Environmental Quality in Connecticut

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The 2022 Annual Report of the Council on Environmental Quality

STATE OF CONNECTICUT

COUNCIL ON ENVIRONMENTAL QUALITY

May 3, 2023

The Honorable Ned Lamont
Governor of Connecticut
State Capitol
Hartford, CT 06106

Governor Lamont:

The Council is pleased to submit *Environmental Quality in Connecticut* for 2022, as authorized by Connecticut General Statutes (CGS), Section 22a-12. The Council was established on June 25, 1971 by Public Act 872. This report uses over fifty indicators of environmental health and human activity to illustrate environmental trends, both positive and negative, for the 2022 calendar year. As required, the Council has also included suggestions for "remedying the deficiencies of existing programs and activities, together with recommendations for legislation". The Council's annual report indicates both improvement in some areas of environmental quality and regression in others.

Though this report can be printed, it is designed to be read as an online document on the Council's website. Online, the values on its charts will appear under the reader's cursor and the reader can access the many supplemental documents which are hyperlinked within it. "Quick Summary" boxes above most of the charts show the data trends for the past year and past decade.

In sending this report, the Council wishes, also, to acknowledge your efforts through the Governor's Council on Climate Change and leadership on the passage of Public Act 22-5 and Public Act 22-25 to address the State's serious climate challenge. Indeed, decarbonization of electric grid, increased use of renewable resources for heating and cooling and the expanded use of electric drive vehicles is critical to reducing greenhouse gases generated by the combustion of fossil fuels.

We would be remiss if we did not reiterate our concern for the two open Council seats and the upcoming term expirations which will threaten the Council's ability to achieve a quorum in 2024, thereby effectively prohibiting the conduct of further business.

As always, the Council looks forward to providing you with any additional information you might request.

Respectfully submitted,

Keith R. Ainsworth

Keith Ainsworth, Esq.
Acting Chair

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Introduction – Understanding "Environmental Quality in Connecticut"

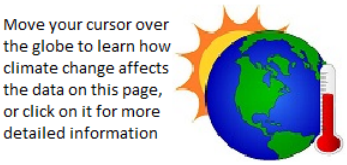
The Annual Report of the Council on Environmental Quality for 2022

published May 4, 2023

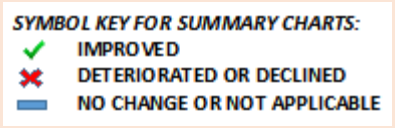
Welcome to *Environmental Quality in Connecticut*. As required by Connecticut General Statutes Section 22a-12 (a), "the council shall submit annually to the Governor an environmental quality report, which shall set forth: (1) the status of the major environmental categories including, but not limited to, the air, the water and the land environment; (2) current and foreseeable trends in the quality, management and utilization of the environment and the effects of such trends on the social, economic and health requirements of the state; (3) the adequacy of available natural resources for fulfilling human and economic requirements of the state in the light of projected population pressures; (4) a review of the programs and activities of the state and local governments and private organizations, with particular reference to their effect on the environment and on the conservation, development and utilization of natural resources; (5) a program for remedying the deficiencies of existing programs and activities, together with recommendations for legislation; and (6) the progress towards achievement of the goals and objectives established in the state-wide environmental plan." This edition addresses the statutory requirements noted above and documents the condition of Connecticut's environment primarily for the 2022 calendar year.

This annual report is designed to be read online to allow use of the navigation buttons to move from section to section within it or to find the topics of interest in the Index. Online, the values on the charts will appear under the cursor.

The majority of Connecticut's key environmental indicators are strongly affected by a changing climate. The symbol at right (example) will identify indicators that are so affected or those that affect the climate. For the online edition, running your cursor over the symbol will reveal a brief statement of the indicator's connection to climate that is also linked to more information. For the printed version, please refer to "Climate Notes" at the end of this annual report.



Summary Key for Indicators: Each page in the report has an environmental theme. Where an indicator shows change over time, there will usually be a summary key to allow for a quick evaluation of the status of that indicator. The top line is the indicator's status for the most recent year; the second line shows the current year's status compared to the ten-year trend; and the third line shows whether the indicator is on track to meet its goal.



The asterisks in the body of the text refer to clarifying information found in the "Technical Note" section on most pages. The endnotes identify the primary source of the information.

