply cycled and

reabsorbed back into the New England forest. We can develop small scaled and reasonably sized boilers all across CT to utilize this renewable energy and one has only to observe the efficacy of biomass steam plants like the

one at Hotchkiss School to see that the savings are beneficial and the offsets to fossil fuel use impressive.

While I agree with so much of the report's focus on more protections for core forest , better stewardship, and large tree retention and adaptive management for resilient forests, we will need to encourage renewed interest in utilizing

clean wood fuel and pelletized wood, even possibly pyrolized wood gas for fuel cells, if we are going to accomplish such lofty aspirations in management. Realizing some of the renewable energy potential in Connecticut's forested landscape

would facilitate so many of the worthy goals of better forest management as we transition to a lower carbon future and balance out our use of fossil versus modern carbon resources. We can develop these resources

right along with the many sound proposals of your report using best available controls and possibly even combined heat and power projects which would yield even higher energy efficiencies. I would like to see some mention and recognition of the

wood energy potential in the final report. I found the chart on page 14 depicting various wood industries and related cash flows and jobs to be woefully under stated, but maybe that is just how far we have fallen behind our neighboring states.

Having seen forests in the north and even here on our Great Mtn. where timber stand improvements has yielded several tons/acre of cullwood for wood fuel, I can assure you all it does meet with approval of forest landowners who might otherwise

just leave their woodlands alone.

Thank you all for an excellent report to the Governor. I look forward to its successful adoption and implementation.

Yours truly,

Star Childs

Starling Childs, MFS

EECOS Environmental Consulting Services

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Norfolk, CT 06058

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# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 6:22 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

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FYI

**From:** Stephanie C. Fox <scfjdqueenbee@yahoo.com>
**Sent:** Wednesday, October 21, 2020 5:52 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change, Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit. Nature is essential for the future, for evolution and for everything we need, and serves the public good now and for the long term. We have so many beautiful natural areas, and some need to be protected for nature study, hiking, and places that people can count on. This has never been more important. Meanwhile - we are burning and exporting our public forests? Who benefits? This is beyond disturbing. We need systems that support good jobs, local resource use, AND natural areas. Our public land is held in the public trust. We need your leadership. Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect core forests and the natural areas connecting them

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 8:49 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

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**From:** Sue Murray <suemur@sbcglobal.net>
**Sent:** Wednesday, October 21, 2020 8:49 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect core forests and the natural areas connecting them



To DEEP Climate Change,

Please protect our forests as they are the most important factor in mitigating climate change while providing a natural outlet for the public to enjoy the outdoors.

We need your leadership.

Please do everything you can to protect nature.

Susan Murray

**Hartland, CT**

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protection of natural areas on public land

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:46 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

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**From:** sbb cello <sbbcello@gmail.com>
**Sent:** Wednesday, October 21, 2020 10:45 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protection of natural areas on public land

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

I am writing to urge you to protect natural areas on public land to the greatest extent possible.

What we get from a natural area protected from further human disturbance:

- Peace and quiet: a refuge from the noise and frenzy of modern life; a place for nature study and hiking;
- The security of knowing that special places we love are likely to remain;
- The opportunity to enjoy the whole vibrant web of the ecosystem of each protected place, and to watch it grow and develop as time passes, undamaged by human activity;
- The satisfaction of providing habitat where wild plants and animals can live their lives relatively undisturbed by humans;
- A rich source of individual plants and animals to recolonize habitats depleted by human or natural causes.

As development continues relentlessly all around us, it will become harder and harder to set aside wild land; but it will become more and more important to have done so. We are on the brink of forgetting entirely what intact undisturbed land looks like and how it functions without human interference. How can people who have no experience of such places be expected to value them? We still have an opportunity to protect our wild lands, and thus begin to restore the precious resource of wildness before it fades completely from our awareness and becomes extinct. It would be our priceless gift to the future.

Dr Susan B Brachwitz

10 Pinecrest Drive, Simsbury CT

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect CT forests

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 12:23 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

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**From:** Susan Lowell <lowellsusanc@gmail.com>
**Sent:** Wednesday, October 21, 2020 11:58 AM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect CT forests

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Please support legislation and local actions to protect CT forests. Our future depends on it.

Susan C. Lowell

--

BAY PATH UNIVERSITY

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Website: https://readingandliteracyclinic.com/

"LANGUAGE IS THE MOST PERFECT WORK OF ART IN THE WORLD."

Henry David Thoreau, from his Journals

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:36 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Carpe, Suzanne N. (2022) <suzanne.carpe@trincoll.edu>
**Sent:** Wednesday, October 21, 2020 9:23 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change,

Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit.

Nature is essential for the future, for evolution and for everything we need, and serves the public good now and for the long term.

We have so many beautiful natural areas, and some need to be protected for nature study, hiking, and places that people can count on. This has never been more important.

Meanwhile - we are burning and exporting our public forests? Who benefits? This is beyond disturbing.

We need systems that support good jobs, local resource use, AND natural areas.

Our public land is held in the public trust.

We need your leadership.

Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

Sincerely,

**Suzanne N. Carpe Elías (she/her/hers)**

ELEVATE
A POLICY LAB TO ELEVATE MENTAL HEALTH AND DISRUPT POVERTY

Yale SCHOOL OF MEDICINE

October 21, 2020

**RE:**
**GOVERNOR'S COUNCIL ON CLIMATE CHANGE (GC3) Working Group Draft Report on Mental Health**

The Elevate Policy Lab (**Elevate**) at the Yale School of Medicine appreciates the opportunity to provide comments on the GC3 Working Group Draft Report on Mental Health. We firmly agree with Connecticut's commitment to enhance resiliency of the state's economic, cultural, human and natural resources to the impacts of climate change, as expressed in Governor Ned Lamont's Executive Order No. 3 (E.O. 3). Further, we commend the Connecticut Department of Energy and Environmental Protection (CT DEEP) for its leadership and commitment to this vital goal.

## Background

**Elevate** is a policy lab at the Yale School of Medicine that works with government partners to elevate mental health and disrupt intergenerational poverty. We aim to advance mental health as a pathway for families to achieve social and economic mobility, thereby seeing families' lives improve as a result. **Elevate** achieves its mission through several mechanisms. First is the federally recognized Mental Health **O**utreach for **M**other**S** (MOMS) Partnership®, an evidence-based program that lowers depressive symptoms and increases family well-being in multiple arenas including economic mobility. Born out of Yale School of Medicine in 2011, MOMS brings mental health within reach of over-burdened, under-resourced mothers. Triple Bottom Line Justice (TBLJ), as a key focus of the **Elevate** policy agenda, involves simultaneously tackling mental health, economic, and environmental challenges facing overburdened and under-resourced populations to address the root causes of health inequities and improve outcomes. TBL Justice builds on the MOMS Partnership® model to advance behavioral wellness while supporting economic stability and environmental sustainability through an integrated policy and place-based practices methodology. TBLJ is premised on the experience that meaningful engagement of underserved, overburdened, and underrepresented individuals in environmental, economic and health decisions at the local, state and national government levels improves the health of these individuals and communities and increases the effectiveness of government policies. **Elevate** is applying the MOMS Partnership® model to increase the capacity of overburdened and under-resourced individuals to meaningfully engage in government decisions that affect their lives.

## Elevate Policy Lab Recommendations

**Elevate** commends the efforts of the GC3 Working Group Draft Report on Mental Health, including the description of mental health challenges experienced as a result of climate change and the proposed recommendation. In addition, **Elevate** offers the following additional recommendations.

### Recommendation 1: Inclusive definition of vulnerable populations

Recommended Implementation Action Description: Across the workgroup reports, there is clear agreement that measures to identify and address climate change effects must recognize vulnerable populations. Given this recognition, it is important to establish an inclusive definition of "vulnerable populations" so that unique conditions can be addressed, and a general population approach can be avoided.

The Working Group on Public Health and Safety articulates the importance of recognizing vulnerable populations, including those with preexisting mental illness (Doherty and Clayton 2011; Sullivan et al. 2013). More specifically, the draft report provides

> Vulnerable Populations: Special consideration is needed for specific groups of Connecticut's population who are at high risk of distress or adverse mental health outcomes following exposure to climate-related disasters. These include children, the elderly, pregnant and postpartum women, first-responders, those with pre-existing mental illness, those with low socio-economic status, and the homeless (Dodgen et al. 2016). Furthermore, those with preexisting mental illness have been identified as a population with multiple 78 vulnerabilities to climate change, in particular extreme heat (Gamble et al. 2016). This is in part due to underlying nature of their illness and that medications they are prescribed can impair the body's ability to thermoregulate.

The Working Group on Equity and Environmental Justice also highlights the need to address vulnerable populations. The draft report provides

> Identifying those communities that are especially vulnerable to climate change impacts, such as childhood asthma, flooding, extreme heat, and other impacts aggravated by a lack of resources to meet basic needs The principles of equity mandate that race, national origin, socio-economic status, religion, gender, sexuality, or other facets of identity do not impact a person's access to resources, including basic necessities such as safe shelter, water, food, heat, and light, as well as opportunities for safe employment to support oneself and one's family, equal access to community supports such as public education, public transportation, healthcare and mental health care.

In addition, the White House Hurricane Sandy Rebuilding Strategy recognizes vulnerable populations as "groups of people especially at risk to impacts of a major storm due to their location or because they are overburdened and lack resources or have less access to services." The strategy explained

> Vulnerable Populations The Task Force understands that the affected areas include a diversity of businesses, neighborhoods, residents, and workers that may have been disproportionately vulnerable to the impacts of Hurricane Sandy due to their location, limited financial or other resources, less access to emergency services and support, or other disadvantages. Accordingly, the Task Force's Rebuilding Strategy seeks to address the needs of such "vulnerable populations," which is meant to include: low-income communities, overburdened populations, children and youth, elderly individuals, certain communities of color, households and people with limited English proficiency, immigrants, individuals with chronic medical conditions, people who are homeless or at risk of homelessness, and individuals with disabilities.

The US Global Climate Change Research Program also addressed the physical states or conditions that increase vulnerability. It emphasized that older adults, young children, pregnant women, and people with chronic health conditions or mental illness are more susceptible to harm from effects of climate change. US Global Climate Change Research Program *See: 16. USGCRP, 2016: The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment. Crimmins, A., J. Balbus, J.L. Gamble, C.B. Beard, J.E. Bell, D. Dodgen, R.J. Eisen, N. Fann, M.D. Hawkins, S.C. Herring, L. Jantarasami, D.M. Mills, S. Saha, M.C. Sarofim, J. Trtanj, and L. Ziska, Eds. U.S. Global Change Research Program, Washington, DC, 312 pp.* http://dx.doi.org/10.7930/J0R49NQX

Finally, the State of California Governor's Office of Planning and Research pursuant to Executive Order B-30-15 identified factors that contribute to vulnerability of people and communities to the impacts of climate change:

- Existing inequities, institutionalized racism, or exclusion
- Poor environmental conditions, access to services, or living conditions
- Physical states or conditions that increase vulnerability

- Lack of investment and opportunities

See: https://www.opr.ca.gov/docs/20180313-Building_a_Resilient_CA.pdf

**Accordingly, Elevate offers the following definition of vulnerable populations** that includes populations identified by both the Working Group on Public Health and Safety and the Working Group on Equity and Environmental Justice:

> Vulnerable populations are "groups of people especially at risk to impacts of climate change due to their location or because they are overburdened and lack resources or have less access to services. These populations include low-income communities, overburdened populations, children and youth, pregnant women, elderly individuals, certain communities of color, households and people with limited English proficiency, immigrants, individuals with chronic medical conditions, people who are homeless or at risk of homelessness, and individuals with disabilities. In addition, specific groups of Connecticut's population who are at high risk of distress or adverse mental health outcomes following exposure to climate-related disasters include children, the elderly, pregnant and postpartum women, first-responders, those with pre-existing mental illnesses, those with low socio-economic status, and the homeless, including those with pre-existing mental health conditions.

**Recommendation 2:** Establish a pilot program to study physical and mental health benefits to babies and mothers to provide a holistic approach to pre and post-natal care in order to increase resiliency in the face of natural and man-made disasters.

Recommended Implementation Action Description

The proposed pilot program, with a specific focus on prevention and mental health, uses research data to demonstrate the impact of providing basic needs, such as diapers on the mental health of mothers and the overall health and well-being of infants and toddlers. The proposed pilot program would be administered by the CT Department of Social Services (DSS) in collaboration with the CT Department of Energy and Environmental Protection (DEEP). As a direct benefit, it would provide diapers and other resiliency related capacity for babies. Peer-reviewed, published literature indicates that diaper need is associated with maternal depression, diaper dermatitis (diaper rash) and that the provision of diapers in pediatric settings increases attendance to pediatric well childcare visits. Outcomes to be achieved by addressing diaper need include a reduction in diaper dermatitis, urinary tract infections, maternal depressive symptoms, behavioral healthcare utilization for mother, ED visits for mother and child, immunization rates, and pediatric well child care utilization. DEEP's role in this pilot would be to support the pilot through DEEP leadership, sharing administrative data and offering consultation and advisement on the potential to scale should the findings be positive. This model of mental health promotion and basic needs could ultimately increase the resilience of families who are most at-risk of the impacts of climate change. Families would build social supports, social networks and social capital through the mental health and basic needs intervention, position families to better face the stress and adversity associated with climate change and man-made and natural disasters. The intervention in this pilot could easily be scaled and replicated by DSS and DEEP to communities in Ct disproportionately burdened by climate change.

In addition, the pilot would establish a demonstration program for a bundled payment ("maternity or pediatric bundle") to support effective interventions that are proven to reduce maternal depression and increase the health and well-being of babies. This payment could reduce Medicaid costs through reductions in diaper dermatitis and urinary tract infections for the child and reductions in acute maternal mental health visits.

Phase One would implement the pilot in New Haven, CT by providing diapers for all births at Yale New Haven Hospital for babies receiving care at the Yale Pediatric Primary Care Center from January 2021-June 2021. Phase Two would establish a similar pilot in Bridgeport, adapting for lessons learned in Phase One.

As further support for this pilot program, Connecticut has been a leader on this issue. In 2007, the state of CT was the first state to have a line item in the budget for a diaper bank. The research connecting diaper need to maternal depression was conducted in CT. The first ever economic analysis of a diaper bank was conducted on The Diaper Bank of Connecticut. In 2019, the CT state budget included funding for The Diaper Bank of Connecticut to provide diaper assistance for TANF eligible families in need. Connecticut would be innovative in this pilot, using research to connect the provision of diapers to improved health outcomes for babies and mothers, as a means of advancing climate resiliency for underserved and overburdened mothers and babies.

**Accordingly, Elevate Policy Lab recommends the establishment of a pilot program** on physical and mental health benefits to babies and mothers in order to increase resiliency in the face of climate change and natural and man-made disasters.

**Recommendation 3**: Cross Reference Relevant Findings and Support Recommendations on Mental Health proposed in the Equity & Environmental Justice Draft Report September 21, 2020.

Recommended Implementation Action Description:
The Equity and Environmental Justice Working Group recognized the discussion of mental health in the draft Public Health and Safety Report, finding it to be "critical." It also made the following observation and recommendation:

> The mental health section discusses service needs for the chronically mentally ill. This is good; however, it should add a recommendation for planning for post-disaster, culturally and linguistically appropriate mental health service structures. These needs are often underestimated in disaster plans.

It is also critical to account for the recognition of mental health in Presidential Policy Directive -8, which provides for the federal National Disaster Recovery Framework. The National Disaster Recovery Framework highlights *Psychological and Emotional Recovery* as one of eight principles that when put into practice, maximize the opportunity for achieving recovery success, support survivor needs and build resilience.

**Accordingly, Elevate Policy Lab supports the inclusion of the Equity and Environmental Justice recommendation** regarding mental health and disaster planning. In addition, we reinforce the need to address service needs throughout the full continuum of natural disaster response, recovery and preparedness. **The following language can be incorporated as a recommendation:**

> In natural disaster response, recovery and preparedness, state and local governments should plan for and provide culturally and linguistically appropriate mental health service structures.

Ultimately, **Elevate** is grateful for the opportunity to offer our expertise and experience on intergenerational maternal mental health and Triple Bottom Line Justice as a pathway to enhance resiliency of the state's economic, cultural, human and natural resources to the impacts of climate change.

Sincerely,

B. Suzi Ruhl, JD, MPH, Director of Policy
Megan Smith, DrPH, MPH, Principal Investigator and Founder

Hilary Hahn, EdM, MPH,  Executive Director

Elevate Policy Lab
Yale School of Medicine

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Draft Report of the Progress on Mitigation Strategies Working Group - Chapter 5 TRANSPORTATION - Our Comments & Recommendations

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:34 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** morrissey.consulting@cox.net <morrissey.consulting@cox.net>
**Sent:** Wednesday, October 21, 2020 9:13 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Cc:** Lee Grannis <grannis@nhcleancities.org>; 'David Gable' <DGABLE@hocongas.com>; 'Craig Peters' <craigpeters82@gmail.com>; 'Daphne Dixon' <Daphne@livegreenct.org>; 'Don Cusson' <don@cussonautomotive.com>; morrissey.consulting@cox.net
**Subject:** Draft Report of the Progress on Mitigation Strategies Working Group - Chapter 5 TRANSPORTATION - Our Comments & Recommendations



RE: Draft Report of the Progress on Mitigation Strategies Working Group – Chapter 5 TRANSPORTATION – Our Comments & Recommendations

Dear GC3:

This section of the report and its recommendations is heavily biased to costly electrification recommendations and almost completely ignores Federally recognized Alternative Fuels that are immediately positioned to economically reduce harmful transportation pollutants while forfeiting valuable Federal incentives to deploy them. Propane and Natural Gas deployed as transportation fuels in our state are already making significant contributions to reducing GHG emissions in our state especially in pupil transportation, beverage delivery and refuse industry. The dirtier fuels like gasoline and diesel, are the ones that have gotten us into environmental trouble in the first place. This can be immediately remedied by encouraging the broader use of propane, natural gas and other recognized clean alternative fuels in the transportation sector.

Of all the alternative fuels offered today including electricity, propane which has no methane molecules at all in its chemical makeup, is the cleanest fuel of all. Not encouraging it and other clean alternative fuels does not make any sense at all when it comes to climate planning in our state. Renewable propane is just around the corner and promises to deliver even cleaner propane in the future.

We would like to conclude by formally offering the following comments/changes to the draft report.

-

## PAGE 84: OUR SUGGESTED CHANGES

-

*New strategy* — **Establish statewide goals for (Our recommendation - insertion) LOW EMISSION & zero-emission medium- and heavy-duty trucks and for school transportation [PRIORITY]**

**OUR COMMENT**: The Working Group has mis-characterized the referenced MOU by implying this pertains to electric powered vehicles only. The actual MOU (see immediately below) allows for the use of low-NOx fuels for trucks. There are currently over 700 powered propane school buses in operation in Connecticut today, are readily available, costing one third the cost of an electric vehicle. Nestle Waters a Stamford, CT based beverage delivery company is running over 1000 trucks on propane nationwide and in CT today. Lastly, the Refuse Industry in CT is operating over 200 Class 8 vehicles on compressed natural gas. In fact, the propane and natural gas industry is already contributing significantly to improved air quality in the Class 3-8 vehicles space and more entities should be encouraged to the same. These vehicles are shovel ready today and are supported with various Federal Tax Incentives to deploy the immediately.

> Actual MOU Abstract:
>
> WHEREAS, electrification2 of the transportation sector is essential to achieve the GHG emission reductions needed to avoid the worst effects of climate change, and **in conjunction with the introduction of low-NOx heavy duty trucks**, to reduce harmful emissions of NOx, particulate matter, and toxic air contaminants that adversely impact public health;

*Strategy* — Develop a State fleet transportation Lead by Example program that sets annual emissions-reduction targets and enables increasing adoption of **(Our recommendation - insertion)** LOW EMISSION & zero-emission vehicles.

**OUR COMMENT:** We suggest this Strategy be modified to include Low Emission vehicles. There are currently over 700 powered propane school buses in operation in Connecticut today, are readily available, costing one third the cost of an electric vehicle. Nestle Waters a Stamford, CT based beverage delivery company is running over 1000 trucks on propane nationwide and in CT today. Lastly, the Refuse Industry in CT is operating over 200 Class 8 vehicles on compressed natural gas. In fact, the propane and natural gas industry is already contributing significantly to improved air quality in the Class 3-8 vehicles space and more entities should be encouraged to the same. These vehicles are shovel ready today and are supported with various Federal Tax Incentives to deploy the immediately.

## PAGE 85: OUR SUGGESTED CHANGES

*New strategy* — Establish new sources of funding for EV rebate programs (Our recommendation - insertion) **& CREATE SIMILAR INCENTIVES FOR LOW EMISSION VECHICLES**

**OUR COMMENT: Equipping a vehicle to operate on propane and natural gas requires and expenditure of $5000 - $35,000 and in some cases even more. This premium additional cost is the single biggest reason discouraging vehicle adoption to Alternative Fuels. Any new incentive would make a significant improvement in adopting clean Alternative fuels in our state.**

## Page 118 Preliminary Glossary (Our Suggested Changes)

| | |
|---|---|
| **Alternative Fuels** | Fuels other than fossil fuels used in vehicular transport. |

**OUR COMMENT: Our Federal Government formally identifies alternative fuels to include: Electricity, Hydrogen, Biodiesel, Ethanol, Propane and natural gas. We recommend the Work Group definition above be changed to comply with Federal government. Broadening this definition here will give interested parties more options in implementing the use of clean alternative fuels instead of conventionally dirtier fuels like gasoline and diesel fuel**

-

***T. Michael Morrissey***
***Director of Government Affairs & Business Development***
**Alternative Fuels Coalition of Connecticut**

***C/O Morrissey Consulting, LLC***
***332 Strickland Street***
***Glastonbury, CT 06033***

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**WEB:** T.Michael Morrissey

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Public Comment: GC3 Forests Sub-Group Draft Report

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:49 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Steeves, Tanner <Tanner.Steeves@ct.gov>
**Sent:** Wednesday, October 21, 2020 11:30 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Cc:** Eric Hammerling <ehammerling@ctwoodlands.org>
**Subject:** Public Comment: GC3 Forests Sub-Group Draft Report

Greetings,

Please accept the attached document for Public Comment on the GC3 Forests Sub-Group Draft Report.

Eric- Thank you very much for the opportunity to comment. I have a tremendous amount of respect for the authors, and hope my comments are well received in the spirit of learning and respectful discourse. Coordinating this effort is no easy task- thank you for doing it and good luck the rest of the way. Please feel free to contact me if you have any questions or would like additional resources.

Tanner Steeves

Tanner Steeves

Wildlife Biologist – Habitat Program

Wildlife Division – Bureau of Natural Resources

Connecticut Department of Energy and Environmental Protection

Eastern District HQ, 209 Hebron Road, Marlborough, CT 06447
P: 860.295.9523|F: 860.295.8175 | E: tanner.steeves@ct.gov

Connecticut Department of
ENERGY &
ENVIRONMENTAL
PROTECTION

**GC3 Comments_Steeves_October-21-2020.pdf**
623K

**Public Comments: GC3 Forests Sub-group Draft Report**

**Submitted: 10/21/2020**

**From: Tanner Steeves – Wildlife Biologist, CT DEEP Wildlife Division**

The GC3 Forests Sub-group Draft Report includes a substantial amount of valuable information and will make an important contribution to the GC3 effort. I strongly support recommendations to protect healthy forests and prevent land use conversion of forests. However, as a wildlife biologist with the CTDEEP's Wildlife Division that specializes in wildlife habitat, I offer the following comments related to wildlife conservation that I hope will provide context and improvements to the final plan. Two main points which I hope to convey are:

- Forest management is an important strategy for the conservation of biological diversity, particularly in the face of climate change. Enacting policy that would prevent or discourage government agencies and NGOs from conducting active forest management on vast areas of forestland will inhibit the ability of scientists and land managers to sustain healthy forests and practice wildlife conservation.

- Silvicultural treatments aimed at creating young forest conditions for wildlife of conservation concern occur across a very small proportion of CT forestland, and do not significantly affect the ability of CT's forestland to function as a carbon sink.