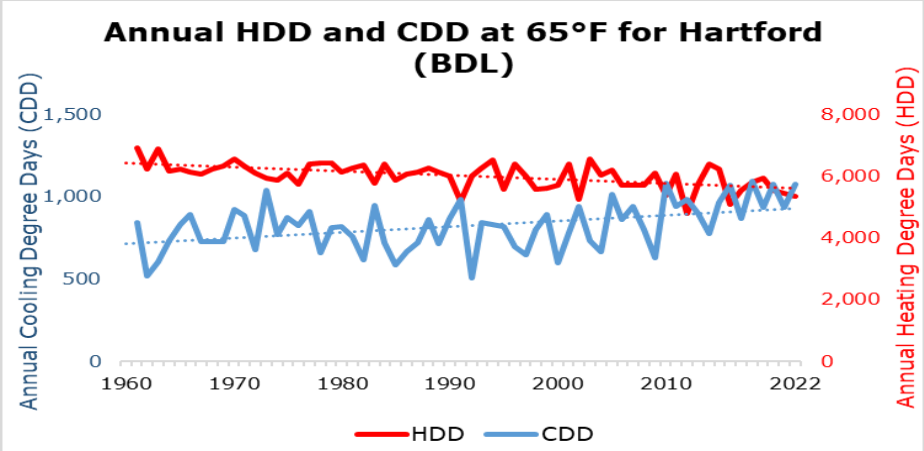
There may be updates to the 2022 annual report if data become available that were not available at publication. Sign up for e-alerts to receive a notice when updates are published. The Council welcomes your comments and questions.

The Climate Challenge*

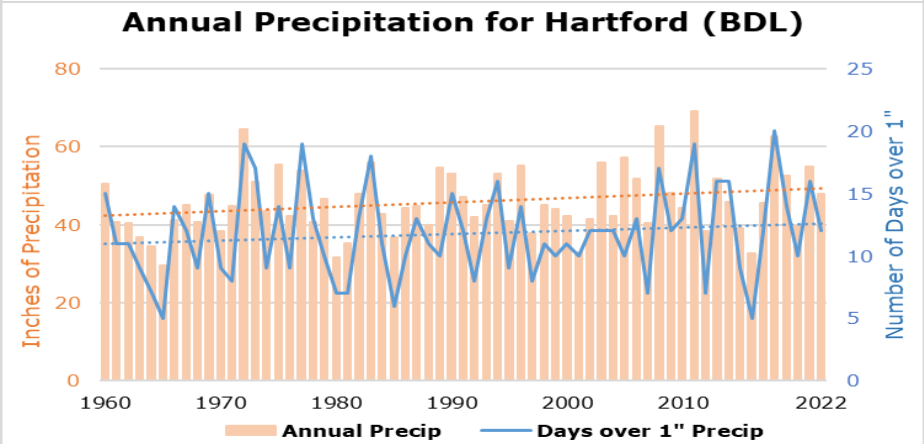
The warming of Connecticut's climate threatens to undo much of the environmental progress of past decades that is illustrated in this report. Nearly every environmental indicator in the 2022 annual report has a tie to the climate. The trend over more than sixty years suggests that Connecticut's climate is getting warmer and there's more precipitation.

The state's warming climate is evidenced by increasing annual average temperature, precipitation, cooling degree days (CDD), and decreasing heating degree days (HDD).[1]

The trend for annual HDD is decreasing while the trend for annual CDD is increasing from 1961 to present. Degree days reflect changes in climate and are a proxy for the energy demand for heating or cooling. It is predicted that as the climate warms, this trend will continue.

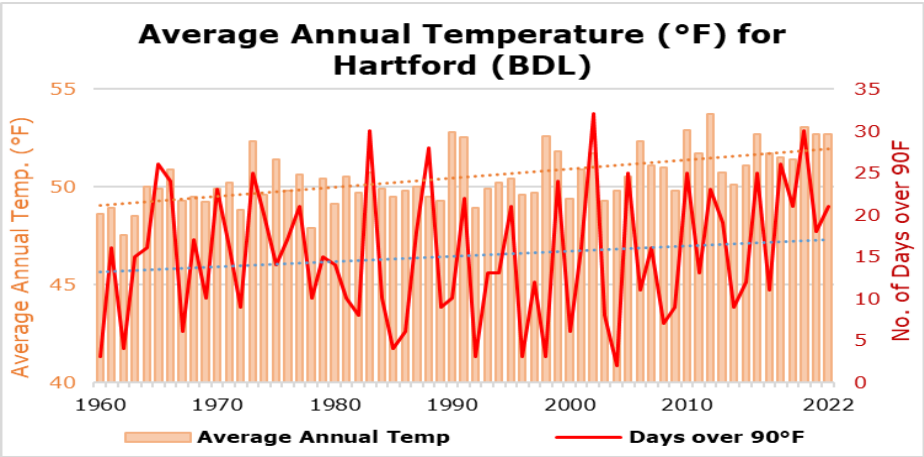


Annual precipitation for 2022 was 4.6 percent higher (47.9) than the annual average since 1961. The number of days with rainfall greater than one inch (12) was equal to the annual average since 1961. It is predicted that as the climate warms, severe weather events, such as drought conditions and extreme rainfall will become more frequent.[2]



The average annual temperature for 2022 was 52.7 degrees Fahrenheit (°F) and the number of days greater than 90°F was 21. Over the last 60 years, the average annual temperature was 50.5°F and the average number of days over 90°F was 15.2.

Technical Note: Weather data measured at Bradley International Airport (BDL).



Climate Changers

QUICK SUMMARY:
- ✓ COMPARED TO LAST REPORT
- ✓ COMPARED TO 10 YR. AVERAGE
- — ON TRACK TO MEET GOAL

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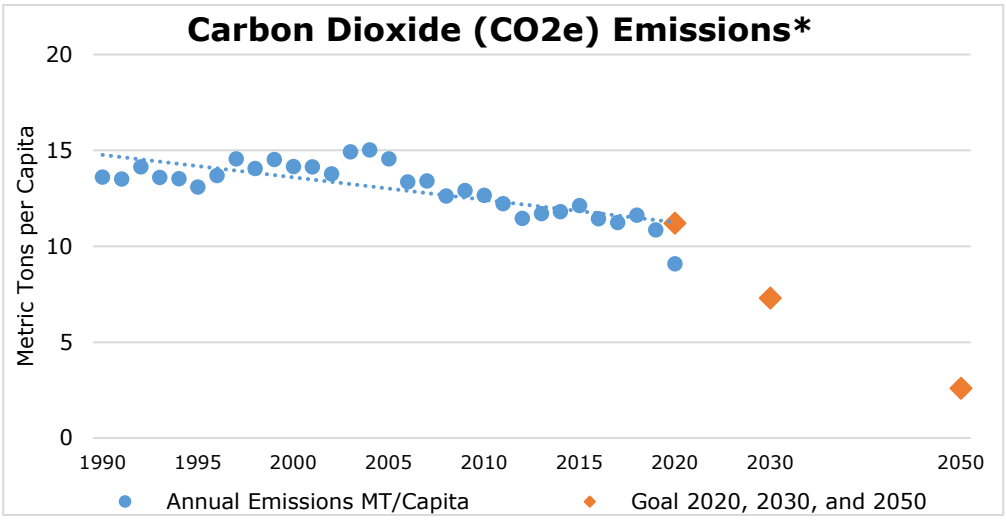
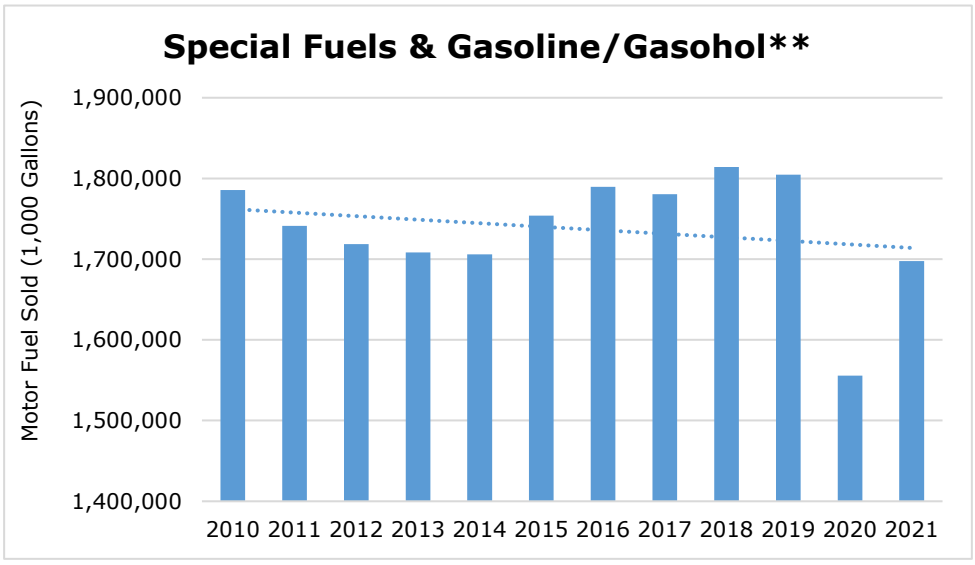
Per-capita greenhouse gas (GHG) emissions decreased in 2020.