In a predominantly forested biome, conservation actions designed to sustain suitable wildlife habitat often involve silvicultural treatments. Forest management aimed at diversifying forest habitat and creating stands of younger forest in support of wildlife are widely supported by decades of science-based evidence. As alluded to in the Report, much of Connecticut forests can be described as mid-successional second growth, that is, forest stands dominated by middle-aged trees growing in areas that experienced drastic anthropogenic disturbance in recent history. While forest-dwelling generalist wildlife species, such as white-tailed deer and gray squirrel, find this closed-canopy homogenous habitat suitable, many other species of plants and wildlife do not. Scientific agencies and NGOs throughout the northeast seek to diversify the forests under their care to provide underrepresented forest types for wildlife of conservation concern. Species such as New England cottontail and ruffed grouse have experienced drastic population declines in the last several decades due to habitat loss. Accordingly, CT DEEP's State Wildlife Action plan indicates that over 50 wildlife species of Greatest Conservation Need associated with young forest habitat face an immediate threat of "loss of early successional habitat due to natural succession" and the conservation action identified to mitigate this threat is to "maintain or increase the use of management techniques to create, restore and manage a variety of early successional habitats to benefit GCN species" (2015 CT Wildlife Action Plan; Appendix 3; p5). Accordingly, scientists and land managers working on both public and private land have responded to provide these important habitats through active forest management. The CTDEEP Young Forest Habitat Initiative is an example of this effort. Numerous strategies exist to reduce carbon emissions; for wildlife populations experiencing decades of habitat loss and fragmentation as a primary driver of population decline, there is no other way to address this immediate threat than to create and sustain suitable habitat.

**Natural Area Preserves:**

I strongly support the Report's approach to "Implement active forest management approaches that can increase structural, age class, and species diversity in low-diversity second-growth forests." and to "promote silviculturally-informed, resilience-focused management" (p 19) but I suggest the locations in which these activities are allowed to occur be dictated by scientists and land managers within an active/passive framework that is developed by CT DEEP in collaboration with any willing partners– not mandated by legislative action through the designation of Natural Area Preserves on State Land. I do not object to the concept of increasing the amount of forestland held in passive management, but the designation of a large portion of State-owned forestland as Natural Area Preserves to prevent silvicultural treatments is a drastic action. The Report offers no quantitative reasoning as to how the proposed Natural Area Preserve acreage would effectively offset carbon emissions within the framework of a carbon budget. The proposal would reduce the ability of DEEP, federal agencies, and NGOs to maintain resilient and healthy forests, to conserve biological diversity, and to respond to future climate-caused conservation issues. Forest management is widely cited as an adaptation strategy to enhance ecosystem sustainability and mitigate the negative effects that climate change may have on plants and wildlife in forested biomes. Designating large areas as off-limits to management will create an unnecessary burden on scientific agencies that wish to apply adaptive management to natural resources, particularly with regard to the conservation of wildlife concern that rely on underrepresented forest habitats.

Readers of the Report should understand that active forest management, as defined by the CT DEEP, does not indicate a forest stand is scheduled for a silvicultural treatment within the life of a given Forest Management Plan, or necessarily ever in the future. It simply indicates the forest stand has not been categorized Old Forestland, Inoperable, or Inaccessible; these stands may have been managed in past decades and are growing or perhaps never managed but simply have the *potential* to be managed with a silvicultural treatment at some point in the future.

The primary threats to forestland are habitat loss and habitat fragmentation due to land use conversion by residential, commercial or industrial development. Silvicultural treatments do not cause habitat loss or fragmentation, and do not affect Core Forest designation. Though of a different age and structure following a timber harvest, the forest remains a forest. The Natural Area Preserve proposal is focused on Core Forests that intersect State land despite no risk of land use conversion here; Core Forest on private land is at much greater risk of forest loss due to the opportunity for development. Given that "Connecticut's forests are currently harvested at a relatively low intensity – 17% of the state's annual forest growth in volume is being cut each year." (p 25) recommendations should concentrate more on minimizing forest loss and less on preventing silviculture treatments. Among all states, CT has the highest percent loss of carbon attributable to land use conversion (Harris 2016[96]).

As a result of climate change, certain plants and animals are expected to experience shifts in species distribution. Limiting forest management will reduce the ability of land managers to respond to climate-driven shifts in species distribution. Particularly with regard to those species that are currently absent or occur at low relative abundance in CT, but which may become more locally abundant as a result of climate change. One relevant example is the cerulean warbler, a bird species of prominent conservation concern expected to experience a northward range shift. Currently, CT lies within the northern edge of these species' ranges, but CT may eventually constitute a significant portion of this species' range. Conservation efforts are occurring throughout the core of the cerulean warbler's current range to conduct silvicultural

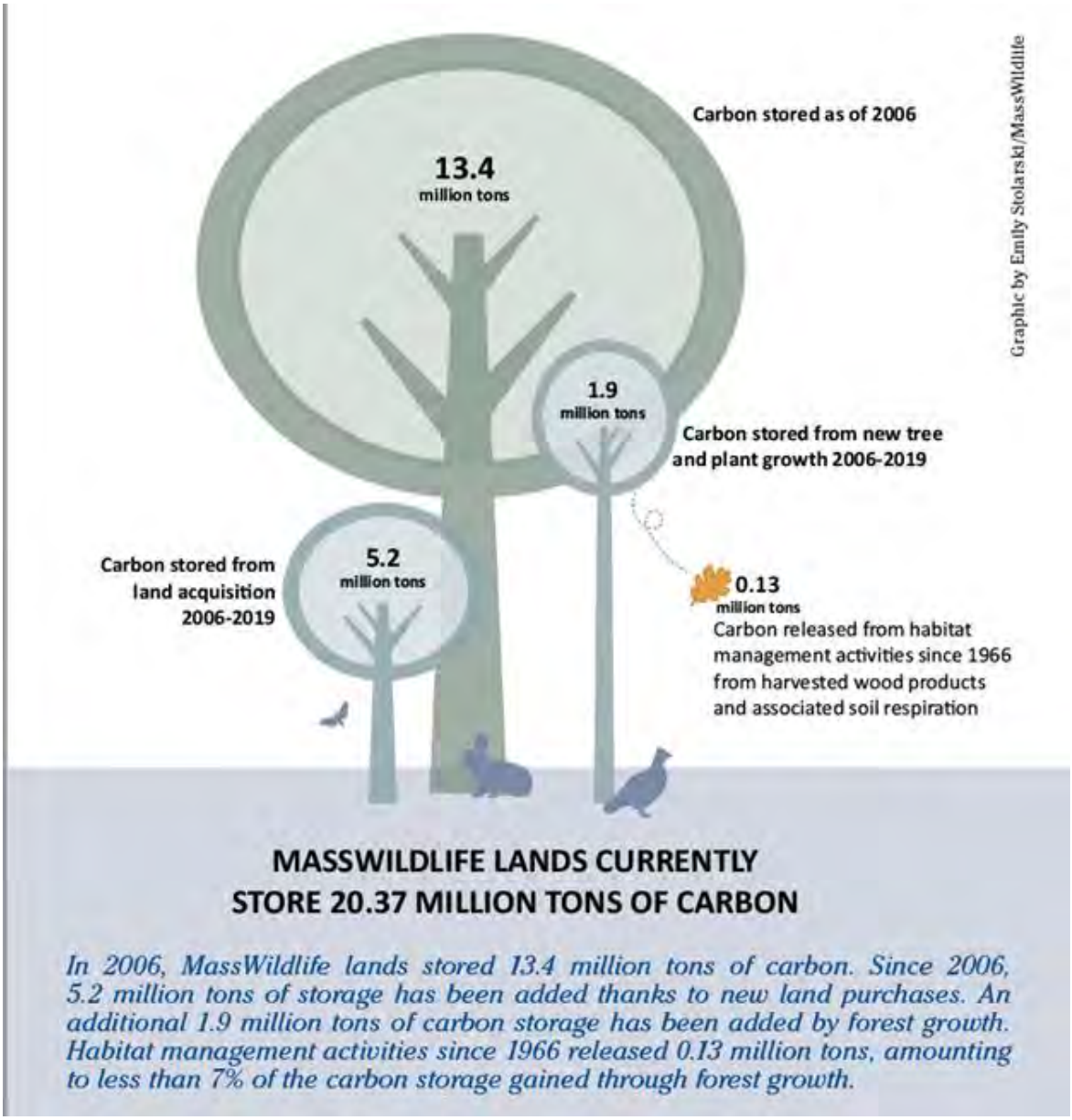
treatments that create gaps in the canopy while retaining large mature deciduous trees. Under the Natural Area Preserve proposal, scientists and land managers would be severely limited in their ability to conduct management that would provide suitable habitat for this species. When faced with new conservation challenges and greater responsibility for certain forest-dwelling imperiled species, enacting conservation action will be difficult or impossible under this proposal.

**Young Forest Habitat:**

One recommendation within the "Develop Action Plan to Increase Forest Cover from 59% to over 60% by 2040" is to "Greatly reduce clear-cutting of mature forests as a habitat management practice benefiting young forest species." (p 28).

This recommendation lacks context and supporting information. Silvicultural treatments aimed at creating young forest conditions occurs on a very small percentage of CT forestland. The proposition that silvicultural treatments aimed at producing young forest conditions need to be 'greatly' reduced implies that this conservation practice poses a significant threat to CT forests and its ability to sequester carbon, yet the Report offers no data of acreage or impact to net carbon change. To date, CTDEEP has conducted silvicultural treatments for wildlife habitat on approximately 626 acres of 34,000 acres within WMAs (<2% of WMA land) and 164 acres within State Forests (<0.1% of State Forest land). This recommendation would greatly reduce the ability of scientists and land managers to conserve biological diversity and practice wildlife management, and could eventually lead to population declines or local extinctions of wildlife that rely on these habitats.

In Massachusetts, MassWildlife WMA holdings are directly analgous to CT WMAs. Recently, MassWildife developed a carbon budget of Massachusetts WMAs which emphatically demonstrates that forest management aimed at maintaining suitable habitat for wildlife has a small contribution to the carbon budget of these forests, and overall, carbon sequestration continues to increase. An identical effect would be expected for CT WMA forestland.




**Additional Comments:**

Pg 17: "4. Fragmented forests with permanent "edge" are more prone to degradation -- Permanent edge exists because of persistent and continuous disturbance from: i) farming and agricultural activities; ii) development and suburban expansion through roads, lawns, and lots; and iii) through continuous activities in the forest such as recreation (e.g. trails), frequent rather than episodic timber harvesting, and the chronic imbalance of predator-prey in wildlife populations (e.g. deer).[69]"

- This definition of edge, wherein edge exists due to "persistent and continuous disturbance" from a variety of factors could be revised. Anthropogenic permanent forest edge exists due to land use conversion of forest regardless of the resulting land cover type. Edge effects can then be more or less pronounced depending on the degree of 'persistent and continuous disturbance' which

occurs in and around this space. Neither frequent nor episodic timber harvests create permanent forest edge.

Pg 24: "Temperate deciduous forests typically develop structural complexity naturally as they age and are exposed to moderate severity disturbances; this complexity can lead to greater carbon sequestration that helps maintain carbon storage in mature forests well beyond the 100-year mark. [97] [98]"

- The 100-year mark is somewhat arbitrary and not supported by either citation. Gough 2018 [97] find increased net primary productivity increase with structural complexity (not age), and conclude that: "In application, forest management and land-use policies that promote or preserve temperate forest canopy structural complexity may aid in sustaining the biome's carbon sink." Accordingly, the Report should consider including recommendations to *promote* canopy structural complexity through *forest management*, alongside preservation recommendations, as a strategy to increase carbon sequestration.

Pg 29: "State lands managed for proforestation would provide a "control" to compare to the outcomes of management prescriptions that are designed to increase the resilience of Connecticut's forest or to mitigation-focused forest management. In experimental research, the "control" provides the "no change" option that other variables are tested against.[128] Without areas that exclude commercial harvests and salvage logging, there would be no controls to compare with forests subject to various management techniques"

- Given large amounts of forestland already in passive management on both State and private land, this is not a necessary reason to designate 104,000 acres of Natural Area Preserve.

Links:

CTDEEP Young Forest Initiative:

https://portal.ct.gov/DEEP/Wildlife/Habitat/Young-Forest-Habitat-Initiative

MassWildlife Carbon Budget:

https://www.mass.gov/service-details/carbon-storage-on-masswildlife-lands

Cerulean warbler Conservation Efforts:

http://amjv.org/wp-content/uploads/2018/06/cerulean_guide_1-pg_layout.pdf

**Public Comments: GC3 Forests Sub-group Draft Report**

**Submitted: 10/21/2020**

**From: Tanner Steeves – Wildlife Biologist, CT DEEP Wildlife Division**

The GC3 Forests Sub-group Draft Report includes a substantial amount of valuable information and will make an important contribution to the GC3 effort. I strongly support recommendations to protect healthy forests and prevent land use conversion of forests. However, as a wildlife biologist with the CTDEEP's Wildlife Division that specializes in wildlife habitat, I offer the following comments related to wildlife conservation that I hope will provide context and improvements to the final plan. Two main points which I hope to convey are:

- Forest management is an important strategy for the conservation of biological diversity, particularly in the face of climate change. Enacting policy that would prevent or discourage government agencies and NGOs from conducting active forest management on vast areas of forestland will inhibit the ability of scientists and land managers to sustain healthy forests and practice wildlife conservation.

- Silvicultural treatments aimed at creating young forest conditions for wildlife of conservation concern occur across a very small proportion of CT forestland, and do not significantly affect the ability of CT's forestland to function as a carbon sink.

In a predominantly forested biome, conservation actions designed to sustain suitable wildlife habitat often involve silvicultural treatments. Forest management aimed at diversifying forest habitat and creating stands of younger forest in support of wildlife are widely supported by decades of science-based evidence. As alluded to in the Report, much of Connecticut forests can be described as mid-successional second growth, that is, forest stands dominated by middle-aged trees growing in areas that experienced drastic anthropogenic disturbance in recent history. While forest-dwelling generalist wildlife species, such as white-tailed deer and gray squirrel, find this closed-canopy homogenous habitat suitable, many other species of plants and wildlife do not. Scientific agencies and NGOs throughout the northeast seek to diversify the forests under their care to provide underrepresented forest types for wildlife of conservation concern. Species such as New England cottontail and ruffed grouse have experienced drastic population declines in the last several decades due to habitat loss. The CT DEEP's State Wildlife Action plan indicates that over 50 wildlife species of Greatest Conservation Need associated with young forest habitat face an immediate threat of "loss of early successional habitat due to natural succession" and the conservation action identified to mitigate this threat is to "maintain or increase the use of management techniques to create, restore and manage a variety of early successional habitats to benefit GCN species" (2015 CT Wildlife Action Plan; Appendix 3; p5). Accordingly, scientists and land managers working on both public and private land have responded to provide these important habitats through active forest management. The CTDEEP Young Forest Habitat Initiative is an example of this effort. Numerous strategies exist to reduce carbon emissions; for wildlife populations experiencing decades of habitat loss and fragmentation as a primary driver of population decline, there is no other way to address this immediate threat than to create and sustain suitable habitat.

**Natural Area Preserves:**

I strongly support the Report's approach to "Implement active forest management approaches that can increase structural, age class, and species diversity in low-diversity second-growth forests." and to "promote silviculturally-informed, resilience-focused management" (p 19) but I suggest the locations in which these activities are allowed to occur be dictated by scientists and land managers within an active/passive framework that is developed by CT DEEP in collaboration with any willing partners– not mandated by legislative action through the designation of Natural Area Preserves on State Land. I do not object to the concept of increasing the amount of forestland held in passive management, but the designation of a large portion of State-owned forestland as Natural Area Preserves to prevent silvicultural treatments is a drastic action. The Report offers no quantitative reasoning as to how the proposed Natural Area Preserve acreage would effectively offset carbon emissions within the framework of a carbon budget. The proposal would reduce the ability of DEEP, federal agencies, and NGOs to maintain resilient and healthy forests, to conserve biological diversity, and to respond to future climate-caused conservation issues. Forest management is widely cited as an adaptation strategy to enhance ecosystem sustainability and mitigate the negative effects that climate change may have on plants and wildlife in forested biomes. Designating large areas as off-limits to management will create an unnecessary burden on scientific agencies that wish to apply adaptive management to natural resources, particularly with regard to the conservation of wildlife that rely on underrepresented forest habitats.

Readers of the Report should understand that active forest management, as defined by the CT DEEP, does not indicate a forest stand is scheduled for a silvicultural treatment within the life of a given Forest Management Plan, or necessarily ever in the future. It simply indicates the forest stand has not been categorized Old Forestland, Inoperable, or Inaccessible; these stands may have been managed in past decades and are growing or perhaps never managed but simply have the *potential* to be managed with a silvicultural treatment at some point in the future.

The primary threats to forestland are habitat loss and habitat fragmentation due to land use conversion by residential, commercial or industrial development. Silvicultural treatments do not cause habitat loss or fragmentation, and do not affect Core Forest designation. Though of a different age and structure following a timber harvest, the forest remains a forest. The Natural Area Preserve proposal is focused on Core Forests that intersect State land despite no risk of land use conversion here; Core Forest on private land is at much greater risk of forest loss due to the opportunity for development. Given that "Connecticut's forests are currently harvested at a relatively low intensity – 17% of the state's annual forest growth in volume is being cut each year." (p 25) recommendations should concentrate more on minimizing forest loss and less on preventing silviculture treatments. Among all states, CT has the highest percent loss of carbon attributable to land use conversion (Harris 2016[96]).

As a result of climate change, certain plants and animals are expected to experience shifts in species distribution. Limiting forest management will reduce the ability of land managers to respond to climate-driven shifts in species distribution. Particularly with regard to those species that are currently absent or occur at low relative abundance in CT, but which may become more locally abundant as a result of climate change. One relevant example is the cerulean warbler, a bird species of prominent conservation concern expected to experience a northward range shift. Currently, CT lies within the northern edge of this species' range, but CT may eventually constitute a more significant portion of this species' range. Conservation efforts are occurring throughout the core of the cerulean warbler's current range to conduct silvicultural

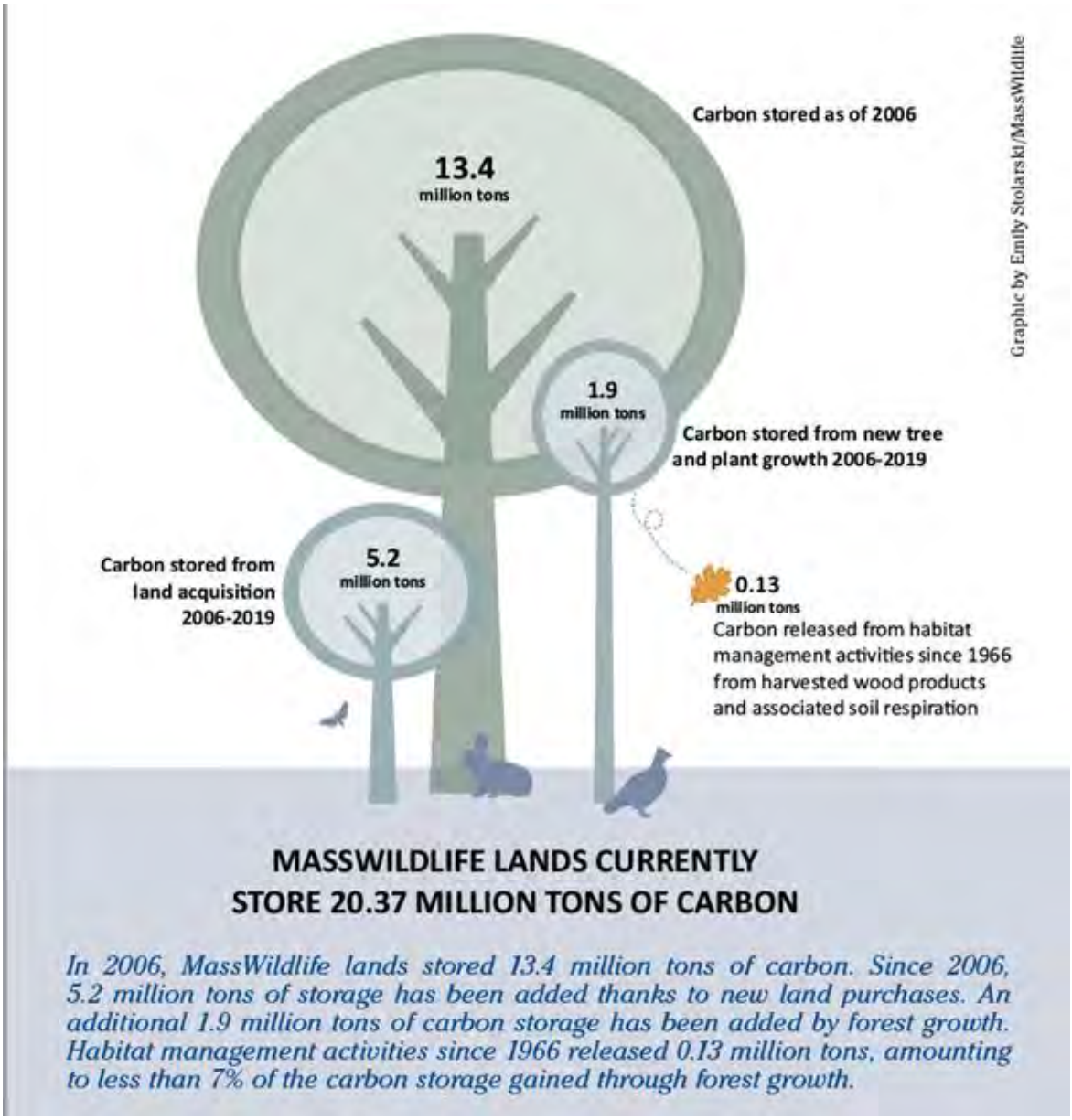
treatments that create gaps in the canopy while retaining large mature deciduous trees. Under the Natural Area Preserve proposal, scientists and land managers would be severely limited in their ability to conduct management that would provide suitable habitat for this species. When faced with new conservation challenges and greater responsibility for certain forest-dwelling imperiled species, enacting conservation action will be difficult or impossible under this proposal.

**Young Forest Habitat:**

One recommendation within the "Develop Action Plan to Increase Forest Cover from 59% to over 60% by 2040" section is to "Greatly reduce clear-cutting of mature forests as a habitat management practice benefiting young forest species." (p 28).

This recommendation lacks context and supporting information. Silvicultural treatments aimed at creating young forest conditions occurs on a very small percentage of CT forestland. The proposition that silvicultural treatments aimed at producing young forest conditions need to be 'greatly' reduced implies that this conservation practice poses a significant threat to CT forests and its ability to sequester carbon, yet the Report offers no data of acreage or impact to net carbon change. To date, CTDEEP has conducted silvicultural treatments for wildlife habitat on approximately 626 acres of 34,000 acres within WMAs (<2% of WMA land) and 164 acres within State Forests (<0.1% of State Forest land). This recommendation would greatly reduce the ability of scientists and land managers to conserve biological diversity and practice wildlife management, and could eventually lead to population declines or local extinctions of wildlife that rely on these habitats.

In Massachusetts, MassWildlife WMA holdings are directly analgous to CT WMAs. Recently, MassWildife developed a carbon budget of Massachusetts WMAs which emphatically demonstrates that forest management aimed at maintaining suitable habitat for wildlife has a small contribution to the carbon budget of these forests, and overall, carbon sequestration continues to increase. An identical effect would be expected for CT WMA forestland.




**Additional Comments:**

Pg 17: "4. Fragmented forests with permanent "edge" are more prone to degradation -- Permanent edge exists because of persistent and continuous disturbance from: i) farming and agricultural activities; ii) development and suburban expansion through roads, lawns, and lots; and iii) through continuous activities in the forest such as recreation (e.g. trails), frequent rather than episodic timber harvesting, and the chronic imbalance of predator-prey in wildlife populations (e.g. deer).[69]"

- This definition of edge, wherein edge exists due to "persistent and continuous disturbance" from a variety of factors could be revised. Anthropogenic permanent forest edge exists due to land use conversion of forest regardless of the resulting land cover type. Edge effects can then be more or less pronounced depending on the degree of 'persistent and continuous disturbance' which

occurs in and around this space. Neither frequent nor episodic timber harvests create permanent forest edge.

Pg 24: "Temperate deciduous forests typically develop structural complexity naturally as they age and are exposed to moderate severity disturbances; this complexity can lead to greater carbon sequestration that helps maintain carbon storage in mature forests well beyond the 100-year mark. [97] [98]"

- The 100-year mark is somewhat arbitrary and not supported by either citation. Gough 2018 [97] find increased net primary productivity increase with structural complexity (not age), and conclude that: "In application, forest management and land-use policies that promote or preserve temperate forest canopy structural complexity may aid in sustaining the biome's carbon sink." Accordingly, the Report should consider including recommendations to *promote* canopy structural complexity through *forest management*, alongside preservation recommendations, as a strategy to increase carbon sequestration.

Pg 29: "State lands managed for proforestation would provide a "control" to compare to the outcomes of management prescriptions that are designed to increase the resilience of Connecticut's forest or to mitigation-focused forest management. In experimental research, the "control" provides the "no change" option that other variables are tested against.[128] Without areas that exclude commercial harvests and salvage logging, there would be no controls to compare with forests subject to various management techniques"

- Given the large amounts of forestland already in passive management on both State and private land, setting up control plots is not a valid reason to designate 104,000 acres of Natural Area Preserve.

Links:

CTDEEP Young Forest Initiative:

https://portal.ct.gov/DEEP/Wildlife/Habitat/Young-Forest-Habitat-Initiative

MassWildlife Carbon Budget:

https://www.mass.gov/service-details/carbon-storage-on-masswildlife-lands

Cerulean warbler Conservation Efforts:

http://amjv.org/wp-content/uploads/2018/06/cerulean_guide_1-pg_layout.pdf

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College of Agriculture, Health and Natural Resources
**Department of Extension**
**Middlesex County Extension Center**

10/20/2020

Governor's Council on Climate Change

Forests Sub-Group Committee

Dear Sub-Group Committee Members,

Please accept these comments on the GC3 Forests Sub-Group Draft Report. Credit to the members of the subgroup for all the time and hard work put into the document. In general, the report is well-written and readable with many recommendations that are well though-out and potentially very effective and I applaud the hard work and effort that has obviously gone into its preparation.

I also applaud the emphasis on monitoring, study, assessment and analysis. Prior to making management decisions, even a decision to do nothing from a management standpoint for a time within a forested area, it is paramount that we know as much as we can about any forested area in order to ascertain what the options and implications of different management strategies might be.

It is also important to establish a reliable method for determining the carbon sequestration and storage potential for different forested areas. This might be the most important task that the research and academic community might contribute. Because forest lands vary so dramatically in terms of species mix, age structure and condition it stands to reason that some forested areas will exhibit greater carbon sequestration and storage capacity potential than others. Thus the assessment and monitoring actions suggested in the report also need to be high priority, before actions such as creating old forests or young forests or "unmanaged preserves" is undertaken. We need to know where and what conditions are most suitable for the anticipated uses or benefits we expect to derive across the forested landscape.

The following series of comments are intended to be suggestions for edits or improvements to the GC3 Forest Subgroup Draft Report.

I am fully aligned with the concept of no net loss of forest acreage and with the idea of increasing the percent of forested land statewide. But before any decision is made to "increase forest reserve acreage", where management is banned or severely restricted, I would remind the sub-group members about the Aldo Leopold adage concerning the secret of successful tinkering – not throwing away any of the parts. While he was referring to populations of organisms and components of ecosystems, I would extend that concept to management strategies, tactics and techniques that might be applied appropriately to sustain or enhance forest productivity or optimize a balance of multiple benefits. Especially on those sites that are best suited for growing trees, which we will have identified through monitoring, study, assessment and analysis. Let's not throw away any of the tools, either.

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I would also remind sub-group members that in addition to the acreage already under passive management on state-owned lands, the reality is that many private owners and land trusts also follow "passive" management strategies, so the de-facto percentage of reserve-style acreage in CT is quite high at any point in time (pages 29 and 30). There are numerous existing "control" areas.

The Draft Report from the Forests Sub-group highlights the value of core forest areas for carbon sequestration and storage purposes and calls for efforts to protect them and keep core forests intact. On Page 26 of the report a recommendation is made to protect at least 50% of core forests 250 acres+ by 2040. I can agree that strong efforts should be made to avoid conversion of core forest areas to other land uses.

However, on page 28 the Draft Report goes on to recommend, "*Establish criteria and designate core forest natural area preserves on State lands*", citing proforestation as the primary strategy to accomplish this. This "preserve" approach would work counter to the multiple-benefit management strategies currently applied on State lands, would potentially remove highly productive sites from management enhancements and even eliminate the ability to apply appropriate management that might improve carbon sequestration and storage, and/or enhance forest resiliency in the face of climate change. "Core Forest Natural Area Preserve" is not a descriptor I could support. "Protected Core Forest Management Area" is suggested as a suitable alternative.

Within the Connecticut Forest Action Plan 2015 it is suggested that a greater effort is needed to promote forest age-class diversity across the landscape, for both future forest growth and habitat purposes and particularly within large unfragmented tracts. The CT-FAP2015 also identifies a lack of both very young forest and very old forest within the forest cover mix. Opportunities to enhance age-class diversity on the landscape, optimal spatial arrangement and distribution of age classes and options to create those conditions can be addressed through sustainable forest management. In order to have 100-year-old trees on the landscape 100 years from now we need to start some seedlings today, and tend them throughout their lifetime.

The notion of "retaining more large trees" is mentioned a number of times in the document. I think some emphasis needs to be placed on growing large trees and the management techniques we use to accomplish that. I firmly adhere to the concept of growing the best, highest quality trees where possible on the most productive, high quality sites and growing them to a highly valuable size and then utilizing them for high-value long-lasting products, ultimately replacing them with new trees that will repeat the process. This concept supports efficient carbon management and multiple other benefits simultaneously. On page 24 of the report under the section on Mitigation Considerations, a paragraph describing forest management strategies that enhance primary production and that are used to grow large and valuable trees for long-term carbon sequestration and storage and eventual conversion to long-life wood products on the best tree-growing sites needs to be included.

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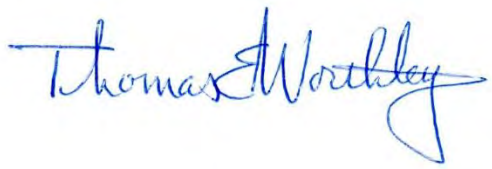
Personally, I also fail to see how reducing the salvage of dead and dying trees contributes any more to carbon storage than removing the most useful portions of those trees for manufacture into long-life wood products (page 30). An oak log left to rot on the ground or in a standing dead tree will return its carbon to the atmosphere in ten or twelve years. Removed and manufactured into a railroad tie, that same oak log will have the bulk of its carbon tied up for 50 to 60 years, long enough for another oak tree to grow in its place to its most productive age and size if the correct management is applied to ensure the success of the young oak tree.

Finally, I think it important to order and prioritize recommendations in the report to avoid the appearance of contradictory ideas. For example, the report describes the use of long-lasting wood products as an effective means of accomplishing carbon storage and avoiding high-carbon-use alternative materials, where in another place the report seems to recommend that creating preserves and banning timber harvesting is best for storing carbon. Which is it? The average reader might experience some confusion about these seemingly contradictory ideas, especially following the discussion of “leakage” and “substitution” at the beginning of the report.

Thank you for the opportunity to submit these comments.

Sincerely,



Thomas E. Worthley

Associate Extension Professor

University of Connecticut

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**Alec Shub <alec.shub@uconn.edu>**

# FW: GC3 draft report comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 1:40 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: thomaskaput@everyactioncustom.com <thomaskaput@everyactioncustom.com>
Sent: Wednesday, October 21, 2020 1:08 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: GC3 draft report comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Climate Change Bureau CT DEEP Climate Change Bureau,

Connecticut has ambitious climate targets, and I support our state's goals of reducing greenhouse gas emissions and planning for a resilient and equitable future. The draft reports of the Governor's Council on Climate Change work groups are an important step in achieving those goals.

I particularly support these recommendations, and urge their inclusion in the final reports:

- Strengthen alignment between the state's decision-making and its greenhouse gas reduction goals. All regulatory decisions should be evaluated for consistency with meeting Global Warming Solutions Act targets.

- Move climate adaptation and resiliency measures—like nature-based solutions, forest and wetland protection, urban green infrastructure and tree planting, and making low/moderate income housing energy efficient and healthy—from demonstration project scale to widespread adoption and protection.

- Support robust, equitable state funding and financing (leveraged and matched by federal and local sources) for emissions reduction and adaptation programs. This is a large ($150-600 million/year) investment. Promising sources include:
  a) adopting the Transportation & Climate Initiative (up to $250 m/yr) and increasing the petroleum gross profits tax (~$100 m/yr). Connecticut can help ensure robust TCI implementation that drives down emissions while reinvesting auction proceeds in other high-impact and equitable programs;
  b) increasing or re-directing state bonding (up to $70 m/yr);
  c) adopting the Maryland "flush tax" model (up to $75 m/yr).

- Reduce stormwater pollution and flooding, and help municipalities afford green infrastructure and resiliency investments, by passing statewide enabling legislation for stormwater authorities.

- Target future building projects to already-developed areas, and prioritize the conservation and preservation of naturally-resilient coastal marsh, dunes, and forests.

- Develop and fund a community engagement strategy to inform the 2021 GC3 process and implementation, including grants for community-based NGOs partners and ensuring environmental justice perspectives are integral to the process.

The reports could be made even stronger. Please consider these additions and modifications to build the ambitious climate mitigation, resilience, and justice plan Connecticut needs:

- Emphasize the importance and urgency of strong climate mitigation action, by:
  a) highlighting the current and projected impacts of climate change in Connecticut, including health and economic impacts;
  b) identifying the greenhouse gas reduction potential of suggested projects;
  c) prioritizing, among the many valuable ideas in the reports, the highest-impact polices that will be most effective in driving down emissions and transitioning to a carbon-free economy.

- Eliminate, not just “phase down,” biomass as an eligible resource in the Renewable Portfolio Standard (RPS). If we are to achieve our climate goals, we can’t keep subsidizing dirty energy sources.

- Add dams to the proposed statewide GIS database of culverts, flood gates, tide gates, and other water control structures, and create a dynamic list that prioritizes structures for replacement, removal, and/or modification—including identifying dams that are vulnerable to our changing climate, and ensuring culverts can handle 100-year floods and allow migratory fish to pass.

- Encourage municipalities to adopt green infrastructure as a first-choice solution to flooding and stormwater pollution.

Together, this suite of policies can reduce Connecticut’s contribution to climate change and help our region adapt to the changes that are already occurring—while protecting public health, generating good jobs, and protecting vulnerable communities from storms, flooding, and air pollution.

Thank you for your consideration.

Sincerely,
Mr. Thomas Kaput
1051 Copper Hill Rd  West Suffield, CT 06093-2906 thomaskaput@yahoo.com

October 21, 2020

Science and Technology Work Group of Governor's Council on Climate Change
Via Email

Dear Science and Technology Work Group:

You are to be commended for calling attention to the need for unbiased, peer-reviewed science. Yet the report includes a recommendation to prioritize proforestation, a concept of dubious scientific validity and probably not the surest way to maximize carbon sequestration or protect the full range of native species. Diversification of forest conditions through series of carefully-planned small-scale interventions (harvests, controlled burns, and control of invasives and out-of-balance populations, e.g.) will create a forested landscape that is most resilient to major perturbations and thus able to sequester carbon in spite of the extreme future weather your report describes. Numerous studies have found undisturbed forest stands to capture and store the most carbon, but these studies do not account for the disturbances that are inevitable over the long term and do not account for carbon leakage effect of replacing locally-grown lumber with lumber harvested from places with less professional forestry oversight or with much more carbon-intensive materials such as steel and concrete. See Birdsey et al, USDA Forest Service RMRS-GTR-402. 2019 and Fahey et al, Front Ecol Environ 2010; 8(5): 245–252.

In my 45 years as a naturalist, forester, and watershed manager, I have seen many carbon-releasing stand-replacing disturbances from insects like gypsy moth and hemlock woolly adelgid, from winds of a hurricane, tornado, and microburst. As your report states, we can expect climate change to increase the frequency of some of these disturbance-causing events.

Your report would be more useful if it contained more data, instead of making recommendations that fall within the scope of one of the other work groups. For example, the report notes that by 2050 mean sea level may have risen by 20 inches. How many people, homes, and businesses, and how much infrastructure will be directly impacted by sea level increases of 5, 10, or 20 inches? How much carbon is at risk from clearing additional forest to provide new space for those displaced by rising sea levels and what technologies (like livable cities) are available to provide less-carbon-intensive alternatives?

The first "Impacts" section (sea level and weather) has a good start at reporting data. The other "Impacts" sections cry out for data. How much of our grid's energy is from fossil fuels, trash, wood, nuclear, hydro, wind, and solar? What are the projected costs of reducing the carbon intensity of our electricity by various technologies? How much carbon could we sequester with an investment of $1 million in solar versus composting, for example. More useful, how much global warming potential could be reduced with $1 million invested in energy conservation?

Finally, regional, national, and international cooperation in collecting and analyzing relevant data should be given even more evidence.

Thank you,

Tim Hawley
5 Sunnyslope Drive, Middletown, CT 06457

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:31 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: Tom Sabin <tesabin2@yahoo.com>
Sent: Wednesday, October 21, 2020 9:00 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change,

Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit.

Nature is essential for the future, for evolution and for everything we need, and serves the public good now and for the long term.

We have so many beautiful natural areas, and some need to be protected for nature study, hiking, and places that people can count on. This has never been more important.

Meanwhile - we are burning and exporting our public forests? Who benefits? This is beyond disturbing.

We need systems that support good jobs, local resource use, AND natural areas.

Our public land is held in the public trust.

We need your leadership.

Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

Thank you,

Tom Sabin

Sent from my iPad

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 6:33 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: Tricia Cavanaugh <tricia.cavanaugh@gmail.com>
Sent: Wednesday, October 21, 2020 6:33 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: Protect nature and science for the public and the future

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 8:08 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

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-----Original Message-----
From: Virginia Garratt <g.garratt@sbcglobal.net>
Sent: Wednesday, October 21, 2020 8:05 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: Protect nature and science for the public and the future

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To DEEP Climate Change,

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Virginia Garratt

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 5:33 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Zhulkovsky, Vitali <Vitali.Zhulkovsky@taylorandfrancis.com>
**Sent:** Wednesday, October 21, 2020 4:34 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future



To DEEP Climate Change,

Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit.

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We need your leadership.

Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

Information Classification: General

THE TRUST FOR PUBLIC LAND

Memorandum

To: CT Department of Energy and Environmental Protection, GC3

From: The Trust for Public Land

Date: October 21, 2020

Re: Governor's Council on Climate Change – working group report comments

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The Governor's Council on Climate Change (GC3) working group reports are an impressive compilation of research, strategy, and goals that will enhance Connecticut's climate resilience – the positive co-benefits of this work are sure to reverberate in our state's economy, health, natural resources, community cohesion, and quality of life. The Trust for Public Land thanks staff of CT DEEP and members of all working groups for the collaborative effort to produce these reports. We are grateful for the opportunity to provide comment. For questions and followup, please contact Walker Holmes, CT State Director for The Trust for Public Land at walker.holmes@tpl.org.

**Working and Natural Lands: Forests Sub-Group Draft Report**

- The report does a wonderful job of touching on the important factors in this topic area, including co-benefits, equity, cross-sector partnerships, and more. Kudos to the working group.
- Comment on *Establishing a Forest Carbon Baseline for Connecticut (page 48).* The Forests Sub-Group Draft Report recognizes the opportunities and challenges of accounting for carbon fluxes resulting from land use changes. The draft report covers opportunities for state-wide accounting; recent advancements in local and regional accounting practices could be added. Last summer, "ICLEI–Local Governments for Sustainability USA (ICLEI) unveiled new guidance that enables U.S. cities and counties to include forests and trees within their greenhouse gas (GHG) emissions accounting, a key activity to ensure representation of local forestry and land use consideration in climate action planning." Appendix J to the "U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions will help fill a critical gap in enabling communities to develop climate action related to land management at a local level." (https://icleiusa.org/communities-now-better-equipped-to-include-trees-in-climate-action-planning/). If the working group deems it appropriate, this

report could recommend that municipalities with climate action plans update their plans to incorporate forests as outlined in the ICLEI protocol, and that new climate action plans include this new forest protocol.

- For consideration re: mapping/GIS: The Forest Carbon Map (https://web.tplgis.org/carbonmap/) is a publicly available tool developed by the Trust for Public Land and American Forests. The tool was designed to answer three key questions: where are the existing forest carbon stocks, what are the threats to the carbon stocks, and where can conservation provide the most co-benefits. It includes county-level summaries and provides context on how much forest carbon is stored on private vs public land as well as the value of those carbon stocks. Originally created to guide county and state policy, this resource is constantly being improved and could be a valuable tool for decision makers.

**Financing Adaptation and Resilience**

General Comments:

- Kudos to the working group for a thorough analysis of funding for nature-based solutions/natural climate solutions through an equity lens. The analysis of the funding mechanisms includes implications for underserved communities; it is important to remember that existing funding mechanisms can be amended to become more equitable. For example, the Denver CO climate measure being considered this November is a sales tax, a very regressive option. For this reason the program, and even the ballot language, ensures that 50% of the revenues generated will be used for investments in traditionally underserved communities, i.e., those facing the largest challenges from a changing climate).
- The Trust for Public Land believes in three key ingredients for funding mechanisms to be successful: elected official support; demonstrable need/threat/benefit for revenue proposed; on-the-ground coalition of advocates. We strongly recommend robust community outreach as well as polling, to ensure that the need is fully understood and that mechanisms will generate enough funding to fit the need.
- Nature-based solutions/natural climate solutions are about more than mitigating the effects of climate chance and protecting ecosystems. Natural climate solutions provide critical co-benefits that are not currently emphasized in this draft report: thriving communities, health, and wellness. With natural climate solutions, we can provide close-to home parks for Connecticut residents who currently have no park access. We can create

green schoolyards that offer the triple benefits of outdoor play, environmental education, and green infrastructure. And we can create opportunities for all people to experience the physical and mental health benefits that nature provides.

- We concur with the importance of understanding the costs and benefits of natural climate solutions, as well as the return on investment and associated risks; we suggest that conservation economics analyses be sought to assist with this information gap.

Comments on Funding Mechanisms:

- In lieu of a detailed commentary on all funding mechanisms, we offer select comments on a handful of the mechanisms considered in the report based on our experience with similar mechanisms in other states; we look forward to additional consideration and discussion.
- Wastewater Use Fee: Large potential, as a small fee can generate large dollar amounts.
- Carbon tax: This mechanism has great potential and we hope to see more of these implemented across the country. The concept tends to make sense to voters, due to its similarity to the "polluters pay" principle.
- Community Investment Act: Increasing funding for this mechanism has huge upside. The CIA has funded incredible work in Connecticut since its inception; current funding levels are not commensurate with the ambitious goals and challenges at play in present times.
- TIFs: We echo this concern from the report: "A challenge here is that solely relying on TIF Districts for resilience improvements means that wealthy areas will be the only neighborhoods to see an increase in resilience."
- Stormwater Authorities: A critical funding source for green infrastructure implementation in other geographies, including parks and green schoolyards (both of which have substantial co-benefits).
- Create an Environmental Infrastructure Bank: We support this idea. CT Green Bank has achieved much-deserved notoriety in green energy. Expanding its purview has great potential. For example, the Rhode Island Infrastructure Bank's broad infrastructure mandate has led to significant progress in natural climate solutions.
- Green bonds: A go-to option, depending on electorate and debt service.
- State Revolving Fund: Fully funding the 10% state revolving loan funds for green infrastructure has great benefit. Vermont recently reworked its State Revolving Fund program with the result that more funding becomes

available for climate-related strategies, specifically conservation. Maine and New Hampshire area also in the process.

- Incentivize CT's insurance industry to promote and grow the catastrophe bond market and pilot a resilience bond program: A concept worthy of further study.
- Revolving loan fund for 1-6 Family Affordable Housing: A mechanism with notable equity strength. Associated additional urban green spaces would have substantial co-benefits.
- Regarding next steps: The Trust for Public Land looks forward to participating in further discussion and analysis of financing mechanisms. For background, The Trust for Public Land helps elected officials, government executives, legislatures, land trusts, and public agencies research and evaluate conservation finance options and design ballot and legislative measures that reflect public priorities. Since 1996, we've helped pass over 572 measures—82 percent of those we've worked on—that generated $80 billion for parks and conservation. The following online tools may be useful references:
    - Conservation Almanac: a website for discovering, analyzing, and mapping the results of federal, state, and local land conservation funding. http://conservationalmanac.org/
    - Landvote®: a searchable online database of all state and local conservation ballot measures since 1988. http://landvote.org

**Public Health and Safety**

- Kudos to this working group as well for a thoroughly researched draft report that considers a broad range of climate-related public health and safety concerns. If helpful, we offer the following research and tools:
- The Trust for Public Land's research on urban heat islands confirms that communities with nearby parks can be dramatically cooler than those in so-called "park deserts." Our analysis of 14,000 cities and towns shows that nationwide, areas within a 10-minute walk of a park are as much as 6 degrees cooler than areas beyond that range. And yet, not everyone has equal access to the kinds of parks that lower temperatures (and in current times, that allow for safe social distancing). Our data reveals that across the United States, parks serving primarily nonwhite populations are half the size of parks that serve majority white populations and nearly five times more crowded. In addition, parks serving majority low-income households are, on average, four times smaller and nearly four times more crowded than parks

that serve majority high-income households. For more information, see https://www.tpl.org/the-heat-is-on.

- A data source that might help: The Trust for Public Land's ParkServe mapping tool measures park access in cities and towns nationwide and includes a first-of-its-kind nationwide dataset on urban heat islands, which we developed using Landsat 8 satellite data and processed in partnership with Descartes Labs. ParkServe shows optimized points in urban areas where creating new green spaces will address both park need and extreme heat. This free platform has the potential to increase awareness of heat islands and to drive local decision-making to implement urban greening projects to protect those who are most vulnerable. https://www.tpl.org/parkserve
- When GC3 considers mapping tools, we would be pleased to participate in discussion of options and needs, based on our experience creating climate-related GIS decision support tools in other geographies. These tools foster effective collaboration and science-based prioritization for natural climate solutions. The tools can consider climate risks within and across a geography and identify priority areas for multi-benefit green infrastructure investment, based on environmental and health threats and the location of vulnerable populations. For example, the Healthy Connected Chattanooa tool: https://web.tplgis.org/chattanooga_csc/.

**Equity and Environmental Justice**

- We applaud the sincere commitment of the Equity and Environmental Justice working group in developing this draft report and in the clear effort to weave equity and environmental justice into all aspects of the GC3, such that equity is in the fabric of the process. The importance of this approach cannot be overemphasized. The Trust for Public Land looks forward to participating meaningfully and authentically in the implementation of GC3 equity and environmental justice goals.
- Please also see comment in Financing Adaptation and Resilience, above, on equity considerations in financing mechanisms.
- Please also see comments in Public Health and Safety, above, on urban heat island, vulnerable communities, and GIS tool development.

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature snd public lands

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 5:40 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

-----Original Message-----
From: AOL Mail <westwoms4@aol.com>
Sent: Wednesday, October 21, 2020 5:29 PM
To: DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
Subject: Protect nature snd public lands

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change

You must, moreover, you are morally obligated to protect our natural world.

Nature and all its benefits are essential to everyone on the planet.
Who denies or simply ignores this isn't fit to make decisions that affect the rest of us.

We are exploiting and destroying our public forests. Climate change, droughts, forest fires, litter, and misuse manage to do the rest.

We need leadership.

Please protect our public lands and support our local communities.

Wayne Westbrook
Sent from my iPhone

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Alec Shub <alec.shub@uconn.edu>

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 7:54 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Wendy Zhulkovsky <ghosteey@gmail.com>
**Sent:** Wednesday, October 21, 2020 7:51 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change,

Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit.

Nature is essential for the future, for evolution and for everything we need, and serves the public good now and for the long term.

We have so many beautiful natural areas, and some need to protected for nature study, hiking, and places that people can count on. This has never been more important.

Meanwhile - we are burning and exporting our public forests? Who benefits? This is beyond disturbing.

We need systems that support good jobs, local resource use, AND natural areas.

Our public land is held in the public trust.

We need your leadership.

Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

Comments on the GC3 Forests Sub-Group Draft Report 10/21/2020

I am writing to provide a few comments on the draft report prepared by the Forest sub-group, which overall has some good points, but also contains recommendations that raise concern. Of greatest concern is the inclusion of a concept termed “proforestation”. Without broad support from the larger scientific community and scientific justification for this theory, it’s my opinion that information related to this topic should be removed from the report.

I am also concerned about the discussions around “Core Forests” and their protection. The draft fails to define “protect” in relation to “permanently protecting at least 50% of Core Forests over 250 acres”. It is unclear what that means. Core forests on State land are recognized for the ecological services they provide, they are currently sequestering and storing carbon, and will continue to do so as the land is and will continue to be forested. Personally, I am against permanently protecting Core Forest if that includes banning active management in these areas. I feel resources should be managed for multiple benefits and consideration for active management of these areas should not be excluded. Consideration must also be given to the negative social and economic impacts that would follow if large holdings of State lands were removed from active management directly impacting the forest products industry and those that seek their services.