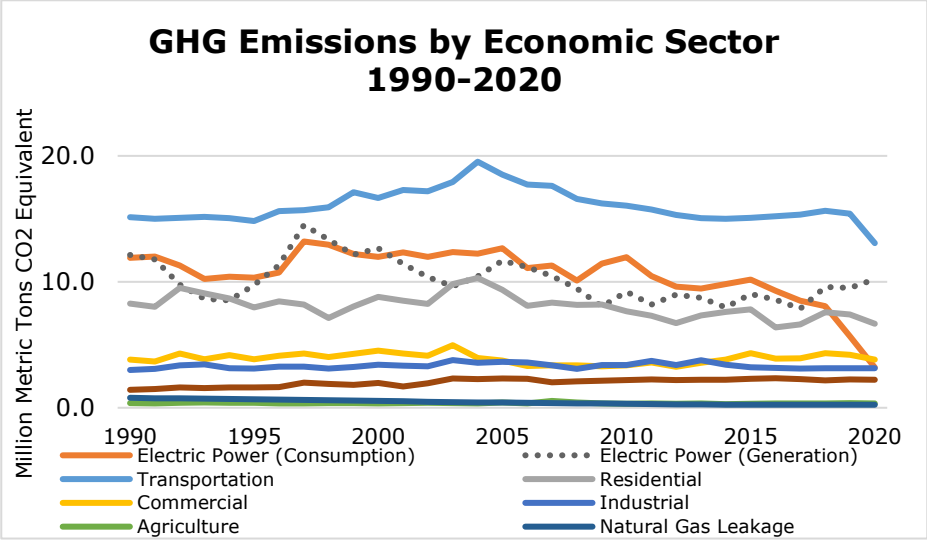
There was an approximately 21 percent decrease in per capita GHG emissions from 2018 (the last data reported by the Council) to 2020 (the most recent available data). GHG emissions in 2020 were calculated at 9.1 metric tons per capita, which was less than the calculated goal of 11.2 metric tons per capita.[3]

The largest decrease in GHG emissions generated in Connecticut* from 2018 to 2020 was in the transportation sector (16 percent). The effect of the pandemic on transportation is also evident in the amount of transportation fuel sold in the state in 2020 and the calculated daily vehicles miles traveled. The biggest monthly decline in motor fuel sales in Connecticut occurred in April 2020, which was approximately 40 percent less than the gallons of transportation fuel sold in April 2019.[4]



Goal: Prior to 2022, state law set three goals for greenhouse gas emissions: reduce statewide emissions to 10 percent below 1990 levels by 2020, 45 percent below 2001 levels by 2030 and 80 percent below 2001 levels by 2050. Public Act 22-5 established a new goal for the state to reduce GHG emissions to a level of zero percent from electricity supplied to electric customers in the state by 2040.

Technical Note: *Connecticut's GHG emissions are now calculated by the Department of Energy and Environmental Protection (DEEP) using the consumption of electricity, not the generation of electricity in the state. According to DEEP's report, *Connecticut Greenhouse Gas Emissions Inventory 1990-2021*, "in 2019, 2020, and 2021, in-state electric generation emitted 9.5, 10.2, and 11.0 MMTCO2e respectively. For the three years, consumption of electricity in Connecticut resulted in 5.7, 3.2, and 3.0 MMTCO2e in GHG emissions." MMTCO2e = million metric tons of carbon dioxide equivalents. The x-axis on the chart is not to scale. The goals on the chart above have been adjusted to account for growth in population that is projected for 2030 and 2050. Values from previous reports have been updated based on more current data. **The vertical axis on the chart starts at 1.4 million rather than zero.

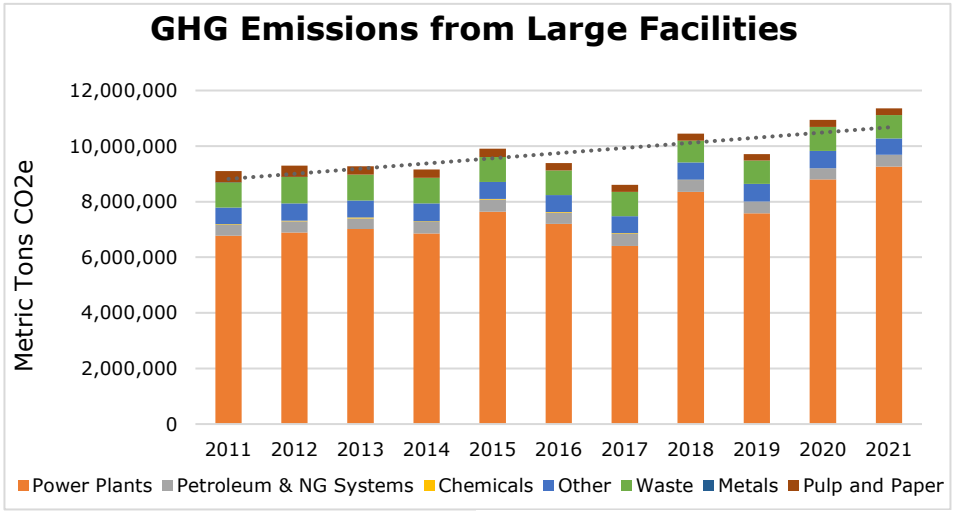


While there was a significant decline in GHG emissions in the transportation sector from 2018 to 2020, the transportation sector still accounted for the most GHG emissions in 2020 at 40 percent, while the residential, commercial, and electric power sectors accounted for 20 percent, 12 percent, and 10 percent, respectively, based on the electric consumption model.[5]

Using the electric generation model, transportation still accounted for the most GHG emissions in 2020 at 33 percent, but the electric power sector was the second largest contributor at approximately 26 percent. (The dashed line in the chart, which represents the GHG emissions from the electric power sector using the generation model, is for illustrative purposes only.)