The Connecticut Forest Products Industry is and will continue to be an essential partner as we work to address climate and carbon issues. Any reduction of actively managed state lands will threaten the stability of the industry that has been hampered by global trade tariffs and other market changes caused by various factors including the current pandemic. The health of CT’s forests depends on an available workforce to carry out operations that will be designed by certified foresters to address climate and carbon issues head on. These operations will create resiliency across the forested landscape and enhance carbon sequestration and storage both in the forest and additionally, in long term carbon storage forest products that are produced. These locally sourced and sustainable wood products, which are a substitute to more carbon intensive materials, have not received the attention in this report that they should.

Forests are dynamic, ever changing and somewhat unpredictable; as foresters we need to have all the tools available to address climate and carbon concerns. I stress that a recommendation for increased scientific based active forest management with efforts to strengthen the Forest Products Industry in the State be considered as a primary solution within this report.

Sincerely,

Will Hochholzer

Certified CT Forester

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:36 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Krohg, Will N. (2023) <william.krohg@trincoll.edu>
**Sent:** Wednesday, October 21, 2020 9:23 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change,

Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit.

Nature is essential for the future, for evolution and for everything we need, and serves the public good now and for the long term.

We have so many beautiful natural areas, and some need to be protected for nature study, hiking, and places that people can count on. This has never been more important.

Meanwhile - we are burning and exporting our public forests? Who benefits? This is beyond disturbing.

We need systems that support good jobs, local resource use, AND natural areas.

Our public land is held in the public trust.

We need your leadership.

Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

PS-

The GC3 Science and Technology Report was important because it showed me one important thing. Nature should not be confined to a certain area withdrawn imaginary borders. Nature should not be contained because it is wild and free. Alternatively, nature should be allowed to spread in every nook and cranny of society. Nature is so beneficial to everyone and everything. Nature is good for the economy. We must learn to coexist with nature to benefit society, the economy, and the mental and physical health of people and everything. Nature has evolved to protect us from harm: providing shelter, supplying nourishment, educating us, giving us space to roam, and giving us problems to solve. We have evolved alongside nature to extra its sweetness. Now we must learn to coexist with nature before we destroy the planet. We must form a symbiotic relationship between us and nature to benefit both us and nature. The report does not say that no nature can be maintained, but it does stress how some nature must be able to grow freely. Most importantly, this report shows how these plans will help us in the long term. Change is painful but this report shows how important it is for the future of our planet.

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:51 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

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**From:** Moomaw, William R <William.Moomaw@tufts.edu>
**Sent:** Wednesday, October 21, 2020 11:58 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future



To DEEP Climate Change,

Forests provide multiple benefits for human society. In the past, they have been considered either an impediment to economic development so that in New England (including Connecticut) , they were cleared by the 19th century. Once these cleared lands were abandoned, they grew back to an amazing extent. In fact, the recovery of the forests of New England and New York is perhaps the greatest recovery of ecosystems in history.

The introduction of the concept of sustainable forest management in the early 20th century by Gifford Pinchot ended much of the "cut and run" forest practices, and have allowed provision of a continuous utilization of these forests for commercial production of forest products.

It is now realized that globally forests play many additional roles besides production of timber, fiber, and fuel. Globally, forests reduce the annual increase in atmospheric carbon dioxide emitted by fossil fuel burning, industrial production of cement, steel and other products, and land use change by approximately 30%. In the Us by contrast, forest growth only reduces our net emissions by less than 12% both because Americans emit so much carbon dioxide and because we have managed our forests to keep them relatively young and therefore containing much less carbon. Forest also provide resiliency against flooding from intensified downpours and evaporative cooling of surrounding areas in an ever-warming world.

It is urgent that we limit the increase in atmospheric greenhouse gases as rapidly as possible and this requires that we simultaneously reduce emissions from all sources and accumulate as much carbon as possible in forests, wetlands, and soils. sustainable forest management of 70% forests for timber production (USFS) has left the US with only a small percentage of forests as primary forests (outside of Alaska). Our secondary forests average only abut 75 years of age in Connecticut and much of New England when they are composed of species with potential lifetimes of 200-400 years.

Research has found that by changing management practices, forests on average could be storing twice as much carbon as they now do globally (Erb et al 2018) and that in forests world-wide, half of the carbon in living biomass is stored in the largest 1% diameter trees (Lutz et al, 2018). Stephenson (2014) reported that trees accumulate more carbon as they become larger. In recent work that I have co-authored, we found that in six national forests in Oregon, the five species of "lumber trees" over 21" in diameter accounted for just 3% of the stems, but accounted for 42% of the above ground carbon (Mildrexler et al 2020). The recent paper by Cook-Patton (2020) and two dozen colleagues demonstrates that natural regeneration of forests accumulates more carbon than does managed planting. we have known since 1990 by the work of Harmon that an old growth forest stores more carbon than does a sustainably managed forest even when wood products are counted as stored carbon. Nunnery and Keeton 2010 compare an undisturbed New England forest to several management alternatives, and also find that an unmanaged forest stores about twice as much as does a clear-cut forest including the carbon in wood products. Keeton et al (2011) show that there are sites in New England forests that could be storing between 2.4 and 4.3 times the carbon they now hold. Hudiurg et al (2019) found that since the beginning of the forestry industry in Oregon in 1900, that just 19% of the original carbon was stored in products, 16% was in landfills and 65% was in atmospheric carbon dioxide.

These and many additional ones lead me and two colleagues to publish our paper in 2019 where we used the term proforestation to designate a forest management strategy that sets the primary goal of accumulating carbon and to the ecological potential to which it is capable.as an alternative to reforestation and afforestation as a means for growing more carbon as rapidly as possible. To accumulate more carbon, we need to have a greater proportion of larger trees. This means setting aside some forests as carbon reserves that will also address the other major challenge of biodiversity loss. because we have so few primary forests, we are deficient in species found in old growth forests. There is nothing mysterious about the term proforestation, it is simply shorthand for letting a larger proportion of forests continue to grow instead of managing them sustainably keeping stocks constant. Constant stocks are no longer sufficient for addressing climate change. We need to be increasing the forest carbon stocks to keep carbon out of the atmosphere (IPCC 2018, 2019). Public forests are a reasonable place to manage this way as their purpose is to serve the public and not the forestry industry. They are a small fraction of total forest land in Connecticut. Taking them off the timber market will increase the returns to private landowners. for private landowners, paying those whose forests can accumulate large amounts of carbon in the near term is the lowest cost way to limit the buildup of atmospheric CO2.

I would be pleased to discuss this with any of those who are concerned about shifting some forest management practices from forest product production to favor climate and biodiversity.

William R. Moomaw

Professor Emeritus Tufts University

Distinguished Visiting Scientist Woodwel Climate Research Center

Lead author of 5 IPCC reports

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**Alec Shub <alec.shub@uconn.edu>**

# FW: No Biomass Incentives. Leave some public forests as self-managed wildlands.

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:42 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Dave Galt <dave.galt@gmail.com>
**Sent:** Wednesday, October 21, 2020 9:57 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** No Biomass Incentives. Leave some public forests as self-managed wildlands.

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

I would like to express my opposition to biomass incentives of any kind. Not only is wood burning an inefficient means of generating energy, but it is an exceptionally dirty means of doing so in terms of the particulates and other pollutants that it produces including CO2. We are better off burning fossil fuels than burning wood in the coming decades as they are cleaner and more efficient. Claims that biomass energy production is carbon neutral are dubious at best. Our best hope is to incentivise conservation and energy efficiency. The greenest energy is that which is never produced.

In addition, developing biomass would inevitably lead to feeding whole trees to the production of energy. It will not stop with scraps generated by other harvesting or maintenance activities. It will lead to harvesting forests for the purpose of feeding biomass energy plants or wood pellet facilities. Please CLOSE the door to spending public money on biomass.

We need natural forests for the carbon sequestration they provide and for their support of the greatest possible biodiversity long-term. Older forests are better carbon sinks then younger/young forests and they pack away more atmospheric carbon per year. Defenders of active management for all forests are financially conflicted.

Therefore, please DO NOT advocate for incentives to increase harvesting and/or burning wood.

DO include opportunities to protect nature in a self-managed state.

Thank you for your consideration.

Sincerely,
Dave Galt, PhD
West Simsbury, CT

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Alec Shub <alec.shub@uconn.edu>

# FW: Does Connecticut have the courage?

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 5:36 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Debby Reelitz <calligraphy@cox.net>
**Sent:** Wednesday, October 21, 2020 4:54 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Does Connecticut have the courage?

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear GC3,

In the simplest terms, as a State, we must do everything we can to preserve our natural spaces--not just for recreation, or logging, but for NATURE. We must have wild spaces, which in Connecticut mostly means forests. Wild, unmanaged, old-growth forests are critical for many reasons, carbon capture, cooling the hot planet, supporting biodiversity, fostering physical and mental well-being and preserving beauty. Connecticut needs to adopt the principles of proforestation! CT residents understand the importance of our forests--they have flocked there in droves during the pandemic for connection to nature, solace and exercise and beauty.

The events that unfolded this year around Massacoe State Forest are an excellent place to learn what it will take for our State, our Country and our World to protect our planet and leave anything for the next generation.

Local residents fought vehemently against the destruction of their neighborhood forest. Logging interests fought for the right to cut publicly-owned trees, and logging work is subsidized by the State, so the State came down, and still comes down hard on the side of logging under the guise of “management”. Local residents were also told by a CT DEEP official at a public event at Massacoe that we need to cut down our trees to have toilet paper and Amazon boxes. Those in attendance cried out knowing all too well that we DO NOT need to cut our forests for TP and boxes. Using recycled products and conserving resources are alternatives to the cutting of forests, here in Connecticut and around the globe.

But because state and federal resources subsidize and legislate in ways to help the logging industry, I can go into a Staples office supply store and buy a ream of virgin paper from trees for a mere $5, but to buy a ream of recycled paper, it costs me $12. THIS IS A STRUCTURAL problem of our society!!!!!! We need to place a higher value on our forests. Recycled products should cost significantly LESS than virgin tree products--if governments at all levels value the role of forests.

Fortunately, the logger at Massacoe asked to get out of the contract. So Massacoe State Forest is safe for now from being logged, but we are hearing of retribution from State officials and the logging industry. And the State has clearly told the public, they could come back to log if they want. After all, how dare a community say no to extensive logging?? And blowback against protecting Massacoe is coming from the logging industry and logging interests like the Yale School of Forestry who is trying to discredit the idea of proforestation. Of course, Yale School of Forestry and the logging industry is

going to attempt to discredit proforestation, donors to the YSF are some of the largest logging corporations out there!!!! Of course, the logging industry and YSF is going to say protecting forests is bunk--it is in their private interests to be pro-management. But logging under the guise of “management” is NOT the interest of the planet. Studies all over cite the incredible damage done by fragmentation, how species are dying off because intact habitats are so rare and broken up.

Fundamentally, we can't wait to put the interests of the planet first. We don't need more evidence. We need action and there are SO many steps we can take--immmediately. Here are just a few things the State of Connecticut can do and get started, even in the midst of the pandemic.

· promote the use of recycled products

· create resources to salvage and reuse wood products

· help the logging industry shift away from practices that require extensive logging just to be able to pay the mortgages on their massive machines. Encourage them to create a co-operative where the machine can be shared/rented.

· STAY AWAY from using our forests for biofuels. Massachusetts (and much of Europe) has made a huge mistake by cutting down American forests so they can burn wood instead of fossil fuels.

· we are a technologically savvy state, let's promote the development and use of solar

· Move ahead with the community solar program—be sure to prioritize rooftops rather than land for solar farms.

· Find ways to tap into our hydro resources. Much of our state waterways are dammed. Let's figure out safe ways to turn those dams into small-scale energy production.

· designate sizable forests with real protections so they can mature and become old growth forests where biodiversity can truly thrive and carbon capture can happen on a large scale

· encourage residents and businesses to reduce their lawns and create habitats that foster the natural world (The Pollinator Pathway projects provide an excellent model of what can be done and needs to be done on a much larger scale.)

· The State of CT needs to foster discussion of how to solve the problem of climate change, not continue to send out staff defending the destruction of CT’s natural spaces—which we experienced over the spring and summer discussion on Massacoe.

· Ask CT residents to get involved in protecting our natural spaces. Educate. Provide opportunities to volunteer (ie: invasive work days, clean-up days, competitions to see who can become the most 'green', incentivize green infrastructures, practices, purchases, etc.)

· If the State of CT can subsidize the logging industry, I know we have resources that can be shifted to protecting our natural spaces.’

· Create a civilian conservation corps. There are so many projects that could be done to restore the environment. Hire those who are struggling with unemployment to clean up, remove invasives, research, etc.

Even the economics all favor genuine action on addressing climate change. The costs are coming. No, they are here. Fire, flood, damaged crops, drought. Connecticut with a significant coastline is being affected. Let’s get out in front of that and spend the money on adjusting our economy NOW, not just responding to disasters after they happen.

All throughout history, those who want to exploit people and environment for profit will do so as long as others let them. We must shift the paradigm of exploitation to one of preservation and restoration.

Don’t make the GC3 a token gesture. Let’s get real and take courageous steps to make change.

There are lots of brilliant people who can support the State in making this shift. The ideas are there. We know what needs to be done. Let’s get to it!!

With great urgency,

Debby Reelitz

Debby Reelitz

Calligraphy Design Studio

24 Silkey Road

North Granby CT 06060

Landline: 860-413-9041

Letteringdesign.com

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Letter to GC3 Infrastructure and Land Use Adaptation Working Group

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 8:46 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Diane Hoffman <hoffmandiane30@gmail.com>
**Sent:** Wednesday, October 21, 2020 8:39 AM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Letter to GC3 Infrastructure and Land Use Adaptation Working Group



Diane Hoffman

190 Wilmot Rd.

Hamden, CT 06514

10/21/2020

Dear Infrastructure and Land Use Adaptation Working Group,

Thank you all for your long hours, hard work and very informative report.

In reviewing your scope, I recognize that you are tasked with the built environment not on the natural world in your report. However, I believe it is critical that all of your planning reflect awareness and acknowledgement of the critical role green infrastructure plays in mitigation, adaptation and resiliency and should be reflected in your plans and recommendations so it is not inadvertently omitted in the final planning.

I also ask that you support the EEJ Top Priority Action: Develop and fund a community engagement strategy to inform the 2021 GC3 planning process and implementation, including support in the form of grants for partnering community-based, non-governmental organizations to design the community engagement process, receive training, and co-develop recommendations to ensure meaningful input and equitable approaches to mitigation and adaptation. Both public and private funding should be pursued.

Thank you for your attention and consideration of my comments.

**Page 7 Equity & Environmental Justice**

Trees are needed in every part of the Infrastructure and land use working group. Trees will help vulnerable communities deal with increased flooding and increased high heat days by absorbing rainwater, shading and cooling walkways and streets which will aid walkers and cyclists. Trees will provide medical benefits by cleaning the air, and improving mental health by reducing stress and road rage. Trees will increase property values by providing beauty, reducing noise and hiding unsightly items in the neighborhood. They will increase local business and pride in their neighborhoods. This will attract investment and increase engagement by the residents in the planning process and will create a greater vision for these neighborhoods. https://www.arborday.org/trees/treefacts/

**Pages 7-8 Transportation** –*******Plan should encourage increased bicycle ridership and walking to reduce fossil fuels and improve health. Call for installation of automatic off switch in trucks and buses to automatically turn off vehicles so they are not idling.

According to the presentation of this working group 38% of CT greenhouse gases is from transportation and 32% of Hartford households do not have a car! These residents have to walk or bike to get to other forms of transportation. This group called for focus on the safety of people traveling outside of cars. Trees along our streets are essential for the safe travel of these community members in hot days by providing shade, creating oxygen and working to clean the air. Trees also calm drivers which reduces road rage, resulting in safer streets. ( https://www.streettreesforliving.org/benefits-of-street-trees )

**Page 8** Land Use and Buildings and utility infrastructure **–***Please keep in mind the role trees play in cleaning our water and reducing the cost of drinkable water. https://www.americanforests.org/why-it-matters/water/#:~:text=Forests%20act%20like%20a%20sponge,also%20act%20like%20a%20filter.**

**I was very pleased to hear Utility Infrastructure Chair, Todd Burman, acknowledge the importance of trees and legitimacy of undergrounding in appropriate locations that exist throughout our state. I look forward to seeing that reflected in the final report submitted to the GC3 and Governor Lamont in a few months.**

**Page 9** Recommended Implementation Action Title G-1. Establish a State-wide Climate Adaptation Implementation Committee –

Recommended Implementation Action Description *****Please include need/role of trees**

Implementation Entities - State agencies, COGs, CIRCA, NGOs, Water Planning Council; representatives from vulnerable communities

***** Please include DEEP and grassroots organizations**

**Page** 11. Recommended Implementation Action Title T-3. Conduct vulnerability assessment using standard methodology on all publicly funded transit operations and facilities, and infrastructure for use by pedestrians, bicycles and people with disabilities.

Implementation Entities- listed are**:** CTDOT, Amtrak, Metro North, CT Transit, CIRCA, non CTDOT public transit operators. ***** Please Include representatives from vulnerable communities and DEEP to be sure trees are fully assessed and valued.**

Climate challenges addressed**- *** The vulnerability assessment should also analyze the treescape to ensure being outside in hot summer months is tolerable. Trees have a significant positive impact on resiliency and also meaningfully contribute to adaptability and mitigation and are extremely important to the health and safety of vulnerable communities.**

**Page 13** Recommended Implementation Action Title T-5. Continue to pursue best available science for updating standards and guidelines used in transportation engineering design; including sources of sufficient confidence, specificity, acceptance and scale for CT/northeast region

*****The importance of shade and cooling provided by urban/suburban trees should be included in your complete streets vision.**

Recommended Implementation Action Description- “Action is relevant to infrastructure durability and longevity, and compliments natural hazard mitigation planning.”

*****Sidewalks are a critical part of safe pedestrian traffic. Engineered soils should be incorporated into all planning of sidewalk repair where trees are involved. Engineered soil allows the roots of trees to grow and not interfere with sidewalk construction resulting in all protecting trees and the benefits they provide to our municipalities and improved sidewalk safety. https://en.wikipedia.org/wiki/Structural_Soil**

Implementation Entities- CT DOT generally, plus partnership with participating jurisdictional federal agencies, other state DOTs, and American Association of State Highway and Transportation Officials (AASHTO) *****This only includes DOT**

**and other similar organizations. Should Include CIRCA and DEEP and professional representatives of vulnerable communities.**

Climate challenges addressed- ***** Please recognize the role trees can play in addressing the climate change impacts that are most likely for CT or the northeast region**

**Page 14** Recommended Implementation Action Title T-6. Create a statewide GIS database of culverts, flood gates, tide gates and other water control structures that restrict flow. Develop a framework for continued identification and documentation of such structures. *****Forested/wooded areas should be part of the database**

Climate challenges addressed- ***** Please recognize role trees play in mitigating flooding.** **https://www.woodlandtrust.org.uk/trees-woods-and-wildlife/british-trees/flooding/**

**Page 15.** Recommended Implementation Action Title LUB-3. Establish Connecticut community resilience program

Implementation Entities- ***** Please include CIRCA and representatives of vulnerable communities and other grassroots groups.**

Climate challenges addressed- ***** Please include need/role of trees**

**Page 16.** Recommended Implementation Action Title LUB-5. Convene a Task Force including representatives and stakeholders from state agencies, municipalities and non-governmental organizations to review relevant planning documents, evaluate alternatives and develop a proposal to address needs related to ownership, operation and maintenance of resilience structures.

Implementation Entities CGA OPM, DAS, DEEP, DOT, DECD, municipalities, NGOs, COGs, DPH, Local Health Directors. ***** Please Include CIRCA and professionals representing vulnerable communities.**

Climate challenges addressed- ***** Please include impact on trees**

**Page 17**. Recommended Implementation Action Title LUB-8. Establish an Energy Efficiency and Healthy Homes (EEHH) Equity Fund to assist low to moderately low-income households increase the energy efficiency and thermal comfort and safety.

***** Please Include planting trees and green roof etc. to this plan**

Recommendations- energy efficiency- ***** trees enhance inside quality of air by providing free natural cooling of trees and fresh air** **https://www.firstenergycorp.com/help/saving_energy/trees.html**

**Page 18** Recommended Implementation Action Title UI-5. UI-5. Update safe daily yield calculations and assess current drinking water quality measures/testing to understand and address climate change impact. quality of drinking water- ***** Please Include assessment of of our trees to help clean our water and lower the cost to do so.**

**Page 19** UI-1 Inventory and geo-locate vulnerable utility facilities and their service areas and overlay to prioritize vulnerable populations. ***** Are trees viewed as a threat to these facilities?**

UI-2 Require that all utility sectors be subject to statutory and policy-based directives that require the consideration of all projected climate change impacts in their planning. *****What is the treatment of trees near these facilities? What is the plan for trees near these facilities?**

UI-3 *****Please Involve representatives of vulnerable communities especially for drills and communication.**

UI-4 *****Please Study the appropriate techniques for overall resiliency that balance the costs and climate benefits associated with different electric distribution strategies.**

**Report says "It is necessary to understand and compare the impacts of various protection strategies for overall resiliency including microgrids, undergrounding and other adaptive measures. We have to be in a position to holistically compare the tradeoffs associated with storm risk and the climate benefits to urban, suburban, and vulnerable communities."** ******* I absolutely support this and it is also important that the need/role of street trees also be included in the analysis.

**Page 20** Continued emphasis on resolution of chronic CSO over-flow conditions. *****Trees assist with CSO over-flow!** **https://www.americanforests.org/magazine/article/trees-the-new-sewers/**

**Pg 21** UI-10 Identify and prioritize funding for critical infrastructure- ***** Please recognize that trees and under grounding of electric wires should also be considered critical parts of our infrastructure.**

UI-12 Price utility infrastructure risk correctly- ***** Please including dollar value of benefits lost if remove street and roadside trees and cost to remove these trees. Regarding undergrounding, look at the past and future long-term cost of not pursuing undergrounding where flooding is not a serious threat.**

**Pg.22** UI-13 Assess, plan for, and Implement actions to improve access to services and availability of electricity for people with disabilities, limited mobility or special medical needs. ***** Proper placement of undergrounding of electric utility wires will facilitate this during severe weather- There will be far fewer power outages and downed poles with electric wires will not be creating safety hazards and slowing down clean up.**

**Pg 23 The State Building Code ***I support this and call for including green roofs, https://www.nps.gov/tps/sustainability/new-technology/green-roofs/benefits.htm pocket parks, tree canopied walkways etc.**

**When it comes to design, building geometry should be focused on to maximize energy efficiency. https://www.researchgate.net/publication/322727624_Influence_of_the_building_geometry_on_energy_efficiency_of_timber-glass_buildings_for_different_climatic_regions**

**Page 24** LUB-6 Incentivize and prioritize redevelopment of previously used sites within established neighborhoods, including Brownfield Remediation

***** I support this <u>but do not endorse</u> new construction on undeveloped land. That land should be places for parks, pollinator pathways, gardens etc**.