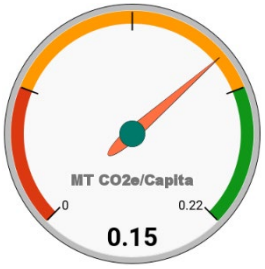
Greenhouse Gas Emissions from Stationary Sources Increased in 2021

Facility-level data from the Environmental Protection Agency (EPA) indicates that GHG emissions from large reporting facilities in the state increased approximately 25 percent in the last ten years. GHG emissions from reporting facilities in the "power plant" sector increased over 35 percent from 2011 to 2021.[6]*** This is consistent with the Council's analysis of the electricity generation data that indicates an increase in fossil fuel electricity generation.



In order to meet the GHG emissions reduction goal for 2050, significant reductions of GHG emissions in the transportation, electric power, and residential sectors, which combined made up more than 70 percent of all GHG emissions in 2020, will be needed. The needle in the chart depicts the average annual reduction (0.15 metric tons per capita) of GHG emissions for 1990-2020, using the electric consumption model. The annual per capita reduction needed to achieve the 2050 goal, based on the projected population, is approximately 0.22 metric tons.

1990-2020 Rate (needle) **vs. Rate Needed to Reach 2050 Goal**



Technical Note: ***The "power plant" sector made up approximately 81 percent of GHG emissions from large "reporting" facilities in Connecticut in 2021. Emissions are reported in terms of carbon dioxide equivalents (CO2e, i.e., CO2 and other gasses with equivalent climate warming impact), also referred to as greenhouse gases (GHG). While carbon dioxide is the primary GHG, emissions of other GHGs are expressed on the basis of their potential to contribute to global warming, relative to carbon dioxide's potential.

Air Days

QUICK SUMMARY:
- X COMPARED TO LAST REPORT
- ✓ COMPARED TO 10 YR. AVERAGE
- — ON TRACK TO MEET GOAL

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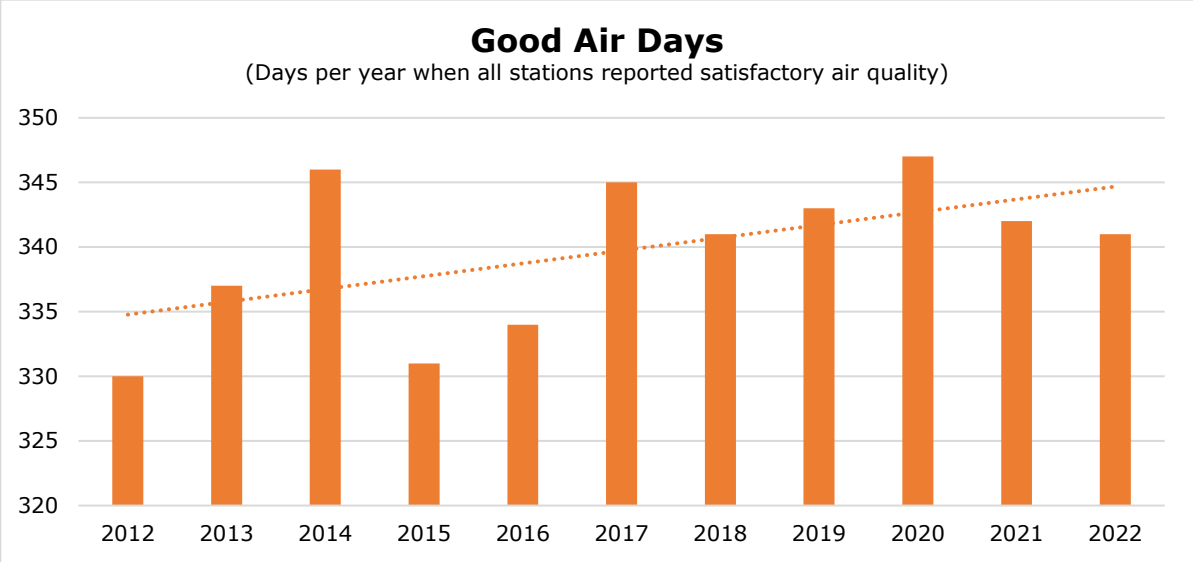
Connecticut residents breathed healthful air on 341 days in 2022; an increase from the ten-year average (340 days).