**Page 25** T-1 Conduct vulnerability assessment using standard methodology on the entire road and pedestrian/bicycle network using 2050 estimates. ***** including the need for trees.**

**==========**

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Alec Shub <alec.shub@uconn.edu>

# FW: Letter to Financing and Funding Adaptation and Resilience Working Group GC3

2 messages

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 1:39 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Diane Hoffman <hoffmandiane30@gmail.com>
**Sent:** Wednesday, October 21, 2020 1:02 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Letter to Financing and Funding Adaptation and Resilience Working Group GC3



**Diane Hoffman**

**190 Wilmot Rd.**

**Hamden, CT 06514**

**10/21/2020**

**Dear Financing and Funding Adaptation and Resilience Working Group,**

**Thank you all for your long hours, hard work and very in depth report. I am very thankful we have volunteers such as yourselves who are knowledgeable about this area and are willing to donate your time to this critical effort.**

**The following are my concerns:**

1. **I ask that you please support the EEJ Top Priority Action: Develop and fund a community engagement strategy to inform the 2021 GC3 planning process and implementation, including support in the form of grants for partnering community-based, non-governmental organizations to design the community engagement process, receive training, and co-develop recommendations to ensure meaningful input and equitable approaches to mitigation and adaption. Both public and private funding should be pursued.**

**I truly believe that our vulnerable communities must be supported in this way so they can fulfill their important role in helping our state address the crisis we find ourselves in.**

2. **According to the Forestry Working Group draft report (page 14), 71% of the state's woodlands are privately owned by individuals/families, corporate landholders, and land trusts. These entities should**

**receive incentives to keep their forested land undisturbed.**

**3. Trees should be viewed as a public asset as the services they provide benefit the entire neighborhood/ community as is custom in England. Non-forest private property owners should be required to pay a permit fee to remove any healthy tree, as certified by a certified arborist.**

**In addition, Realtors should be required to disclose tree regulations that affect trees on private property that is being purchased. This will have several co-benefits: property owner will learn tree regulations for their town and state; trees will not be destroyed after the property is purchased thus protecting the character and ecology of the neighborhood; needed funds will be collected by the town if regulations are violated.**

***Require realtors to get a signed disclosure form that informs the buyer of state and local regulations regarding trees on their property fr*om new property owners* before the closing to be included in the closing papers.**

***Copy of signed disclosure form given to town tree warden.**

***Fine realtors who don't disclose and fine property owners who don't obey regulations. All fines should be used for tree planting and care.**

***Tree Warden responsible for enforcement of tree regulations.**

**4. Page 20 of the Forestry Working Group report calls for the Creation and funding of a Connecticut Youth Conservation Corps. This is an excellent suggestion and should be funded. Members of our vulnerable communities should be recruited to participate in this conservation corp.**

**5. As called for by CCAG – Please Prioritize equity in all recommendations of this workgroup. At least 40% of all new programs should benefit low-income communities and communities of color that have suffered from decades of intentional structural racism, disinvestment, red lining, discrimination, segregation, and many other injustices.**

**6. As called for by CCAG- Please Ensure funding for low-income equitable access to Flood Insurance and Resilience Bonds (as recommended on page 30 and 42) by requiring that 1) insurance companies pay a tax for each fossil fuel company or project that they underwrite, 2) insurance companies pay a tax on the profits from investments in fossil fuel companies, and 3) a portion of any proceeds received as a result of the state's lawsuits against fossil fuel companies. Taxes should be set at a level that ensures the adequacy of funding.**

**7. As called for by CCAG- Please Require that insurance companies:**

**a. Immediately cease insuring new coal projects and coal companies, unless they are engaged in a rapid transition process away from coal to clean energy of no more than two years.**

**b. Immediately cease insuring new oil or gas expansion projects.**

**c. Commit to phasing out insurance for oil and gas companies in line with a 1.5ºC pathway.**

**d. Divest all assets from coal companies and oil and gas companies that are not in line with a 1.5ºC pathway, including assets managed for third parties.**

**e. Bring stewardship activities, membership of trade associations and public positions as a shareholder and corporate citizen more broadly in line with a 1.5ºC pathway in a transparent way. This must include forceful advocacy for a green and just recovery from COVID-19.**

**8. As called for by CCAG- Please Reintroduce and enact SB 345 that requiring the Insurance Commissioner to (1) annually conduct a study on issues related to climate change and report the results of such study to the joint standing committee of the General Assembly having cognizance of matters relating to insurance, and (2) assess the feasibility of collecting and reporting additional data concerning climate change.**

**9. Lastly please support carbon pricing to seriously address the cost of carbon producing activities and meaningfully reduce them and "Ensure that the revenues generated are invested in programs that reduce the pollution burden on LMI communities and address any potential adverse economic impacts of the program" as called for on page 44 of the EEJ report. Please also see:**

**https://www.ucsusa.org/resources/carbon-pricing-101#:~:text=The%20resulting%20interaction%20between%20the,sector%20or%20the%20whole%20economy.**

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**Bryan Garcia** <Bryan.Garcia@ctgreenbank.com> Thu, Oct 22, 2020 at 8:51 AM
To: "Shub, Alec" <alec.shub@uconn.edu>

*Message sent from a system outside of UConn.*

Can you get this into MS teams

**Bryan Garcia**
President & CEO, Connecticut Green Bank

T 860-257-2170 | M 203-675-9464 | F 860-398-5510
845 Brook Street, Rocky Hill, CT 06067
bryan.garcia@ctgreenbank.com **ctgreenbank.com**

CONNECTICUT GREEN BANK


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**From:** French, Rebecca <Rebecca.French@ct.gov>
**Sent:** Wednesday, October 21, 2020 2:39 PM
**To:** Bradner, George <George.Bradner@ct.gov>; Mais, Andrew <Andrew.Mais@ct.gov>; Bryan Garcia

<Bryan.Garcia@ctgreenbank.com>; Daum, Alexandra <Alexandra.Daum@ct.gov>
**Subject:** FW: Letter to Financing and Funding Adaptation and Resilience Working Group GC3

[Quoted text hidden]

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Alec Shub <alec.shub@uconn.edu>

# FW: GC3 Working Group Report Comments

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:50 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Li <lua.dwr@gmail.com>
**Sent:** Wednesday, October 21, 2020 11:41 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** GC3 Working Group Report Comments

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

1. **Working and Natural Lands**
    1. **Agriculture**
        1. **More and deeper changes to education is required than technical assistance provided by dedicated expert staff, restorative land practices are necessary. Ensure indigenous staff and require indigenous land care training.**
        2. **Livestock farmers could be incentivized to price up meat and dairy.**
        3. **Alternative solutions like seaweed feed for livestock would greatly reduce methane emissions.**
        4. **State-wide composting mandate must be issued along with public education tools, with returns given to farmers.**
        5. **More than just pollinators programs, we need to phase out pesticide use for insect health and to protect delicate ecosystems,**
    2. **Forests**
        1. **A focus on heat-resilient trees for research.**
    3. **Rivers**
        1. **Investment in carbon sinks underwater, kelp growth, polyculture underwater farming would be great additions!**

2. **Infrastructure**
    1. **Transportation:**
        1. **The recommendations offered are great for the purposes of resiliency, but don't offer much in the way of mitigation**
        2. **Transportation makes up nearly 40% of CT's GHG emissions, and most of this comes from passenger vehicles and light duty cars.**
        3. **We can either encourage the purchase of electric/low-emission vehicles, but this raises an equity question because these are typically prohibitively expensive**
        4. **OR we can encourage people to drive less**
        5. **With COVID, there has been a rise in biking and walking...this moment needs to be seized! There should be a strong push to encourage active transportation as an actual form of transportation rather than just a leisurely activity, and this can be done by rapid implementation of bicycle and pedestrian infrastructure.**
        6. **More funding needs to go towards electrifying CT's transit fleet, expanding service, and making transit service more connected, less confusing, and more seamless across the state to encourage ridership (i.e. touchless fare, single transit pass for all services, including micromobility, etc.)**
    2. **Land Use & Buildings**
        1. **CT is facing a critical shortage of affordable housing**
        2. **CT must implement a Green New Deal for Public Housing program**
            1. **LUB-8 starts to address this, but a GND for public housing would more comprehensively address both the need for upgrading existing low-income housing, and making sure more affordable housing is built throughout the state that is efficient**
3. **Public Health**
    1. **Appreciate the comments already there!**
4. **Equity and Environmental Justice**
    1. **Appreciated Sena's point about carbon pricing exacerbating impacts on LMI communities**
    2. **Integrating mutual aid training and climate-based info sessions, wildlife integration into LMI communities**
    3. **Focus on trees and regrowth in LMI communities would be wonderful.**
    4. **Treating CC as a public health crisis in LMI communities and requiring information disseminated about new infrastructure projects to have a public health focus**

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Alec Shub <alec.shub@uconn.edu>

# FW: Woody biomass

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Wed, Oct 21, 2020 at 5:35 PM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

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**From:** Silk, Mark R. <Mark.Silk@trincoll.edu>
**Sent:** Wednesday, October 21, 2020 4:55 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Woody biomass



I direct am a professor at Trinity College, where I direct the Program on Public Values. In recent years I have become involved in issues of climate change both as a teacher and as an organizer. We sponsored the 2018 gubernatorial forum on climate change, the 2019 and 2020 legislative summits of the Connecticut League of Conservation Voters, and educational programs for journalists and the general public on the impact of climate change on our state, on carbon tax proposals, and on forest policy in New England. In Massachusetts, we helped launch a new coalition, the Faith Science Alliance for Climate Leadership, headed by Philip Duffy, president of the Wood Climate Research Center in Woods Hole, and Sean O'Malley, Cardinal Archbishop of Boston.

I would like to focus on an issue that has received far too little attention in the climate change movement—and which, thanks to canny lobbying and monetary contributions by the interested industry, has even obtained the support of some environmental organizations. That is power generation via woody biomass— generating electricity by burning pelletized wood. This is a growing threat in New England—driven by claims made not only by the forest industry but by DEEP's own Forestry Division regarding alleged economic benefits of including woody biomass in the state's T-RPS program. I would here call particular attention to recommendations to harvest not merely diseased trees but also "standing trees that are

susceptible to disease"—in other words, healthy trees—and the claim that such harvesting can be done "without impairing the carbon-sequestration capacity of the state's forests."

That claim is based on faulty, out-of-date science. This is made abundantly clear in a paper published last year by William Moomaw, one of the country's leading climate scientists, my Trinity colleague Susan Masino, and Edward Faison, titled "Intact Forests in the United States: Proforestation Mitigates Climate Change and Serves the Greatest Good." The paper demonstrates that growing existing forests intact to their ecological potential is the most effective, immediate, and low-cost way for state forest policy to contribute to achieving our 100% zero-carbon target for the electricity sector by 2040. Of central importance is the evidence that far more carbon is sequestered by older than younger trees, and that forests that are allowed to grow naturally sequester more carbon—and do more to promote necessary biodiversity—than managed forests.

DEEP acknowledges that claims for the ability of woody biomass fuel are based on "lifecycle accounting that assumes carbon dioxide is captured from the atmosphere during subsequent cycles of plant growth." Such lifecycle accounting would take us far beyond 2040. The point is that in the current climate emergency, the criterion for power generation cannot be "renewable" energy. What we need is energy production that does not release greenhouse gases. Even as we speak, forests in the Southeast are being cut to make into pellets to ship across the Atlantic for Europe to burn. This is how the Europeans are meeting their carbon budgets. At the present time, less than 10 percent of New England's power generation comes from green energy, and two-thirds of *that* comes from burning wood and refuse. We must not follow in Europe's footsteps, but already we are beginning to do so, in the northern part of our region and now, increasingly, in the southern.

New England is the only region in the world that has, over the past century, gone from brown to green. Through remote-sensing satellite technology, it is now possible to track carbon storage over time; and what we're seeing in western Massachusetts right now is a slowing down, not an acceleration of carbon sequestration. As you know, there are plans afoot to build a biomass plant in Springfield and though there's reason to hope that public opposition will be sufficient to stop it, the threat to our forests is not about to disappear. In May of last year, the Baker administration in Massachusetts proposed sweeping changes to that state's Renewable Portfolio Standard that would significantly weaken what are currently the most stringent, science-based standards in the nation for wood-burning power plants. Here in Connecticut, the Lamont administration needs to go in the opposite direction.

There is a need to phase down renewable energy credits for biomass facilities as quickly as possible; indeed, rather than merely devise a schedule for doing so, as currently mandated by

law, woody biomass should be removed as a Class One renewable. Given the current timetable of global warming, we might as well treat coal as a Class One renewable. It's a more efficient fuel than wood, and in due course our supply of it will be renewed. In both cases, civilization as we know it will be gone by the time the renewal takes place. We also should use our satellite imaging capacity to enable carbon sequestration to be factored into our calculations of green energy and thereby encourage proforestation across the state.

Last year, our two U.S. senators joined with five other New England senators to write ISO New England President and CEO Gordon van Welie to complain that the regional grid operator is not doing enough to quit carbon-based fuel. DEEP Commissioner Katie Dykes was herself quoted in the *Hartford Courant* today as saying, "Sadly, there's some missed opportunities and missed leadership at the ISO to help achieve state policies." Let's do it ourselves by getting woody biomass out of the mix.

Sincerely yours,

Mark Silk

September 9, 2020

Ms. Donna Wieting
Director, Office of Protected Resources
National Marine Fisheries Service
1315 East-West Hwy.
Silver Spring, MD 20910

Ms. Jolie Harrison
Division Chief, Permits and Conservation Division, Office of Protected Resources
National Marine Fisheries Service
1315 East-West Hwy.
Silver Spring, MD 20910

**RE: Failure to Adequately Protect Endangered and Protected Marine Mammals During Marine Site Characterization Surveys Required for Offshore Wind Development**

Dear Ms. Wieting and Ms. Harrison,

We are writing to express our profound concern regarding flaws in the incidental harassment authorizations ("IHAs") issued by the National Marine Fisheries Service ("NMFS") for marine site characterization surveys required for offshore wind development. Our organizations are united in support of responsibly developed offshore wind energy as a critically needed climate change solution, and we have long advocated for policies and actions needed to bring it to scale in an environmentally protective manner. We are heartened to see that in some instances developers are going beyond sub-standard NMFS requirements to adopt more protective measures, but NMFS should require even stronger protections of all developers.

Since March 2018, our groups have submitted 12 comment letters to NMFS on proposed IHAs for marine site characterization surveys associated with 12 offshore wind Lease Areas and associated potential export cable route corridors from Massachusetts to North Carolina (*see* Attachment 1). In these letters, we consistently identified recurring flaws in NMFS' incidental take analyses and recommended measures to mitigate and monitor potential impacts to endangered and protected marine mammals—actions critical to environmentally responsible offshore wind development. Despite our urging, NMFS has made no meaningful improvements to the IHAs issued; in fact, NMFS has weakened the required mitigation and monitoring measures over time. This trend is irresponsible in light of the worsening conservation status of a number of species, including the critically endangered North Atlantic right whale, and the significant increase in the number and geographic and temporal scale of marine site characterization surveys.

Here, we summarize our overarching concerns and necessary improvements, and request a meeting with you and your staff to discuss how NMFS should adjust its current IHA process to reflect requirements under the Marine Mammal Protection Act ("MMPA").

In brief, NMFS must:

A. Incorporate additional data sources into calculations of marine mammal density and take;
B. Analyze cumulative impacts to North Atlantic right whales and other endangered and protected marine mammal species and stocks as part of the take estimation and permitting process;
C. Not adjust take numbers downward for large whales based on unproven mitigation measures;
D. Require mitigation measures that meet the least practicable adverse impact standard;
E. Strengthen its vessel speed restrictions to mitigate the harm of increased vessel traffic; and
F. Prohibit extensions of any one-year IHA through a truncated 15-day comment period as is contrary to the MMPA.

We also submit our recommendations for advancing monitoring and mitigation during offshore wind development.

## I. The Marine Mammal Protection Act

Congress enacted the MMPA because "certain species and population stocks of marine mammals are, or may be, in danger of extinction or depletion as a result of man's activities."[1] The statute seeks to ensure that species and population stocks are not "permitted to diminish beyond the point at which they cease to be a significant functioning element of the ecosystem of which they are a part," and do not "diminish below their optimum sustainable population."[2] Congress intended for NMFS to act conservatively in the face of uncertainty when authorizing activities harmful to marine species.[3] This careful approach to management was deemed necessary because of the vulnerable status of many species and because it is difficult to measure the impacts of human activities on marine mammals in the wild.[4]

At the heart of the MMPA is its "take" prohibition, which establishes a moratorium on the capture, harassing, hunting, or killing of marine mammals, and generally prohibits any person or vessel subject to the jurisdiction of the United States from taking a marine mammal on the high seas or in waters or on land under the jurisdiction of the United States.[5] Harassment is any act that "has the potential to injure a marine mammal or marine mammal stock in the wild" or to "disturb a marine mammal . . . by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering."[6]

NMFS may grant exceptions to the take prohibition. As relevant here, the agency may authorize, for not more than a one-year period, the incidental, but not intentional, "taking by harassment of small numbers

[1] 16 U.S.C. § 1361(1).

[2] *Id*. § 1361(2); see also *Conservation Council for Hawaii v. NMFS*, 97 F. Supp. 3d 1210, 1216 (D. Haw. 2015).

[3] H.R. Rep. No. 92-707 (Dec. 4, 1971), as reprinted in 1972 U.S.C.C.A.N. 4144, 4148.

[4] 16 U.S.C. § 1361(1), (3).

[5] *Id.* § 1362(13), 1371(a).

[6] *Id*. § 1362(18)(A).

of marine mammals of a species or population stock" if the agency determines that such take would have only "a negligible impact on such species or stock."[7] The agency must prescribe permissible methods of taking to ensure that the activity has "the least practicable impact on such species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance."[8] NMFS must also establish monitoring and reporting requirements.[9] No later than 45 days after receiving an application for an IHA, NMFS must publish a proposed authorization and open a 30-day comment period.[10]

## II. The Status of Marine Mammals in the Northwestern Atlantic

The North Atlantic right whale is on a path to extinction. Although the species has been listed as endangered under the Endangered Species Act ("ESA") for decades, recent scientific analysis confirms a population decline since 2010 due to entanglements in commercial fishing gear and vessel strikes.[11] In the wake of an alarming number of detected deaths of North Atlantic right whales in 2017, NMFS declared an Unusual Mortality Event ("UME"),[12] which devotes additional federal resources to determining and—if possible—mitigating the source of excessive mortality. This designation is still in effect. At least 31 animals are known to have been killed since 2017 and an additional ten whales have been documented with serious injuries they will not survive.[13] These 41 animals represent roughly ten percent of the population that now numbers approximately 400 individuals.[14] Moreover, these documented serious injuries and deaths only represent a small fraction of whales that are injured or killed by human activities.[15] Of great concern is that females are more negatively affected than males by the lethal and sublethal effects of human activity, surviving to only 30-40 years of age with an extended inter-calf interval of approximately ten years.[16] Calf survival is also severely diminished. Two of the ten calves born in the 2019/2020 calving season are already either confirmed or likely dead due to vessel strikes.[17] In 2019, North Atlantic right whales were listed as a NOAA "Species in the Spotlight" indicating that they

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[7] *Id*. § 1371(a)(5)(D)(i).

[8] *Id*. § 1371(a)(5)(D)(ii)(I).

[9] *Id.* § 1371(a)(5)(D)(iii).

[10] *Id.* § 1371(a)(5)(D)(iii).

[11] Sharp, S.M., McLellan, W.A., Rotstein, D.S., Costidis, A.M., Barco, S.G., Durham, K., Pitchford, T.D., Jackson, K.A., Daoust, P.Y., Wimmer, T. and Couture, E.L., "Gross and histopathologic diagnoses from North Atlantic right whale Eubalaena glacialis mortalities between 2003 and 2018." *Diseases of Aquatic Organisms*, vol. 135, pp.1-31 (2019).

[12] NOAA-NMFS, "2017-2020 North Atlantic right whale Unusual Mortality Event." Available at: https://www.fisheries.noaa.gov/national/marine-life-distress/2017-2020-north-atlantic-right-whale-unusual-mortality-event.

[13] The preliminary cumulative total number of animals in NMFS' North Atlantic right whale Unusual Mortality Event has been updated to 41 individuals to include both the confirmed mortalities (dead stranded or floaters) (n=31) and seriously injured free-swimming whales (n=10) to better reflect the confirmed number of whales likely removed from the population during the UME and more accurately reflect the population impacts. *Id*.

[14] NOAA Fisheries, "North Atlantic right whale." Available at: https://www.fisheries.noaa.gov/species/north-atlantic-right-whale.

[15] Sharp, S.M., et al., "Gross and histopathologic diagnoses from North Atlantic right whale Eubalaena glacialis mortalities between 2003 and 2018," *supra* note 11.

[16] Corkeron, P., Hamilton, P., Bannister, J., Best, P., Charlton, C., Groch, K.R., Findlay, K., Rowntree, V., Vermeulen, E., and Pace, R.M., "The recovery of North Atlantic right whales, *Eubalaena glacialis*, has been constrained by human-caused mortality." *Royal Society Open Science,* vol 5, art. 180892 (2018).

[17] NOAA-NMFS, "2017-2020 North Atlantic right whale Unusual Mortality Event," *supra* note 12.

are one of nine marine species to be at greatest risk of extinction in the United States.[18] In July, the International Union for Conservation of Nature ("IUCN") reclassified the North Atlantic right whale from "endangered" to "critically endangered" on the IUCN Red List of Threatened Species, one step away from "extinction."[19]

Ongoing UMEs exist for other large whales. Alarmingly, 93 minke whales have stranded between Maine and South Carolina from January 2017 to September 2020 (data through September 1, 2020).[20] Elevated numbers of humpback whales have also been found stranded along the Atlantic Coast since January 2016 and, in a little over four years, 131 humpback whale mortalities have been recorded (data through September 1, 2020), with strandings occurring in every state along the East Coast.[21] NMFS' declaration of these UMEs in the past few years for three large whale species for which anthropogenic impacts are a significant cause of mortality[22] demonstrates an increasing risk to whales from human activities along the East Coast.

In addition to endangered and protected large whales, the Western North Atlantic Southern Migratory Coastal stock of bottlenose dolphin is of concern. The stock is considered to be both strategic and depleted under the MMPA due to the number of annual human-caused mortalities and previous UMEs.[23]

We also note that the waters off Cape Hatteras, North Carolina, have the highest marine mammal biodiversity of any area along the East Coast, and compare favorably to other locations internationally renowned for their diversity of species, including waters off Northwest Spain, New Zealand, and South Africa.[24] Nine families and 34 species (29 cetaceans, 4 pinnipeds, and 1 manatee) were recorded for the entire coast of North Carolina in a recent study.[25] In addition to the diversity of species, marine mammals also occur at unusually high densities off Cape Hatteras compared to other areas along the East Coast.[26] In

[18] NOAA-NMFS, "North Atlantic right whale – In the Spotlight." Available at: https://www.fisheries.noaa.gov/species/north-atlantic-right-whale#spotlight.

[19] Cooke, J.G., "Eubalaena glacialis." *The IUCN Red List of Threatened Species*, e.T41712A162001243 (2020). Available at: https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T41712A162001243.en.

[20] NOAA-NMFS, "2017-2020 Minke whale Unusual Mortality Event along the Atlantic Coast." Available at: https://www.fisheries.noaa.gov/national/marine-life-distress/2017-2020-minke-whale-unusual-mortality-event-along-atlantic-coast#:~:text=While%20minke%20whales%20are%20protected,Unusual%20Mortality%20Event%20(UME).

[21] NOAA-NMFS, "2016-2020 Humpback whale Unusual Mortality Event along the Atlantic Coast." Available at: https://www.fisheries.noaa.gov/national/marine-life-distress/2016-2020-humpback-whale-unusual-mortality-event-along-atlantic-coast.

[22] *Id*.; NOAA-NMFS, "2017-2020 North Atlantic right whale Unusual Mortality Event," *supra* note 12; NOAA-NMFS, "2017-2020 Minke whale Unusual Mortality Event along the Atlantic Coast," *supra* note 20.

[23] Hayes, S.A., et al., "U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments – 2017," *NOAA Technical Memorandum NMFS-NE-245*, at pp. 110-124 (Sept. 2018). Available at: https://repository.library.noaa.gov/view/noaa/22730.

[24] Byrd, B.L., Hohn, A.A., Lovewell, G.N., Altman, K.M., Barco, S.G., Friedlaender, A., Harms, C.A., McLellan, W.A., Moore, K.T., Rosel, P.E., and Thayer, V.G., "Strandings as indicators of marine mammal biodiversity and human interactions off the coast of North Carolina." *Fishery Bulletin*, vol. 112, pp.1-23 (2014).

[25] *Id*.

[26] Halpin, P.N., Read, A.J., Fujioka, E.I., Best, B.D., Donnelly, B.E.N., Hazen, L.J., Kot, C., Urian, K., LaBrecque, E., Dimatteo, A., and Cleary, J., "OBIS-SEAMAP: The world data center for marine mammal, sea bird, and sea turtle distributions." *Oceanography*, vol. *22*, pp.104-115 (2009).

light of the outstanding importance for marine mammals, including the aforementioned strategic species and stocks, this area demands special attention from NMFS during the IHA permitting process.

NMFS is obligated under both the ESA and the MMPA to protect the North Atlantic right whale from additional harmful impacts of human activities and required by the MMPA to consider the full range of potential impacts on all marine mammal species, including minke and humpback whales and strategic stocks of small cetaceans, that are known to utilize the proposed survey area(s) and surrounding regions before issuing an IHA with appropriate avoidance, minimization, mitigation, and monitoring measures. NMFS must use the best available scientific information on marine mammal presence and density, as required by law.[27] Considering the elevated threat to federally protected species and populations in the Atlantic, and emerging evidence of dynamic shifts in the distribution of marine mammal habitat, NMFS must ensure that any potential stressors posed by the proposed surveys are mitigated to effectuate the least practicable impact on affected species and stocks.[28]

## III. Concerns Regarding Current Incidental Harassment Authorizations for Marine Site Characterizations Surveys and Necessary Improvements

### *A. NMFS must incorporate additional data sources into calculations of marine mammal density and take*

To comply with statutory requirements of the MMPA, NMFS must base its IHA analysis on the best available scientific information.[29] However, in determining the proportion of marine mammal species and populations taken by the proposed activities—a calculation that lies at the heart of the agency's "small numbers" analysis—NMFS has chosen to rely on estimates of marine mammal densities derived from the habitat-based density model (the "Roberts et al." model) produced by the Duke University Marine Geospatial Ecology Laboratory.[30] While this model has been updated to incorporate additional data sources, including in Cape Cod Bay, and two or more years of data,[31] it still excludes important data sources.