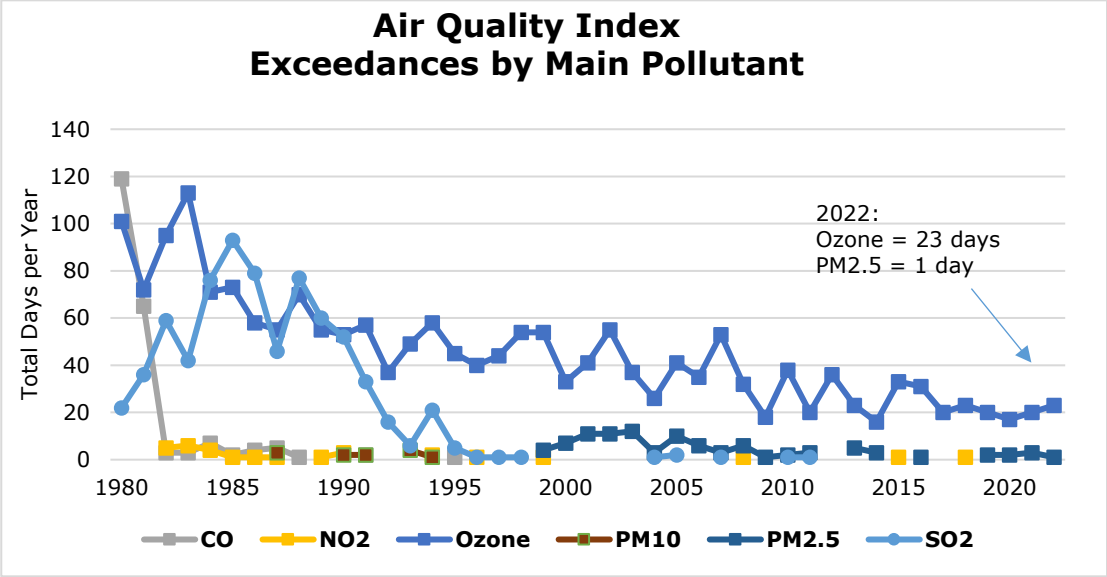
The number of statewide "good air days" decreased from 342 in 2021 to 341 days in 2022. A "good air day" is when every monitoring station in the state records "satisfactory air quality", which is defined here as air that meets the health-based National Ambient Air Quality Standard (NAAQS) for all of the following six pollutants: sulfur dioxide, carbon monoxide, particulate matter (PM2.5 and PM10), nitrogen dioxide, and ground-level ozone.*

Air with an Air Quality Index (AQI) above 100 is considered "unhealthy for sensitive groups", which includes people with heart or lung disease, older adults, and children. In 2022, there were 23 days that exceeded the AQI for ozone as the primary pollutant and one day that exceeded the AQI for particulate matter (PM 2.5) as the primary pollutant.[7] Exposure to particle pollution is linked to a variety of significant health problems, ranging from aggravated asthma to premature death in people with heart and lung disease. Fine particles are a health concern because fine particles can easily reach the deepest parts of the lungs.[8]

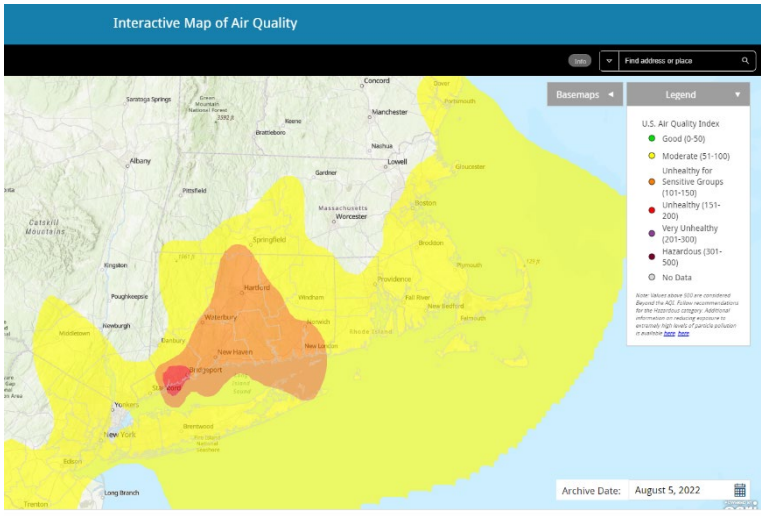
In 2022, the Department of Energy and Environmental Protection (DEEP) issued a special report which noted that "Connecticut has again failed to meet both the 2008 and 2015 National Ambient Air Quality Standards (NAAQS) for ozone within the timeframe prescribed by EPA. Resultantly, DEEP expects EPA to begin the process necessary to reclassify Fairfield, New Haven and Middlesex Counties to "severe" nonattainment under the 2008 ozone NAAQS. This means DEEP will be required to amend its clean air regulations and identify additional strategies to reduce emissions."[9]

There has been a long term trend of improved air quality, in part, due to the air pollution controls that were put in place after the 1971 Clean Air Act. The chart below, "Air Pollutants", shows that in the 1980's, exceedances for sulfur dioxide (SO_2) and nitrogen dioxide (NO_2) were common, but not so recently.[10] Statewide exceedances of pollutants, except for ozone, are rarely seen, due to federal restrictions on emitters, mostly to Connecticut's west and southwest. Lead (Pb) is not shown.**

Air Pollutants



The image (below) illustrates a bad-air day in 2022 that was more intense than average but followed the typical pattern of Connecticut having the worst ozone pollution in New England.[11] The yellow areas indicate moderate air quality, but it meets the standard for ground-level ozone, while the orange and red areas did not. Some residents in the yellow areas, who are unusually sensitive to air pollution, might have been adversely affected. Much of Connecticut's ground-level ozone originates in states to the west and southwest. Unless emissions in those states are reduced substantially, Connecticut residents are likely to continue to breathe unhealthful air. Past ozone control strategies for nitrogen oxides (NOx) have centered around point source electrical generating units, which have been effective in reducing long-range air pollutant transport into Connecticut. Increasingly, area sources and on-road / non-road mobile sources have become the dominant source of NOx production.[12]



Cities and towns in coastal regions of the state usually see more bad ozone days than inland locations. Coastal towns with monitoring stations that saw the most unhealthful days in 2022, included Westport (14), Greenwich (12), and Stratford (10); while the air monitoring stations in Abington (Pomfret)(0), Stafford (2), and Cornwall (3), saw the fewest.[13]

No other New England state had more days with unhealthful levels of ozone than Connecticut, which had a total of 23 in 2022. Rhode Island was the next highest with five unhealthful days due to ozone.[14]

Goal: While not formally stated, the goal is for Connecticut residents to have a "good air day", every day.

Technical Note: *The federal air quality standard for ozone was revised prior to the 2016 ozone season. The new standard (0.070 parts per million over eight hours) is slightly more protective of human health than the older standard (0.075). **Connecticut's lead levels have been below the national standard (NAAQS) since 1994.

Preserved Land

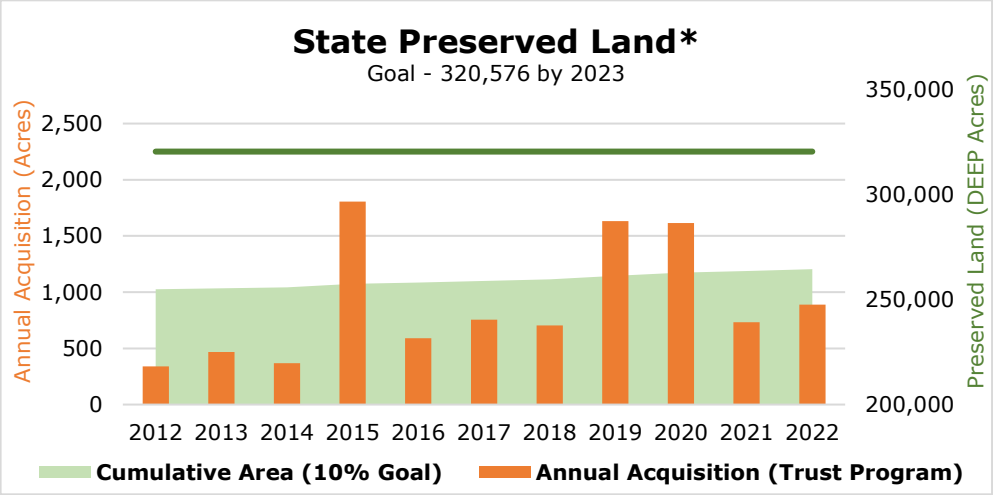
QUICK SUMMARY:

✓ COMPARED TO LAST REPORT
X COMPARED TO 10 YR. AVERAGE
X ON TRACK TO MEET GOAL

Move your cursor over the globe to learn how climate change affects the data on this page, or click on it for more detailed information

In 2022, the state acquired more land than in 2021, but less than the average for the previous ten years.

Goal #1: State Owned Land – ten percent



In 2022, the Department of Energy and Environmental Protection (DEEP) acquired 888 acres of land** under the Recreation and Natural Heritage Trust Program (Trust Program), the primary vehicle for adding land to the state's system of parks, forests, wildlife areas, water access areas, and other open spaces. The state invested more than $393,000 and leveraged almost $1.8 million (plus a donation of land estimated to be worth almost $840,000) to acquire the 888 acres in 2022.[15]

The total area of land estimated to be acquired by DEEP as preserved open space is approximately 264,500 acres. Over the previous ten years, the state has preserved an average of 901 acres per year. While DEEP has made steady progress to increase the amount of land preserved, DEEP's preservation efforts are not on track to reach the state's preservation goal of 320,576 acres by 2023. At the average acquisition rate of 901 acres per year, it would take DEEP approximately 62 years to achieve the ten percent goal. As the cost of land increases, that goal will become more remote unless the rate of open space acquisition increases significantly.