**Of particular concern is NMFS' continuing assertion that the lease areas and cable routes south of Nantucket and Martha's Vineyard are situated only within the North Atlantic right whale**

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[27] 16 U.S.C. § 1362(19), § 1362(27).

[28] 16 U.S.C. § 1371(a)(5)(D)(ii)(I).

[29] 16 U.S.C. § 1362(19), § 1362(27).

[30] Roberts, J.J., Best, B.D., Mannocci, L., Fujioka, E., Halpin, P.N., Palka, D.L., Garrison, L.P., Mullin, K.D., Cole, T.V., Khan, C.B. and McLellan, W.A., "Habitat based cetacean density models for the U.S. Atlantic and Gulf of Mexico," *Scientific Reports,* vol. 6, p.22615 (2016); Roberts J.J., Mannocci L., and Halpin P.N., "Final Project Report: Marine Species Density Data Gap Assessments and Update for the AFTT Study Area, 2016-2017 (Opt. Year 1)." Document version 1.4. Report prepared for Naval Facilities Engineering Command, Atlantic by the Duke University Marine Geospatial Ecology Lab, Durham, NC (2017); Roberts J.J., Mannocci L., Schick R.S., and Halpin P.N., "Final Project Report: Marine Species Density Data Gap Assessments and Update for the AFTT Study Area, 2017-2018 (Opt. Year 2)." Document version 1.2 - 2018-09-21. Report prepared for Naval Facilities Engineering Command, Atlantic by the Duke University Marine Geospatial Ecology Lab, Durham, NC. (2018).

[31] *Id*.

**migratory corridor,[32] rather than acknowledging that North Atlantic right whales are now regularly observed aggregating socially and foraging in these areas year-round.** This omission is irresponsible in light of NMFS' current work to develop new regulations to reduce entanglement of North Atlantic right whales,[33] for which the importance of this area as a new aggregation and foraging site forms a central point of consideration. A recent NMFS Technical Memorandum authored by the agency's North Atlantic right whale "Expert Working Group" describes the area "South of the Islands" as "core" North Atlantic right whale foraging habitat during the "Winter/Spring/Summer/Fall."[34] The Roberts et al. model does not adequately capture this increase in habitat use by right whales and, therefore, levels of take based solely on those models will most certainly be underestimates. The Expert Working Group specifically notes the need to improve the North Atlantic right whale habitat model and recommends "a coordinated and unified modeling approach [with Canada] to provide distribution and density predictions across the range of NARW habitat."[35]

Similarly, NMFS defined the North Atlantic right whale migratory corridor as a biologically important area ("BIA") in 2015 before evidence emerged of the new foraging areas south of Martha's Vineyard and Nantucket. While helpful in identifying key areas of importance, the BIAs are not comprehensive and are intended to be periodically reviewed and updated to reflect the best available scientific information.[36] Until this review is undertaken for the East Coast, NMFS should not rely on the North Atlantic right whale migratory corridor BIA as the sole indicator of habitat importance for the species.

NMFS must require that all available data are used to ensure that any potential shifts in North Atlantic right whale habitat usage are reflected in estimations of marine mammal density and take. Additional data can be obtained from sightings databases (*e.g.*, NOAA Right Whale Sighting Advisory System;[37] NEFSC Monthly DMA analysis[38]), and passive acoustic monitoring efforts (*e.g.*, Robots4Whales detections;[39]

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[32] *See*, *e.g.*, 85 Fed. Reg. at 37,872 (Jun. 24, 2020).

[33] *See*, *e.g.*, "Atlantic Large Whale Take Reduction Team Meeting—Key Outcomes Memorandum," Providence, Rhode Island, April 23-26, 2019 (October 2019). Available at: https://www.fisheries.noaa.gov/webdam/download/97751765.

[34] Oleson, E.M., Baker, J., Barlow, J., Moore, J.E., and Wade, P., "North Atlantic Right Whale Monitoring and Surveillance: Report and Recommendations of the National Marine Fisheries Service's Expert Working Group." NOAA Technical Memorandum NMFS-OPR-64 (August 2020), at Fig. 1. Available at: https://www.fisheries.noaa.gov/resource/document/north-atlantic-right-whale-monitoring-and-surveillance-report-and-recommendations.

[35] *Id*., at 22.

[36] "However, these BIAs are meant to be living documents that should be routinely reviewed and revised to expand the number of species covered and to update the existing BIAs as new information becomes available." Van Parijs, S. M., "Letter of introduction to the Biologically Important Areas issue." *Aquatic Mammals*, vol. 41, p.1 (2015).

[37] NOAA Fisheries, "NOAA Right Whale Sighting Advisory System." Available at: https://apps-nefsc.fisheries.noaa.gov/psb/surveys/MapperiframeWithText.html.

[38] NOAA Fisheries, "Interactive DMA Analyses." Northeast Fisheries Science Center, updated September 2019. Available at: https://apps-nefsc.fisheries.noaa.gov/psb/surveys/interactive-monthly-dma-analyses/.

[39] Woods Hole Oceanographic Institution, "Robots4Whales." Available at: http://dcs.whoi.edu/; *See*, *also*, WCS/WHOI, "Autonomous real-time marine mammal detections, New York Bight buoy." Available at: http://dcs.whoi.edu/nyb0218/nyb0218_buoy.shtml; WCS/WHOI, "Autonomous real-time marine mammal detections, New York Bight buoy NW." Available at: http://dcs.whoi.edu/nybnw0120/nybnw0120_buoy.shtml; WCS/WHOI, "Autonomous real-time marine mammal detections, New York Bight buoy SE." Available at: http://dcs.whoi.edu/nybse0120/nybse0120_buoy.shtml.

NEFSC Acoustic Indicators of Right Whale Occurrence[40]). Further, from February 2017 through June 2018, monthly standardized marine mammal aerial surveys were flown in the Massachusetts and Rhode Island and Massachusetts Wind Energy Areas ("WEAs") by the New England Aquarium. Right whales were seen in every season and 14 of the 18 months surveyed.[41] As part of the New England Aquarium Study, a digital acoustic monitoring instrument at Nomans Land station detected right whales throughout the sampling period.[42] During the 2018 Atlantic Marine Assessment Program for Protected Species ("AMAPPS") ship-based surveys,[43] two *foraging* right whales were sighted within the Massachusetts WEA by NMFS researchers studying the potential linkages between biological and physical oceanography and marine mammal sightings on April 7. Additional sightings in the North Atlantic right whale consortium database document 47 right whales in the WEA from March 18, 2018 to April 11, 2018. A study funded by the Bureau of Offshore Energy Management ("BOEM") using autonomous vehicles for real-time monitoring of marine mammals from December 2019 through March 2020 on Cox's Ledge acoustically detected right whales in all months of the study.[44] NMFS should take immediate steps to collate and integrate these different data sets that more accurately reflect marine mammal presence for future IHAs and other work.

As a general matter, the Roberts et al. model does not differentiate between species of pilot whale or seal, or between stocks of bottlenose dolphin, including the depleted and strategic Western North Atlantic Southern Migratory Coastal Stock of bottlenose dolphin. To make up for the general data, NMFS authorizes the total take for each stock of bottlenose dolphins and all pilot whale and seal species.[45] However, the MMPA requires that the agency look at the impact to both species and marine mammal stocks to support a negligible impact finding. A record that provides "general discussions with little, if any, relevance to the population-level effects on specific species and stock, and to conclusory statements that no such effects are expected," is inadequate.[46] Miscalculation of take levels based on incomplete data could have serious implications for the future conservation of these species and stocks.

*B. NMFS must analyze cumulative impacts to North Atlantic right whales and other endangered and protected marine mammal species and stocks as part of the take estimation and permitting process*

[40] Northeast Fisheries Science Center, "Acoustic Indicators of Right Whale Occurrence." Available at: https://apps-nefsc.fisheries.noaa.gov/psb/surveys/interactive-monthly-dma-analyses/.

[41] Quintana, E., Kraus, S., and Baumgartner, M., "Megafauna aerial surveys in the Wind Energy Area of Massachusetts and Rhode Island with emphasis on large whales. Summary Report – Campaign 4, 2017-2018." New England Aquarium and Woods Hole Oceanographic Institution (December 2019).

[42] *Id*.

[43] Northeast Fisheries Science Center and Southeast Fisheries Science Center, "2018 Annual Report of a Comprehensive Assessment of Marine Mammal, Marine Turtle, and Seabird Abundance and Spatial Distribution in US waters of the Western North Atlantic Ocean – AMAPPS II." (2019). Available at: https://www.fisheries.noaa.gov/resource/publication-database/atlantic-marine-assessment-program-protected-species.

[44] Woods Hole Oceanographic Institution, "Autonomous Real Team Marine Mammal Detections: Cox Ledge, Winter 2019-2020," Available at: http://dcs.whoi.edu/cox1219/cox1219_we16.shtml.

[45] *See, e.g.*, 85 Fed. Reg. at 36,537 (Jun. 17, 2020).

[46] *Conservation Council for Hawaii v. NMFS*, 97 F. Supp. 3d 1210, 1223 (D. Haw. 2015).

The spatial and temporal scale of site characterization surveys has increased significantly over the last three years. For example, the Final IHA issued to Orsted Wind Power LLC in 2019, authorizes surveys conducted across a geographic area spanning waters off Massachusetts, Rhode Island, and New York twenty-four hours a day for up to a year, utilizing between five and nine survey vessels at any one time (representing 666 "vessel days").[47] The number of authorizations granted to different applicants in the same geographic region has also increased. This is particularly true of the Lease Areas and associated potential export cable routes off Rhode Island and Massachusetts where there are currently eight separate wind energy projects in various stages of development.[48] Each project has, or will need to, request authorization from NMFS to carry out site assessment and characterization activities that will then be undertaken concurrently or sequentially in space and time.

The operation of multiple, large-scale geophysical surveys within the same area at the same time presents significant potential for cumulative disturbance of strategic and otherwise vulnerable marine mammal species and stocks. The agency acknowledges that "[a]ny disturbance to marine mammals is likely to be in the form of temporary avoidance or alteration of opportunistic foraging behavior near the survey location,"[49] but makes no attempt to account for cumulative impacts from multiple sound sources operating concurrently and continuously across the survey areas. Additionally, "vessel days" are treated equally by the agency in terms of potential impacts to marine mammals[50] even though there are times of year when some species have higher vulnerability to noise exposure from the survey activities being undertaken (*e.g.*, during foraging periods), or may have reduced ability to avoid noise exposure due to multiple survey vessels operating in the same vicinity at the same time.

**We are extremely concerned about the cumulative impacts of survey activities in the Lease Areas and associated potential cable export routes off Rhode Island and Massachusetts on North Atlantic right whales.** These areas coincide directly with year-round "core" North Atlantic right whale foraging habitat[51] and well as ESA critical habitat.[52] Protection of North Atlantic right whales during foraging, and the protection of their foraging habitat, must be one of NMFS' highest priorities. Foraging areas with suitable prey density are limited relative to the overall distribution of North Atlantic right whales, and a decreasing amount of habitat is available for resting, pregnant and lactating females.[53] This means that

[47] 84 Fed. Reg. at 36,055 (Jul. 26, 2019).

[48] *See*, BOEM, "Atlantic OCS Renewable Energy – Massachusetts to South Carolina," (March 30, 2020). Available at: https://www.boem.gov/sites/default/files/images/Map%20of%20Atlantic%20OCS%20renewable%20energy%20areas.jpg

[49] *See*, *e.g.*, 84 Fed. Reg. at 36,054 (Jul. 26, 2019), at 36,065.

[50] *Id*.

[51] Oleson, E.M., et al., "North Atlantic Right Whale Monitoring and Surveillance: Report and Recommendations of the National Marine Fisheries Service's Expert Working Group," *supra* note 34.

[52] 81 Fed. Reg. at 4,837 (Jan. 27, 2016).

[53] Van der Hoop, J., Nousek-McGregor, A.E., Nowacek, D.P., Parks, S.E., Tyack, P., and Madsen, P, "Foraging rates of ram-filtering North Atlantic right whales." *Functional Ecology*, vol. 33, pp. 1290-1306 (2019); Plourde, S., Lehoux, C., Johnson, C. L., Perrin, G., and Lesage, V. "North Atlantic right whale (*Eubalaena glacialis*) and its food: (I) a spatial climatology of Calanus biomass and potential foraging habitats in Canadian waters." *Journal of Plankton Research*, vol. 41, pp. 667-685 (2019); Lehoux, C., Plourde S., and Lesage, V., "Significance of dominant zooplankton species to the North Atlantic Right Whale potential foraging habitats in the Gulf of St. Lawrence: a bioenergetic approach." DFO Canadian Science Advisory Secretariat (CSAS) Research Document 2020/033 (2020). Gavrilchuk, K., Lesage, V., Fortune, S., Trites, A.W., and Plourde,

unrestricted and undisturbed access to suitable areas, when they exist, is extremely important for the species to maintain its energy budget.[54] Scientific information on North Atlantic right whale functional ecology also shows that the species employs a "high-drag" foraging strategy that enables them to selectively target high-density prey patches, but is energetically expensive.[55] Thus, if access to prey is limited in any way, the ability of the whale to offset its energy expenditure during foraging is jeopardized. In fact, researchers have concluded: "[R]ight whales acquire their energy in a relatively short period of intense foraging; even moderate changes in their feeding behavior or their prey energy density are likely to negatively impact their yearly energy budgets and therefore reduce fitness substantially."[56] North Atlantic right whales are already experiencing significant food-stress: juveniles, adults, and lactating females have significantly poorer body condition relative to southern right whales and the poor condition of lactating females may cause a reduction in calf growth rates.[57] NMFS must ensure undisturbed access to foraging habitat to adequately protect the species.

The best available scientific information shows that the North Atlantic right whale population cannot withstand any additional stressors; any potential interruption of foraging behavior may lead to population-level effects and is of critical concern.[58] Currently, NMFS undertakes take analyses and prescribes mitigation measures on a project-by-project basis, leading to inconsistency, inefficiency, and inadequacy. **NMFS must carefully analyze the cumulative impacts from the proposed survey activities on the North Atlantic right whale and other endangered and protected species and stocks and ensure appropriate mitigation of these cumulative impacts. We suggest that the agency advance a programmatic incidental take regulation for site characterization activities.**[59] This will ensure NMFS considers alternatives and mitigation measures at the scale at which impacts will occur and may potentially help increase the pace of environmentally responsible offshore wind development along the East Coast.

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S., "A mechanistic approach to predicting suitable foraging habitat for reproductively mature North Atlantic right whales in the Gulf of St. Lawrence." DFO Canadian Science Advisory Secretariat (CSAS) Research Document 2020/034 (2020).

[54] *Id*.

[55] Van der Hoop, J., et al., *id*.

[56] *Id*.

[57] Christiansen, F., Dawson, S.M., Durban, J.W., Fearnbach, H., Miller, C.A., Bejder, L., Uhart, M., Sironi, M., Corkeron, P., Rayment, W., Leunissen, E., Haria, E., Ward, R., Warick, H.A., Kerr, I., Lynn, M.S., Pettis, H.M., & Moore, M.J., "Population comparison of right whale body condition reveals poor state of the North Atlantic right whale." *Marine Ecology Progress Series*, vol. 640, pp. 1-16 (2020).

[58] *See*, *e.g.*, *id*; Van der Hoop, J., *et al*., "Foraging rates of ram-filtering North Atlantic right whales," *supra* note 53.

[59] *See* Letter from National Wildlife Federation, Natural Resources Defense Council, National Audubon Society, Conservation Law Foundation, Defenders of Wildlife, Sierra Club, Mass Audubon, New Hampshire Audubon, NY4WHALES, Southern Environmental Law Center, Surfrider, and Whale and Dolphin Conservation, submitted to the Program Manager, Office of Renewable Energy, Bureau of Ocean Energy Management, re: "Vineyard Wind 1 Construction and Operations Plan Supplement to the Draft Environmental Impact Statement." Docket ID: BOEM-2020-0005 (July 27, 2020). Some of our groups have mirrored this recommendation in comments to BOEM. To best account for the impacts of the simultaneous development of multiple lease areas on the North Atlantic right whale, we have stressed that BOEM prepare a full Programmatic Environmental Impact Statement ("EIS") encompassing all U.S. East Coast renewable energy development as soon as possible to inform future offshore wind development. It would be highly beneficial to collectively consider available information on North Atlantic right whales in U.S. Atlantic waters to build a picture of responsible development accounting for the lifespan and migratory movements of the species, which have the potential to overlap with every Lease Area along the U.S. East Coast on a twice-yearly basis (*i.e.*, northern and southern migration). A Programmatic EIS is also particularly timely given the climate-driven shifts in North Atlantic right whale habitat use observed over the past decade as well as significant changes in their conservation status and major threats.

*C. NMFS must not adjust take numbers downward for large whales based on unproven mitigation measures*

In a number of IHAs, NMFS elected to adjust take numbers of endangered large whales downward by as much as 100 percent, based on assumptions that marine mammals will avoid the sound and the presumed effectiveness of mitigation measures. For example, in the IHA for Bay State Wind, issued in 2018, the agency elected to adjust take numbers of North Atlantic right whales to zero "due to the implementation of a 500 m shutdown zone [i.e., exclusion zone or "EZ"], which is greater than the 400 m Level B behavioral harassment zone."[60] For Avangrid Renewables, LLC (issued in 2019), NMFS adjusted take numbers of endangered North Atlantic right whales and fin whales to zero as "the calculated numbers of potential acoustic exposures above the 160 dB threshold are small" and based on the implementation of a 500-m exclusion zone for North Atlantic right whales and a 200-m exclusion zone for fin whales that are greater than or, in the case of fin whales, equal to the calculated Level B harassment zone.[61] In the IHA for Mayflower Wind issued in 2020, NMFS adjusted take numbers for North Atlantic right whales and other large whale species downward by 50 percent, acknowledging risk to the species during the night:

> "… expect[s] the proposed mitigation measures, including a 500-m exclusion zone for right whales (which exceeds the Level B harassment zone by over 350-m), will be effective in reducing the potential for takes by Level B harassment, but there is still a risk that right whales may not be detected within the Level B harassment zone during periods of diminished visibility, particularly at night."[62]

While we appreciate NMFS' decision to authorize fewer Level B takes for the North Atlantic right whale and other endangered and protected species, **we do not share the agency's confidence that it can successfully mitigate Level B harassment simply through the implementation of the IHA mitigation measures currently required.**[63]

Our reasons are threefold. First, NMFS' reliance on a 160 dB threshold for behavioral harassment is not supported by the best available scientific information and grossly underestimates Level B take.[64] Second,

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[60] 83 Fed. Reg. at 22,458 (May 15, 2018).

[61] 84 Fed. Reg. at 17,400 (Apr. 25, 2019).

[62] 85 Fed. Reg. at 37,866 (May 25, 2020).

[63] *E.g.*, In support of the adjustment of take numbers authorized for the Avangrid Renewables, LLC. project, the agency reflects on the success of required monitoring during previous geophysical surveys conducted off the U.S. East Coast: "Marine mammal monitoring reports submitted after the completion of HRG surveys indicated that authorized take numbers have never been exceeded."[63] The assumption inherent in this statement is that the number and nature of takes are possible to accurately determine by what has largely been visual monitoring. Moreover, the agency is proposing to authorize solely Level B take, which is highly unlikely to be detected by visual observation. 84 Fed. Reg. 17,384 (April 25, 2019).

[64] *See*, *e.g.*, Gomez, C., Lawson, J.W., Wright, A.J., Buren, A.D., Tollit, D. and Lesage, V. "A systematic review on the behavioural responses of wild marine mammals to noise: the disparity between science and policy." *Canadian Journal of Zoology*, vol. 94, pp. 801-819 (2016); Tyack, P.L., and Thomas, L. "Using dose-response functions to improve calculations of the impact of anthropogenic noise." *Aquatic Conservation: Marine and Freshwater Ecosystems*, vol. 29, pp. 242-253 (2019). *See*, *also*, Letter from the Marine Mammal Commission to Ms. Jolie Harrison, Chief, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service, regarding the IHA requested by Orsted Wind LLC. (June 13, 2018). Available at: https://www.mmc.gov/wp-content/uploads/18-06-13-Harrison-Orsted-Bay-State-IHA.pdf. The Marine

the agency relies on the assumption that marine mammals will take measures to avoid the sound[65] even though studies have not found avoidance behavior to be generalizable among species and contexts[66] and even though avoidance may itself constitute take under the MMPA.[67] Third, we agree with the Marine Mammal Commission that until the effectiveness of mitigation measures are determined, it is premature to include any related assumptions to reduce the numbers of marine mammal takes.[68]

Disturbingly, we have also witnessed an erosion in the strength of mitigation measures in recent IHAs that NMFS has issued compared to previous IHA authorizations for the region, even as the conservation status of the North Atlantic right whale and other species has continued to deteriorate. For example, NMFS required multiple Protected Species Observers ("PSO"), night vision and infrared technology, and passive acoustic monitoring for Bay State Wind in 2018. In subsequent IHAs, NMFS required the use of PSOs as the sole monitoring method[69] and, by Fall 2019, NMFS further weakened requirements to only a single PSO as the primary means of detecting marine mammals during the day, requiring neither night vision or infrared technology nor real-time passive acoustic monitoring.[70]

Collectively, the agency's assumptions regarding acoustic thresholds and mitigation effectiveness are unfounded and NMFS cannot justify any reduction in the number of takes authorized based on these faulty assumptions.

*D. NMFS must require mitigation measures that meet the least practicable adverse impact standard*

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Mammal Commission "…remains concerned that NMFS' current behavior thresholds do not reflect the current state of understanding regarding the temporal and spectral characteristics of various sound sources and their impacts on marine mammals. Therefore, the Commission recommends that, until the behavior thresholds are updated, NMFS require applicants to use the 120- rather than 160-dB re 1 µPa threshold for acoustic, non-impulsive sources (e.g., parametric SBPs, chirps, echosounders, and other sonars including side-scan and fish-finding)."

[65] *See*, *e.g.*, "We expect that all potential takes would be in the form of short-term Level B behavioral harassment in the form of temporary avoidance of the area, reactions that are considered to be of low severity and with no lasting biological consequences (e.g., Southall et al., 2007)." 85 Fed. Reg. at 37,872.

[66] Miller, P. J. O., Johnson, M. P., Madsen, P. T., Biassoni, N., Quero, M., and Tyack, P. L., "Using at-sea experiments to study the effects of airguns on the foraging behavior of sperm whales in the Gulf of Mexico," *Deep Sea Research Part I: Oceanographic Research Papers*, 56, pp. 1168-1181 (2009); Pirotta, E., Milor, R., Quick, N., Moretti, D., Di Marzio, N., Tyack, P., Boyd, I., and Hastie, G., "Vessel noise affects beaked whale behavior: results of a dedicated acoustic response study." *PloS ONE*, vol. *7*, e42535 (2012). *See*, *also*, Letter from the Marine Mammal Commission to Ms. Jolie Harrison, Supervisor, Incidental Take Program, Permits and Conservation, Office of Protected Resources, National Marine Fisheries Service, regarding the NMFS 5 September 2014 notice (79 Fed. Reg. 53025) and the letter of authorization (LOA) application submitted by the U.S. Department of the Navy seeking issuance of regulations under section 101(a)(5)(A) of the Marine Mammal Protection Act (the MMPA). (September 15, 2015). Available at: https://www.mmc.gov/wp-content/uploads/Navy_GOA_ANPR_091514.pdf. The Marine Mammal Commission "knows of no scientifically established basis for predicting the extent to which marine mammals will abandon their habitat based on the presence of vessels or aircraft. That would be essential information for adjusting the estimated numbers of takes."

[67] 16 U.S.C. § 1362(18)(A)(ii).

[68] *See*, *e.g.*, Letter from the Marine Mammal Commission to Naval Facilities Engineering Command, Pacific MITT Supplemental EIS/OEIS Project Manager regarding the U.S. Navy's (the Navy) Draft Supplemental Environmental Impact Statement/Overseas Environmental Impact Statement (DSEIS) for training and research, development, testing, and evaluation (testing) activities conducted within the Mariana Islands Training and Testing (MITT) study area (Phase III; 84 Fed. Reg. 677) (February 11, 2019). Available at: https://www.mmc.gov/wp-content/uploads/19-02-11-Naval-Facilities-Engineering-Command-Pacific-MITT-DSEIS.pdf.

[69] *See, e.g.*, 84 Fed. Reg. at 31,032 (Jun. 28, 2019); 84 Fed. Reg. at 52,464 (Oct. 2, 2019).

[70] *See, e.g.*, 84 Fed. Reg. at 66,156 (Dec. 3, 2019); 85 Fed. Reg. at 55,415 (Sep. 8, 2020).

In authorizing "take" by incidental harassment under the general authorization provision of the MMPA, NMFS must prescribe "methods" and "means of effecting the least practicable adverse impact" on marine mammals and set additional "requirements pertaining to the monitoring and reporting of such taking."[71] Knowing the cumulative risks posed to the North Atlantic right whale and other protected marine mammal stocks by increased site assessment and characterization activities, NMFS has an obligation to impose robust mitigation requirements to protect these species to the maximum extent practicable.

The following site assessment and characterization mitigation measures would help ensure adequate protections for the North Atlantic right whale; many offer protections to other endangered and protected species and stocks as well.

a. Seasonal and diel restrictions

**It is most protective to avoid and reduce impacts in the first instance by separating harmful activities from the species potentially affected.** NMFS should prohibit site assessment and characterization activities involving equipment with noise levels that could cause injury or harassment to North Atlantic right whales (based on the best available science, we consider source levels greater than 180 dB re 1 µPa (SPL) at 1-meter at frequencies between 7 and 35 kHz to be potentially harmful to low-frequency cetaceans[72]) during periods of highest risk to right whales. These periods are defined as times of highest relative density of animals during their migration, and times when mother-calf pairs, pregnant females, surface active groups (indicative of breeding or social behavior), or aggregations of three or more whales (indicative of feeding or social behavior) are, or are expected to be, present, as supported by review of the best available scientific information at the time of the activity (*see* Attachment 2).[73]

Further, while NMFS must minimize existing and potential stressors to the North Atlantic right whale to promote the survival and recovery of the species, the agency must also address potential impacts to other protected whale species, particularly in light of the UMEs declared for humpback whales and minke whales,[74] as well as the several strategic stocks that populate the Atlantic seaboard. It is therefore imperative that NMFS fully account for the consequences of the proposed North Atlantic right whale seasonal restriction on other protected species. NMFS should also advance a robust and effective near real-time monitoring and mitigation system for North Atlantic right whales and other endangered and

[71] 16 U.S.C. § 1371(a)(5)(D)(vi).

[72] *See*, *e.g.*, Gomez, C., et al., "A systematic review on the behavioural responses of wild marine mammals to noise: the disparity between science and policy," *supra* note 64. Tyack, P.L., and Thomas, L., "Using dose-response functions to improve calculations of the impact of anthropogenic noise," *supra* note 64.

[73] Letter from Kraus, S., Quintana, E., Rice, A., Good, C., and Baumgartner, M. to Mr. James Bennet, Chief of the Office of Renewable Energy Programs, Bureau of Ocean Energy Management, and Ms. Donna Wieting, Director, Office of Protected Resources, National Marine Fisheries Service, regarding recommendations for adequate and effective mitigation of noise impacts to the North Atlantic right whale during offshore wind construction (August 2, 2018).For the Rhode Island and Massachusetts and Massachusetts Wind Energy Areas, the scientists recommend a temporary prohibition on pile driving from January 1 to April 30 and an "enhanced mitigation protocol be in place from May 1 through 14 and November 1 through December 31. As North Atlantic right whale distribution is known to be shifting, the scientists recommend the dates of these restrictions and the enhanced mitigation protocol be reassessed every two years by an independent advisory group based on the best scientific and commercial data available.

[74] NOAA-NMFS, "2018-2020 North Atlantic right whale Unusual Mortality Event," *supra* note 12; NOAA-NMFS, "2016-2020 Humpback whale Unusual Mortality Event along the Atlantic Coast," *supra* note 21; NOAA-NMFS, "2017-2020 Minke whale Unusual Mortality Event along the Atlantic Coast," *supra* note 20.

protected species (*see* Section IV: "Advancing Monitoring and Mitigation During Offshore Wind Development").

In addition, when geophysical survey equipment with the potential to injure or harass protected species and stocks is deployed, NMFS should require that work commence, with ramp up, only during daylight hours and good visibility conditions to maximize the probability that marine mammals are detected and confirmed clear of the exclusion zone before activities begin. The activity can then continue into periods of darkness and low visibility. If the activity is halted or delayed because of documented or suspected North Atlantic right whale presence in the area, NMFS should require developers to wait until daylight hours and good visibility conditions to recommence.

b. Adequate monitoring of exclusion zones

As noted above, the 160 dB threshold for behavioral harassment is not supported by best available scientific information and grossly underestimates Level B take (*see* Section III(C)). **For the North Atlantic right whale, NMFS should establish an exclusion zone of 1,000-meters around each vessel conducting activities with noise levels that could result in injury or harassment to this species** (*i.e.*, source levels > 180 dB re 1 µPa (SPL) at 1-meter at frequencies between 7 and 35 kHz). NMFS should establish a minimum exclusion zone of 500 meters for other large whale species and strategic stocks. We agree with NMFS' previous requirements that observations must begin at least 30 minutes prior to the commencement of geophysical survey activity and should be conducted throughout the time of geophysical survey activity. NMFS should require that activity be halted or delayed if a North Atlantic right whale or other species is detected in the relevant exclusion zone.

As noted above in Section C, **NMFS has established a wholly inadequate standard for visual monitoring during marine site characterization surveys and has weakened that inadequate standard over time.** Recently, NMFS approved an IHA that required only a single PSO to be on duty during daylight hours and 30 minutes prior to and during nighttime ramp-ups of HRG equipment,[75] stating that "[v]isual PSOs would coordinate to ensure 360° visual coverage around the vessel from the most appropriate observation posts…"[76] It is not possible for a single PSO to continually visually monitor 360°. NMFS' minimum requirement of a single PSO is underprotective. Furthermore, PSOs are unable to visually monitor the exclusion area during darkness and periods of low visibility. NMFS must require the use of infrared equipment to support visual monitoring by PSOs during periods of darkness.[77]

[75] 85 Fed. Reg. at 45,590-45,591 (Jul. 29, 2020).

[76] *Id*.

[77] Lathlean, J. and Seuront, L., "Infra-red thermography in marine ecology: methods, previous applications and future challenges." *Marine Ecology Progress Series*, vol. 514, p. 263-277 (2014); Smith, H.R., Zitterbart, D.P., Norris, T.F., Flau, M., Ferguson, E.L., Jones, C.G., Boebel, O. and Moulton, V.D., "A field comparison of marine mammal detections via visual, acoustic, and infrared (IR) imaging methods offshore Atlantic Canada." *Marine Pollution Bulletin*, vol. *154*, p.111026 (2020); Zitterbart, D.P., Smith, H.R., Flau, M., Richter, S., Burkhardt, E., Beland, J., Bennett, L., Cammareri, A., Davis, A., Holst, M. and Lanfredi, C., "Scaling the Laws of Thermal Imaging–Based Whale Detection." *Journal of Atmospheric and Oceanic Technology*, vol. 37, pp.807-824 (2020). In addition, NMFS must consider the limitations of the infrared system proposed and ensure that the detection of marine mammals is possible at distances out to and beyond the exclusion zones, in the geographic region in question, and for all relevant endangered and protected species. These technologies have not been well tested for detection of North Atlantic right whales, and may be relatively ineffective for detecting minke whales, both species of concern

Moreover, visual observations are not enough. Studies suggest that North Atlantic right whales exhibit behaviors that reduce their likelihood of detection by PSOs. These behavioral responses may be heightened when whales are in the proximity of the acoustic disturbance from geophysical surveys, meaning that animals may be less detectable by observers during the survey period relative to other times.[78] Other endangered and protected large whales pose similar monitoring challenges. There are also sighting condition limitations. For even the most conspicuous large whale species, estimates of relative detection probability for a Beaufort Sea State of 6 is less than half that for a Beaufort Sea State of 0.[79] Based on data collected by the National Buoy Data Center,[80] a monthly average Beaufort Sea State of at least 3 or 4 can be expected in lease areas situated along the East Coast, year-round. Given these data, observers alone are certain to underestimate the total number of large whales in the mitigation area based on sea state.

NMFS' failure to require using passive acoustic monitoring at any time during geophysical surveys is extremely concerning**. NMFS should require passive acoustic monitoring at all times—not only during nighttime hours—to maximize the probability of detection for North Atlantic right whales, and ideally other protected species and stocks**, including during periods of fog, precipitation, and high sea states, when PSOs and infrared technologies are less effective. It should be noted that passive acoustic monitoring without visual observers would also be insufficient as individuals may not continually vocalize. At minimum, NMFS should always require a combination of agency-approved PSOs to visually detect whales and passive acoustic monitoring to detect vocalizations in real or near-real time when noise levels that could result in injury or harassment to the species are being conducted.

c. Reduction of underwater noise

According to NOAA's "Ocean Noise Strategy Roadmap:"

in light of the current UMEs declared for the Atlantic coast. Further, NMFS should encourage developers to partner with scientists and collect data that increases our understanding of the effectiveness of infrared technologies, with a view towards greater reliance on these technologies to commence surveys during nighttime hours in the future.

[78] Robertson, F.C., Koski, W.R., Thomas, T.A., Richardson, W.J., Würsig, B., and Trites, A.W., "Seismic operations have variable effects on dive-cycle behavior of bowhead whales." *Endangered Species Research*, vol. 21, p. 143-160 (2013).

[79] Barlow, J., "Inferring trackline detection probabilities, g(0), for cetaceans from apparent densities in different survey conditions," *Marine Mammal Science*, vol. 31, p. 923-943 (2015); Baumgartner, M.F., Cole, T.V.N., Clapham, P.J., and Mate, B.R., "North Atlantic right whale habitat in the lower Bay of Fundy and on the SW Scotian Shelf during 1999-2001." *Marine Ecology Progress Series*, vol. 264, p. 137-154 (2003). Sea state has been demonstrated to have a direct effect on the sighting probability of North Atlantic right whales in the Lower Bay of Fundy and in Roseway Basin of the Southwest Scotian Shelf (Baumgartner et al. 2003). In line with Barlow (2015), the probability of sighting a North Atlantic right whale in this area changed by a factor of 0.628 (95% CI: 0.428-0.921) for every unit increase in sea state. These studies indicate the effect of increasing Beaufort Sea State in reducing the probability of detection of large whales, including the North Atlantic right whale. From the findings of Baumgartner et al. (2003), a reduction in detection probability of North Atlantic right whales by up to 84.5 percent based on an average Beaufort Sea State of 4 would be expected, relative to ideal sighting conditions (*i.e.*, Beaufort sea state = 0). Notably, the detectability of North Atlantic right whales even under ideal sighting conditions is likely to be significantly less than 100 percent given availability and perception biases other than those involving sea state.

[80] NOAA-NWS, "National Data Buoy Center." Available at: http://www.ndbc.noaa.gov/.

> "[W]here noise is concerned, mitigation should be broadly designed to do one of two things: (1) reduce the temporal or spatial overlap of ensonified areas with marine taxa (or acoustic habitat) in particular times, places or circumstances, and/or (2) reduce the sound level at the source (which may include replacing the source with a different type of source capable of the same function)."[81]

In addition, simulation studies comparing the level of risk reduction associated with technologies that allow for reduced source levels and current exclusion zone mitigation practices indicate that there will be very few instances where mitigation using visual observers can achieve a greater risk reduction than would be achieved by a reduction in source level.[82] Thus, reducing sound emissions at the source is one the most effective means of mitigating the impacts of noise on protected species.

**NMFS must require IHA applicants to minimize the impacts of underwater noise to the fullest extent feasible, including through the use of best available technology and methods to minimize sound levels from geophysical surveys.** For example, NMFS should require developers to select sub-bottom profiling systems, and operate those systems at power settings, that achieve the lowest practicable source level for the objective. NMFS currently has no such requirements.

*E. NMFS must strengthen its vessel speed restrictions to mitigate the harm of increased vessel traffic*

Vessel collisions are a leading cause of large whale injury and mortality and a primary driver of the East Coast's three ongoing UMEs. Serious injury or mortality can occur from a vessel traveling above 10 knots irrespective of its length.[83] The number of recorded vessel collisions on large whales each year is likely a gross underestimate of the actual number of animals struck, as animals struck but not recovered, or not thoroughly examined, cannot be accounted for.[84] North Atlantic right whales are particularly prone to vessel strike given their slow speeds, their occupation of waters near shipping lanes, and the extended time they spend at or near the water's surface.[85] Some types of anthropogenic noise have been shown to induce sub-surface positioning in North Atlantic right whales, increasing the risk of vessel strike at

[81] Gedamke, J., et al., "Ocean Noise Strategy Roadmap." NOAA Fisheries, (2016), at p. 23. Available at: https://cetsound.noaa.gov/Assets/cetsound/documents/Roadmap/ONS_Roadmap_Final_Complete.pdf.

[82] Leaper, R., Calderan, S., & Cooke, J., "A Simulation Framework to Evaluate the Efficiency of Using Visual Observers to Reduce the Risk of Injury from Loud Sound Sources." *Aquatic Mammals*, vol. 41, pp. 375-387 (2015).

[83] NOAA-NMFS, "Reducing ship strikes to North Atlantic right whales." Available at: https://www.fisheries.noaa.gov/national/endangered-species-conservation/reducing-ship-strikes-north-atlantic-right-whales#:~:text=All%20vessels%2065%20feet%20(19.8,endangered%20North%20Atlantic%20right%20whales. To reflect the risk posed by vessels of any length, the Commonwealth of Massachusetts established a mandatory vessel speed restriction for all vessels (including under 20 meters) in the Cape Cod Bay SMA.

[84] Reeves, R.R., Read, A.J., Lowry, L., Katona, S.K., and Boness, D.J., "Report of the North Atlantic Right Whale Program Review." 13–17 March 2006, Woods Hole, Massachusetts, prepared for the Marine Mammals Commission, (2007); Parks, S.E., Warren, J.D., Stamieszkin, K., Mayo, C.A., and Wiley, D., "Dangerous dining: surface foraging of North Atlantic right whales increases risk of vessel collisions." *Biology Letters*, vol. 8, p. 57-60 (2011).

[85] NOAA-NMFS, "Recovery plan for the North Atlantic right whale (*Eubalaena glacialis*) Revision" prepared by the Office of Protected Resources, National Marine Fisheries Service" (August 2004).

relatively moderate levels of exposure.[86] It is possible that geophysical surveys could produce the same effects, and should therefore be treated conservatively. **The agency has a responsibility to implement mitigation measures to prevent any further vessel collisions for the North Atlantic right whale and other large whale species currently experiencing a UME (*i.e.*, humpback whales and minke whales), as well as other endangered and protected marine mammals (*e.g.*, fin whales), which, in light of the broad distributional shifts observed for multiple species,[87] may be at potential future risk of experiencing a UME.**

NMFS' authorizations acknowledge that vessel strikes can kill animals, that speed is a factor, and that North Atlantic right whales are particularly vulnerable because they are "generally unresponsive to vessel sound" and "more susceptible to vessel collisions,"[88] yet these authorizations only discuss the impacts of survey vessels that generally travel at speeds of less than four knots.[89] This ignores the impacts of all other project vessels on right whales (*e.g.*, crew transfer vessels). While we appreciate that NMFS expressly requires all survey vessels to observe a 10-knot speed restriction within Seasonal Management Areas ("SMAs") or otherwise voluntary Dynamic Management Areas ("DMAs"),[90] NMFS implicitly authorizes project vessels to travel at speeds greater than 10 knots at all other times, unless a right whale is actually observed within 500 meters.[91] This is wholly insufficient. The recent death of a North Atlantic right whale calf off New Jersey[92] indicates how even single or pairs of animals are at risk of vessel strike year-round. North Atlantic right whales had been acoustically detected in the New York/New Jersey Bight region, yet no vessel speed rules were triggered under current regulations. In light of this tragic event, a sighting of three or more North Atlantic right whales is too high a bar to trigger a DMA. As a general matter**, NMFS should require mandatory speed restrictions within DMAs in every instance that a single North Atlantic right whale is sighted or acoustically detected, not just aggregations of three or more whales.** At minimum, NMFS must immediately pay special attention to protecting mother-calf pairs.

As NMFS notes, studies indicate that noise can induce flight responses, behavioral disturbances, habitat avoidance, and stress responses that reduce feeding rates and reproductive success.[93] Because of the noise, geophysical surveys could also cause horizontal displacement[94] and push a North Atlantic right whale out of a protected area (SMA or DMA) into an area where vessels are traveling at greater speed, presenting an

[86] Nowacek, D.P., et al., "North Atlantic right whales (*Eubalaena glacialis*) ignore ships but respond to alerting stimuli." *Proceedings of the Royal Society B,* vol. 271 (2004).

[87] Davis, G.E., Baumgartner, M.F., Corkeron, P.J., Bell, J., Berchok, C., Bonnell, J.M., Bort Thornton, J., Brault, S., Buchanan, G.A., Cholewiak, D. and Clark, C.W., "Exploring movement patterns and changing distributions of baleen whales in the western North Atlantic using a decade of passive acoustic data." *Global Change Biology*, vol. 26, p. 4812-4840 (2020).

[88] *See*, *e.g.*, 85 Fed. Reg. at 37,862 (Jun. 24, 2020) (citing Nowacek *et al*., 2004).

[89] *See*, *e.g.*, 85 Fed. Reg. at 37,866 (Jun. 24, 2020)

[90] *See*, *e.g.,* 85 Fed. Reg. at 55,430 (Sep. 8, 2020).

[91] *See*, *e.g., id.*

[92] NOAA Fisheries, "Dead North Atlantic Right Whale Sighted off New Jersey" (June 29, 2020). Available at: https://www.fisheries.noaa.gov/feature-story/dead-north-atlantic-right-whale-sighted-new-jersey#:~:text=June%2028%2C%202020,of%20the%202019%2F20%20season.

[93] *See, e.g.,* 85 Fed. Reg. at 37,860-37,862 (Jun. 24, 2020).

[94] *E.g*., Castellote, M., Clark, C.W., and Lammers, M.O., "Acoustic and behavioural changes by fin whales (Balaenoptera physalus) in response to shipping and airgun noise." *Biological Conservation*, vol. 147, pp. 115-122 (2012).

even greater danger of vessel collision. Thus, NMFS' analysis must also account for habitat displacement producing an indirect vessel strike.

**Vessel strikes pose an unacceptable risk. NMFS must require all project vessels operating within or transiting to/from survey areas, regardless of size, to observe a 10-knot speed restriction during the entire survey period.**

*F. NMFS must prohibit extensions of any one-year authorizations through a truncated 15-day comment period as is contrary to the MMPA*

On March 7, 2019, NMFS began issuing notice of a new reauthorization process for a multitude of permits. Specifically, NMFS requests comment on the potential one-year renewal of authorizations on a case-by-case basis for identical or nearly identical activities, with only an additional 15 days for public comment, should various criteria be met.[95]

For several reasons, our organizations have repeatedly opposed this process as contrary to law. First, NMFS' proposal to provide one-year renewals does not comport with the plain language of the MMPA. Section 101(a)(D)(i) unambiguously states that incidental harassment authorizations are valid for periods of not more than one year.[96] Second, the statute is clear on its face that a 30-day comment period is required in all instances.[97] The legislative history of the 1972 Act demonstrates that Congress viewed a robust notice and comment process as central to the agency's implementation of the IHA process: "As approved by the Committee, the [MMPA] involves a number of basic concepts," one being that "the public is invited and encouraged to participate fully in the agency decision-making process."[98] When NMFS adheres to this process, "the public is assured of the right to be informed of actions taken or proposed."[99] Third, the legislative history removes any doubt that this 30-day comment period applies even in cases where a new application extends the IHA for another year without change.[100]

The agency lacks discretionary authority to interpret the statute otherwise, whether by regulation, by policy, or on a permit-by-permit basis as it purports to do here.[101] Moreover, NMFS has not supplied a sufficient explanation for why it might assert that the statutory language of Sec. 101(a)(5)(D)(iii) is ambiguous, such that the agency might appropriately exercise its congressionally-delegated gap-filling

[95] *See, e.g.*, 84 Fed. Reg. at 8,316 (Mar. 7, 2019); 84 Fed. Reg. at 13,246 (Apr. 4, 2019); 84 Fed. Reg. at 8,312 (Mar. 7, 2019); 84 Fed. Reg. at 32,881 (July 10, 2019); 84 Fed. Reg. at 20,336 (May 9, 2019); 84 Fed. Reg. at 72,301 (Dec. 31, 2019); 85 Fed. Reg. at 26,962 (May 6, 2020); 85 Fed. Reg. at 42,832 (July 15, 2020); 85 Fed. Reg. at 33,124 (June 1, 2020); 85 Fed. Reg. at 41,560 (July 10, 2020). In fact, NMFS has begun actually issuing renewals through this new reauthorization process. *See, e.g.*, 84 Fed. Reg. at 17,784 (Apr. 26, 2019); 84 Fed. Reg. at 18,801 (May 2, 2019); 84 Fed. Reg. at 15,598 (Apr. 16, 2019); 84 Fed. Reg. at 41,958 (Aug. 16, 2019); 84 Fed. Reg. at 26,405 (June 6, 2019); 85 Fed. Reg. at 9,740 (Feb. 20, 2020); 85 Fed. Reg. at 37,064 (June 19, 2020); 85 Fed. Reg. at 38,863 (June 29, 2020).

[96] 16 U.S.C. § 1371(a)(5)(D)(i).

[97] *Id.* § 1371(a)(5)(D)(iii).

[98] H.R. Rep. No. 92-707, at 4151 (1972), *reprinted in* 1972 U.S.C.C.A.N. 4144, 4151.

[99] *Id.* at 4146.

[100] H.R. Rep. No. 103-439, at 29 (1994).

[101] *See Chevron, U.S.A., Inc. v. NRDC*, 467 U.S. 837, 842–43 (1984) ("If the intent of Congress is clear, that is the end of the matter; for the court, as well as the agency, must give effect to the unambiguously expressed intent of Congress.").

authority to set forth a permissible interpretation of the statute that comports with the statute's objectives.[102]

Should the agency wish to establish its new IHA renewal process as a reasonable interpretation of an ambiguous statutory provision, it should do so through notice-and-comment rulemaking or comparable process with the appropriate indicia of formality. In so doing, NMFS must also explain why applicants whose activities may result in the incidental harassment of marine mammals over more than one year should not be required to apply for authorization to do so through the incidental take regulation procedure established by Sec. 101(a)(5)(A)(i), which provides for authorizing incidental take during periods of "not more than five consecutive years each."[103] Where Congress established clear and distinct statutory processes for authorizing incidental take via harassment for one-year periods versus periods extending more than one year and up to five years, NMFS must justify how its proposed unlawful hybrid administrative extension process, with a curtailed comment period, is consistent with both statutorily-established processes.

NMFS' statement regarding Incidental Harassment Authorization Renewals on its website[104] fails to provide a clear and legally adequate justification for its purported new reauthorization process especially in light of the burden the foreshortened comment period places on interested members of the public to review and formulate comments, all within 15 calendar days. As NMFS apparently intends the new reauthorization process to become the rule rather than the exception, it is incumbent on the agency to set forth, via proposed regulation or policy document, its rationale for this new process and to allow public comment.

## IV. Advancing Monitoring and Mitigation During Offshore Wind Development

While the best available scientific information justifies the use of seasonal restrictions to temporally separate survey activity from North Atlantic right whales in some areas, it is becoming increasingly clear that there may not be a time of "low risk" for this species. The population size is now so small that any individual-level impact is of great concern. In addition, climate-driven changes in oceanographic conditions, and resulting shifts in prey distribution, are rapidly changing the spatial and temporal patterns of habitat use for North Atlantic right whales and other large whale species.[105] Therefore**, we recommend NMFS work, with relevant experts and stakeholders, towards developing a robust and effective near real-time monitoring and mitigation system for North Atlantic right whales and other**

[102] *See Northpoint Tech. Ltd. v. FCC*, 412 F.3d 145, 151 (D.C. Cir. 2005) (a "'reasonable' explanation of how an agency's interpretation serves the statute's objectives is the stuff of which a 'permissible' construction is made").

[103] 16 U.S.C. § 1371(a)(5)(A)(i) (emphasis added). *See also id.* at § 1371(a)(5)(A)(i)(I) (negligible impact finding must evaluate total of such taking "during each five-year (*or less*) period concerned") (emphasis added).

[104] *See, e.g., NOAA Fisheries,* "Incidental Take Authorizations under Marine Mammal Protection Act," last updated June 24, 2020, https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act.

[105] Davis, G.E., et al., "Exploring movement patterns and changing distributions of baleen whales in the western North Atlantic using a decade of passive acoustic data," *supra* note 87; Davis, G.E., Baumgartner, M.F., Bonnell, J.M., Bell, J., Berchick, C., Bort Thorton, J., Brault, S., Buchanan, G., Charif, R.A., Cholewiak, D., *et al.*, "Long‐term passive acoustic recordings track the changing distribution of North Atlantic right whales (*Eubalaena glacialis*) from 2004 to 2014," *Scientific Reports*, vol. 7, p. 13460 (2017); Record, N., Runge, J., Pendleton, D., Balch, W., Davies, K., Pershing, A., Johnson, C., Stamieszkin, K., Ji, R., Feng, Z. and Kraus, S., "Rapid Climate-Driven Circulation Changes Threaten Conservation of Endangered North Atlantic Right Whales," *Oceanography*, vol. *32*, pp. 162-169 (2019).

**endangered and protected species (*e.g.*, fin, sei, minke, and humpback whales) during offshore wind development.**

The ability to reliably detect North Atlantic right whales and other species on a near real-time basis and adjust survey (and future construction) activities accordingly (*e.g.*, if a North Atlantic right whale is detected with X distance of the survey/construction area on Day 1, no survey/construction activity will be undertaken on Day 2) would enable NMFS to adaptively manage and mitigate risks to protected species in near-real time while affording flexibility to offshore wind developers. This approach could be used in conjunction with seasonal restrictions in North Atlantic right whale foraging areas (*e.g.*, off southern New England), or potentially year-round in the Mid-Atlantic region where a changing climate is leading to novel spatial and temporal habitat-use patterns. A near real-time monitoring and mitigation approach would also minimize risks to other protected species that may be present at high densities at times when North Atlantic right whales are expected to be present in lower numbers (*e.g.*, humpback whale and fin whale foraging aggregations that occur in the summer months in the New York Bight).

There are several technologies in various stages of development that would allow near real-time detection of protected species (*e.g.*, Robots4Whales[106]) and convey that information to decisionmakers (*e.g.*, "Mysticetus"[107]) to inform mitigation action. Near real-time monitoring systems are already being deployed to mitigate risks to North Atlantic right whales. For example, an unmanned acoustic glider capable of auto-detecting North Atlantic right whale calls is currently informing decisions being made by Transport Canada on when to impose vessel speed restrictions in the Laurentian Channel. Ten-knot speed limits can be issued within an hour of North Atlantic right whales being detected.[108] NMFS should evaluate the current status of near real-time detection technologies and develop recommendations for an integrated near real-time monitoring and mitigation system that combines, at minimum, both visual and acoustic detections.

It is also of paramount importance that NMFS encourage and promote adaptive management and robust long-term monitoring to assess impacts as offshore wind is developed and operational. Offshore wind remains a relatively nascent technology in the U.S. and it is therefore imperative that the impact of offshore wind operations on marine wildlife and the ocean ecosystem be closely monitored to guide the industry's adaptive management and future development. It is vital that we gain an understanding of baseline environmental conditions prior to large-scale offshore wind development in the United States. To this end, NMFS must coordinate with BOEM to establish and fund a robust, long-term scientific plan to monitor the effects of offshore wind development on marine mammals and other species before, during, and after large-scale commercial projects are constructed. Without strong baseline data collection and environmental monitoring in place, we risk losing the ability to detect and understand potential impacts and set an under-protective precedent for future offshore wind development. Such monitoring must inform and drive future mitigation as well as potential practical changes to existing operations to reduce any potential impacts to natural resources and wildlife. **We are extremely concerned that no such long-**

[106] Woods Hole Oceanographic Institution WHOI and WHOI/WCS, "Robots4Whales," *supra* note 39.

[107] Available at: https://www.mysticetus.com/.

[108] *See, e.g.,* CBC News, "Underwater glider helps save North Atlantic Right Whales from Ship Strikes," (August 30, 2020), https://www.cbc.ca/news/canada/new-brunswick/nb-north-atlantic-right-whales-underwater-glider-1.5701984.

**term monitoring requirements are currently in place for the first commercial-scale projects in the United States.**

## V. Conclusion

NMFS' current approach to authorizing incidental take of marine mammals during marine site characterization activities for offshore wind energy development is inadequate and not compliant with the law. Our groups request the opportunity to meet with you and your staff to further discuss these issues and necessary improvements in more detail. For further discussion, please contact Michael Jasny (mjasny@nrdc.org) at the Natural Resources Defense Council.

Sincerely,

Michael Jasny
Director, Marine Mammal Protection Project
Natural Resources Defense Council

Erica Fuller
Senior Attorney
Conservation Law Foundation

Catherine Bowes
Program Director, Offshore Wind Energy
National Wildlife Federation

Jane P. Davenport
Senior Attorney
Defenders of Wildlife

David Carr
General Counsel
Southern Environmental Law Center

Howard Rosenbaum, Ph.D.
Director, Ocean Giants Program
Senior Conservation Scientist, Global Conservation
Wildlife Conservation Society

Matt Gove
Mid-Atlantic Policy Manager
Surfrider Foundation

E. Heidi Ricci
Acting Director of Advocacy
Mass Audubon

Hallie Templeton
Senior Oceans Campaigner
Friends of the Earth

CT Harry
Marine Campaigner
International Fund for Animal Welfare

William Rossiter
Vice President
NY4WHALES

Colleen Weiler
Jessica Rekos Fellow for Orca Conservation
WDC, Whale and Dolphin Conservation

Jillian Drury
Executive Director
Marine Mammal Alliance Nantucket

Paul L. Sieswerda
President, CEO
Gotham Whale

George Povall
Executive Director
All Our Energy

Enrico G. Nardone, Esq.
Executive Director
Seatuck Environmental Association

Vicki Nichols Goldstein
Founder & Executive Director
Inland Ocean Coalition

ATTACHMENTS:

1. "ENGO Comments on Proposed IHAs 2018-2020"
2. "Scientist Letter. North Atlantic right whale mitigation measures for offshore wind. 2 Aug 2018"

CC: Mr. James F. Bennett, Program Manager, Renewable Energy Program, Bureau of Ocean Energy Management

Comments submitted on GC3 Working Group Reports
Submitted by Jiff Martin, UConn Extension, Extension Educator on Sustainable Food Systems
10/21/20

To Whom It May Concern:

Thank you for the incredible work that has been accomplished so far by the GC3 and the working group members. My comments are focused on the reports of the Equity and Environmental Justice group and the Agriculture /Soils group.

First, I am very grateful for the contributions of the EEJ working group as well as the individuals who recognized the need for this lens on all recommended actions. I am especially grateful for this groups helpful framing of distributive equity, procedural equity, contextual equity, and corrective equity. I strongly support layering the work of GC3 with the principles and priorities highlighted by the EEJ working group.

Second, I would urge the Governor's Council to think about **Equity in Agriculture**. Using the lens of 'distributive equity', members of the GC3 should examine who is making recommendations for agriculture and whether the voices of farmers who lack power (maybe new, young, or BIPOC) are being heard. The voices of farmers in our state who must lease land, and/or rely on marginal parcels in or near cities, are not as well organized as traditional producer associations. Mitigation and adaptation strategies as they relate to agriculture should be identified with non-farmland owning farmers, new farmers, and BIPOC farmers in mind.

Third, there are several recommendations of the Agriculture/Soils group that deserve emphasizing.

- **Soil Health!** – Building a framework for action around Soil Health is of utmost importance. As a member of the UConn community, I can confirm there is a tremendous gap in capacity here given the importance of soil health as an adaptation strategy. We lack a robust curriculum, t.a. providers, and research capacity. An individual seeking a soil science certificate will have to stitch together courses from out of state. A new farmer seeking a soils consultation or cover cropping guidance will have to rely on me to continue to write grants so we might hire an outside consultant since we have no faculty or extension educator available. We also have no organic agriculture extension educator who would support farmers in using cover cropping, no till, and other methods that have value through a climate mitigation and adaptation lens. As stated in the report, our state policies related to soils are narrowly focused on conservation instead of soil health.
- **Farm to School** – Unfortunately, in spite of many years of trying to build awareness and marketing for CT Grown, the average resident of Connecticut is not particularly invested in farms. We don't have a strong state identity, such as Vermont, where agriculture is so intrinsically tied to what it means to live here. As growers might be incentivized to trade production goals for soil health goals and carbon shares, consumers could learn about

these environmental benefits and develop a new appreciation for local farms. Perhaps there is an opportunity to accomplish this by combining climate awareness to the current momentum for Farm to School in our state, using K-12 schools as a forum for children to have meaningful and empowering experiences about the local food system and the forces of climate change and role of farms as environmental stewards in their classrooms, cafeterias, and outdoor learning spaces.

- **Equity lens for Farmland Preservation & Urban Agriculture** – Amid the call for more protection of prime and important soils, as well as a call for more urban agriculture, the state should take time to examine its implementation of the State Farmland Preservation Program, the Community Farms Preservation Program, the Open Space and Watershed Acquisition Program, and the Urban Greens & Community Gardens program for how these programs benefit or harm vulnerable communities. All these programs deal with land ownership. Yet land ownership policy has historically been structured to amass wealth for the ruling majority while excluding access for people of color. These state programs, although potentially important for climate mitigation, should do better than just preserve the status quo for land access and land ownership. The state should invite low income communities to participate in discussions about how these programs could be utilized and implemented more equitably.

Comments Regarding the GC3 Science and Technology Working Group Draft Report

From: Jill Humphreys

October 21, 2020

Governor's Council on Climate Change, Science and Technology Working Group:

As a certified forester in the state of Connecticut, I would like to submit my comments to this working group. I think many of the recommendations are very beneficial to the GC3 cause and should become policy in Connecticut.

However, I oppose the inclusion of forestry practice recommendations in the Science and Technology Working Group Report. If they are included at all, it should be as a reference to any recommendations made by the GC3 Forests Subcommittee of the Working and Natural Lands Working Group. The Forest Subcommittee includes forestry professionals and will be more able to establish a balanced set of recommendations, taking into consideration the complexities of managing forests for carbon and other resources in Connecticut.

This perspective is based on a few specific concerns that struck me in this report.

First, the members of the Science and Technology Working Group and their affiliations are not listed in this report as they are in others.

Second, on pages 12 and 16 where "proforestation" is recommended as a priority on public lands, an article co-authored by the Chair of the Science and Technology Working Group is the reference (references 37 and 67) used as the main support for this position. It is also cited at other points throughout the Report and is used as a reference in the "major scientific outcry" letters cited in the Report. Not only is this article an opinion piece that has no scientific consensus among the forestry community, but I found it concerning that this one unestablished perspective on forest management had such a strong presence in this Report from a group chaired by the co-author of one of the only articles cited as a clear support for this perspective.

Finally, page 37 also recommends relying on proforestation efforts on state forest land. I do agree that old forest stands should be protected, fragmentation of forests with non-forested landscapes should be reduced, and public outreach and education is critical. However, the proforestation approach does not allow for flexibility in management strategies where needed nor does it consider the local economy based around forestry practices. This recommendation did not appear to involve the perspectives of the DEEP or how public lands are currently managed. State forests will remain forests and the small percentage that is sustainably harvest every year supports local business and local wood use. Public outreach and education should include information about the importance of local wood products and silvicultural methods that can help Connecticut forests adapt to climate change.

Again, I think this Group should not include forestry recommendations in this Report, unless they refer solely to the final draft of the Forests Subcommitee Report. I appreciate all of the work that went into compiling this report. Thank you for taking the time to consider my comments.

Sincerely,

Jill Humphreys

Forests provide multiple benefits for human society. In the past, they have been considered either an impediment to economic development so that in New England (including Connecticut) , they were cleared by the 19th century. Once these cleared lands were abandoned, they grew back to an amazing extent. In fact, the recovery of the forests of New England and New York is perhaps the greatest recovery of ecosystems in history.

The introduction of the concept of sustainable forest management in the early 20th century by Gifford Pinchot ended much of the "cut and run" forest practices, and have allowed provision of a continuous utilization of these forests for commercial production of forest products.

It is now realized that globally forests play many additional roles besides production of timber, fiber, and fuel. Globally, forests reduce the annual increase in atmospheric carbon dioxide emitted by fossil fuel burning, industrial production of cement, steel and other products, and land use change by approximately 30%. In the U.S. by contrast, forest growth only reduces our net emissions by less than 12% both because Americans emit so much carbon dioxide and because we have managed our forests to keep them relatively young and therefore containing much less carbon. Forest also provide resiliency against flooding from intensified downpours and evaporative cooling of surrounding areas in an ever-warming world.

It is urgent that we limit the increase in atmospheric greenhouse gases as rapidly as possible and this requires that we simultaneously reduce emissions from all sources and accumulate as much carbon as possible in forests, wetlands, and soils. Sustainable forest management of 70% of our forests for timber production (USFS) has left the US with only a small percentage of forests as primary forests (outside of Alaska). Our secondary forests average only about 75 years of age in Connecticut and much of New England when they are composed of species with potential lifetimes of 200-400 years that can accumulate and store far more carbon out of the atmosphere.

Research has found that by changing management practices, forests on average could be storing twice as much carbon as they now do globally (Erb et al 2018) and that in mature forests world-wide, half of the carbon in living biomass is stored in the largest 1% diameter trees (Lutz et al, 2018). Stephenson (2014) reported that trees accumulate more carbon as they become larger. In recent work that I have co-authored, we found that in six national forests in Oregon, the five species of "lumber trees" over 21" in diameter accounted for just 3% of the stems, but accounted for 42% of the above ground carbon (Mildrexler et al 2020). The recent paper by Cook-Patton (2020) and two dozen colleagues demonstrates that natural regeneration of forests accumulates more carbon than does managed planting. We have known since 1990 by the work of Harmon that an old growth forest stores more carbon than does a sustainably managed forest even when wood products are counted as stored carbon. Nunnery and Keeton 2010 compare an unmanaged New England forest to several management alternatives, and find that an unmanaged forest stores about twice as much carbon as does a clear-cut forest including the carbon in wood products. Keeton et al (2011) show that there are sites in New England forests that could be storing between 2.4 and 4.3 times the carbon they now hold. Hudiburg et al (2019) found that since the start of the forestry industry in Oregon in 1900, just 19% of the original carbon was stored in products, 16% in landfills and 65% was in atmospheric carbon dioxide. Law et al (2018) demonstrate greater potential for forest carbon accumulation.

These and many additional ones lead me and two colleagues to publish our paper in 2019 where we used the term proforestation to designate a forest management strategy that sets the primary goal of accumulating carbon and to the ecological potential to which it is capable.as an alternative to reforestation and afforestation as a means for growing more carbon as rapidly as possible. To accumulate more carbon, we need to have a greater proportion of larger trees. This means setting aside some forests as carbon reserves that will also address the other major challenge of biodiversity loss. because we have so few primary forests, we are deficient in species found in old growth forests. There is nothing mysterious about the term proforestation, it is simply shorthand for letting a larger proportion of forests continue to grow instead of managing them sustainably keeping stocks constant. Constant stocks are no longer sufficient for addressing climate change. We need to be increasing the forest carbon stocks to keep carbon out of the atmosphere (IPCC 2018, 2019). Public forests are a reasonable place to manage this way as their purpose is to serve the public and not the forestry industry. They are a small fraction of total forest land in Connecticut. Taking them off the timber market will increase the returns to private landowners. for private landowners, paying those whose forests can accumulate large amounts of carbon in the near term is the lowest cost way to limit the buildup of atmospheric CO2.

Harvard Forest has proposed a wild lands and Woodlands effort that would assure that 10% of New England Forests would be Wildlands. Current international discussions are calling for 30% of lands and oceans to be protected from exploitation to assure sufficient biodiversity to keep the planet operating. The renowned ecologist, E.O. Wilson has said that "Nature needs Half (50%)." Connecticut has less than one percent of its forests protected, and less than 4% is considered to be "intact." The amount and location of protected forests is a political decision that will be decided by this process. Surely, Connecticut can find more than 1% of its forests to protect and dedicate to addressing the climate emergency. The critical role of forests for climate has been recognized at last count by 13,766 scientists from 156 countries to include *proforestation* among Natural Climate Solutions in its recommendations (Ripple et al, 2019).

Gifford Pinchot, the father of modern forest management in the United States, wrote in 1905, "…where conflicting interests must be reconciled, the question will always be decided from the standpoint of the greatest good of the greatest number in the long run." He understood conservation of forests to be for the sustainable production of forest products and water. Today, he might, and we should, realize that the greater good for the greatest number in the long run is also to utilize our forests to assist in halting and eventually reversing the accumulation of carbon in the atmosphere and return as much as possible to the forests and soils where it belongs. I would be pleased to discuss this with any of those who are concerned about shifting some forest management from forest product production to protecting climate and biodiversity.

William R. Moomaw
Professor Emeritus Tufts University
Visiting Professor Trinity College
Distinguished Visiting Scientist Woodwell Climate Research Center
Lead author of 5 IPCC reports

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Alec Shub <alec.shub@uconn.edu>

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:41 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

**From:** calligraphy calligraphy <calligraphy@cox.net>
**Sent:** Wednesday, October 21, 2020 9:42 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

To DEEP Climate Change, Please protect SOME of the natural world. This is based on SCIENCE. It is a main reason people choose where to live and visit. Nature is essential for the future, for evolution and for everything we need, and serves the public good now and for the long term. We have so many beautiful natural areas, and some need to be protected for nature study, hiking, and places that people can count on. This has never been more important. Meanwhile - we are burning and exporting our public forests? Who benefits? This is beyond disturbing. We need systems that support good jobs, local resource use, AND natural areas. Our public land is held in the public trust. We need your leadership. Please do everything you can to protect nature AND support our local communities. We need both to face the challenges posed by climate change.

Urgently,

Debby Reelitz

Granby CT

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:39 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

**From:** Ellie McCoin <elliemccoin@gmail.com>
**Sent:** Wednesday, October 21, 2020 9:32 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:39 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

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FYI

**From:** Hain, Hannah N. <hannah.hain@trincoll.edu>
**Sent:** Wednesday, October 21, 2020 9:34 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:40 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Dresser, Isabella R. (2022) <isabella.dresser@trincoll.edu>
**Sent:** Wednesday, October 21, 2020 9:38 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

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Alec Shub <alec.shub@uconn.edu>

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:43 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

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**From:** Roche, James M. (2021) <james.roche@trincoll.edu>
**Sent:** Wednesday, October 21, 2020 10:10 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

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Signed,

James M. Roche

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**Alec Shub <alec.shub@uconn.edu>**

# FW: Protect nature and science for the public and the future

1 message

**DEEP ClimateChange** <DEEP.ClimateChange@ct.gov> Thu, Oct 22, 2020 at 7:40 AM
To: "Shub, Alec" <alec.shub@uconn.edu>
Cc: "French, Rebecca" <Rebecca.French@ct.gov>

*Message sent from a system outside of UConn.*

FYI

---

**From:** Zhang, Shunyuan <shunyuan.zhang@trincoll.edu>
**Sent:** Wednesday, October 21, 2020 9:38 PM
**To:** DEEP ClimateChange <DEEP.ClimateChange@ct.gov>
**Subject:** Protect nature and science for the public and the future

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

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Sincerely,

Shunyuan Zhang

Assistant Professor

International Studies and Women, Gender and Sexuality

Trinity College

Hartford, CT 06106

All -

I appreciate your interest in our report.

The draft Science and Technology report (nor anyone that I know of in the working group) does not talk about “banning” logging on state forestland (or anywhere else). I will personally review this carefully before final submission. Neither has anyone made negative assertions about any person or any profession.

The Phase 1 Science and Technology report is intended to be readable by the general public and spans and integrates many topics, including the entire range from protecting nature in a wild state to specifically supporting local resource use. This has generated a lot of interest, and on the latter topic we are the only working group offering ideas and examples to create local systems, including jobs, that reduce the amount of wood that is exported from the state and burned. There is of course a lot more that could be said on any topic in the report, but everyone agrees that land-based carbon storage and sequestration is not accounted for currently and should be. DEEP could be a leader in addressing this issue.

Healthy rural economies are diverse (resources, recreation, small businesses), have nature at their core, and are circular: they keep resources, jobs and money within the community, and there are many types of forest-based jobs. Rural economies based primarily on extraction and exports become trapped in a cycle where resources, money and jobs are funneled out of the community and into subsidized industrial processes. Climate change and other unexpected disruptions will impact our communities, and we need more local systems and cooperation.

Taken together, protecting nature, funding more research, and responsible resource use can do a lot to achieve our climate goals, address multiple impacts and protect our communities. Public land is for everyone, and the public wants nature preserves and needs access to natural areas for health and resilience. Finding the best future and a balance among these critical elements is a primary form of environmental justice for people and the planet.

The Science and Technology report advocates for more research funding as a top priority because we need baselines, trends, and tracking of more variables in complex systems with very long timelines. I personally advocate for three things (nature, research, resources) in every meeting, public talk, etc. relevant to this topic. This is a three-legged stool, and the intent of our report is to provide a proactive and positive vision for the future of Connecticut.

The term "proforestation" simply prioritizes  wild nature, strategically, and it yields quantifiable benefits. It aligns with the consensus principle of “protect the best, restore the rest.” The term is being used internationally, especially as a natural climate solution, and has proven benefits as the type of management used for decades to centuries in natural UNESCO world heritage sites, federal wilderness areas, the Adirondacks, national parks, and similar areas. Wild areas reduce species extinction over time and are beloved by the public - places they can count on, for many reasons, and especially critical in such a small and densely populated state. Strategic areas for wild nature serve the public good, and access to beautiful natural areas is what people love about Connecticut - and why people are flocking to these places during the pandemic.

Aside from these details, we need space and time for the unknown. Preventative medicine

dictates “first do no harm” and that is an essential component of protecting the public trust. There are molecules and species and networks we don’t understand and we have not discovered yet.

Recently, part of Connecticut was include in the Global Safety Net as a Tier 1 climate stabilization area. We have Tier 1 matrix regions and major corridors on the Eastern Wildway. We need to be careful with our precious natural heritage, and these values, along with public well-being, are interdisciplinary issues. Protected natural areas will always be a small but critical portion of the landscape, and strategic decisions can be made easily and based largely on existing science and common sense (coupled with a priority for clean water). We have already made many of these exact strategic decisions based on these principles - it is a matter of affirming them to protect their long-term contribution to the public good in the face of climate change and widespread and increasing pressure from industry.

Realistically, despite the existential crisis of climate change, the majority of our land is and will continue to be open to chronic human intervention for the foreseeable future. But should all of it be open for business? We need to prioritize nature in key areas to make sure we don’t inadvertently damage critical pieces of the puzzle - especially on public land, which is the only land we can protect. We need evidence-based decision making that serves the public good.

In Science and Technology we affirmed as a guiding principle that a critical assessment of any topic cannot start with conflicts of interest or limited perspectives. That is why we recommend multisolving, a process which has implicit climate benefits, an interdisciplinary perspective, and a lack of financial conflicts at its core. From a carbon storage perspective, “proforestation” is supported by an international consensus of scientists from multiple disciplines. In parallel, there are inaccuracies and risks in some assumptions underlying energy and product substitution. These have not been rectified or fully considered, and in some cases have not been applied specifically to Connecticut. They absolutely deserve a serious and unbiased conversation - *but no matter what we still need to protect some areas for nature.*

*Developing a strategic plan, protecting these special areas, and collecting more data is common sense and consistent with previous state reports. This should not be controversial, and I believe such an effort would identify the types of areas that need clear protection for climate and community as well as the types of areas that need dedicated funding for even MORE management. For example, we need to address seriously the spread of invasives plants, and prevent spreading more, and need to responsibly assess outcomes and maintain habitats we invested public resources into creating.*

*In sum, everything should be open for evaluation and assessment as we face the climate crisis - our educational system, our food systems, our transportation system, our natural resources, our built environment and energy. The mission of DEEP is stewardship, and including all voices in a responsible, ethical and evidence-based approach that serves the public good.*

We all agree that we should be evaluating the potential of our land to address the impacts of climate change and I hope we can also agree that we should not be disrupting an ecosystem on public land that is healthy, self-sustaining and has no invasive plants. We should not be damaging headwaters, imperiled habitats, or the last precious fragments of old-growth without an evidence-based reason. Yet right now none of these irreplaceable ecological assets have

any specific protection. Neither does our incredibly high land-based carbon. And there are no requirements for baseline data or control groups even though unmanaged areas are essential as controls. This is why we need more funding for research, so that we can target efforts in the right place and serve the long term public good.

There is a lot more that could be said here, but the disagreement appears to be between protecting SOME natural areas vs. protecting NONE. Protecting none, by suggesting that we know how to perfectly manage everything, is not based on science. We don't know all of the variables, and we are risking the very lifeline that we need for the future.

Susan A. Masino, Ph.D.

Vernon Roosa Professor of Applied Science

Trinity College

Co-chair, Science and Technology Working Group

Governor's Council on Climate Change (GC3 in CT)