Open space provides Connecticut's residents with options for outdoor activities, preservation of scenic beauty, habitat protection, increased biodiversity, protection of unique bedrock and surficial geologic features, water protection and flood control. In addition, forests, farmland and other natural habitats absorb more greenhouse gas (GHG) emissions than they emit.*** Land conservation offers a double benefit for the climate: it helps absorb GHG emissions and it prevents significant GHG emissions that would result from development.

Goal #1: The State shall acquire ten percent of Connecticut's land for preserved open space. This goal was set in statute in 1997 (Connecticut General Statutes, (CGS) Section 23-8(b)).

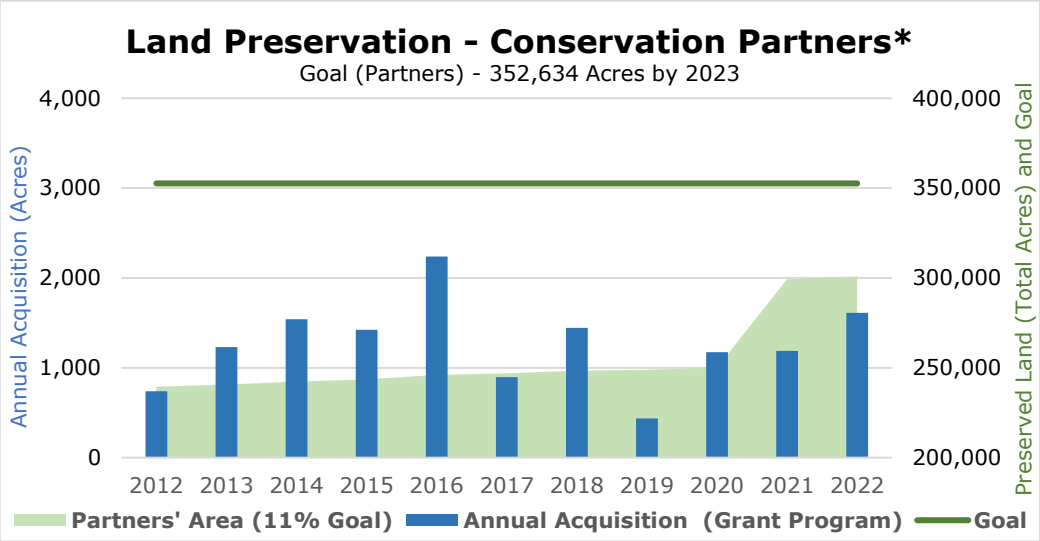
Technical Note: *The right vertical axes in the land preservation charts have been shortened, beginning at 200,000 acres rather than the customary zero. **State land is primarily owned in fee by the State. A notable exception is a 111-acre easement acquired in 2020, which is included in the State acquisition total. Acquisitions by "conservation partners" often include easements. State "preserved land" does not mean land that is not managed or harvested. The lands acquired by the state as open space might not be restricted from logging or other types of management or from recreational activities. ***Nationally, the Land Use, Land-Use Change, and Forestry (LULUCF) sector resulted in a net increase in carbon stocks, which represents an offset of 13.6 percent of total (i.e., gross) greenhouse gas emissions in 2020.[16]

QUICK SUMMARY:

✓ COMPARED TO LAST REPORT
✓ COMPARED TO 10 YR. AVERAGE
✗ ON TRACK TO MEET GOAL

Goal #2: Other Conservation Lands – eleven percent

In 2022, state grants helped municipalities and land trusts acquire or protect 1,613 acres through the Open Space and Watershed Land Acquisition Grant Program (Grant Program), whereby DEEP provides financial assistance to municipalities and nonprofit land conservation organizations to acquire land for open space, and to water companies to acquire land to be classified as Class I or Class II water supply property.[17] The amount of land preserved as the result of grants from the Grant Program in 2022 was greater than last year and greater than the ten-year average of 1,231 acres.



Unfortunately, the exact amount of land held by DEEP's conservation partners is very difficult, if not impossible, to determine because land trusts are continuously acquiring properties for conservation and outdoor recreation, the inventory of municipal land is incomplete, it is very difficult to track easements, and there is no centralized accounting of privately preserved lands. In 2021, the Council estimated that more than 299,500 acres**** are held as open space land in fee by DEEP's "conservation partners." This would be approximately 85 percent of the goal of 352,634 acres. The spike in 2021, depicted in the chart above as "Partner's Area", is due to the addition of the Council's assessment of land trust land and water company land.

As noted above, it is estimated that DEEP has preserved approximately 264,500 acres (Goal 1) and its conservation partners "hold" approximately 301,000 acres (Goal 2) as open space for a total of approximately 565,500 acres or 84 percent of the total statewide goal of 673,210 acres.

Connecticut General Statutes (CGS), Section 7-100l requires that each town that possesses or contracts for services for the creation or maintenance of a digital parcel file shall transmit such file to the regional council of governments (COGs). The Office of Policy and Management (OPM) subsequently asks the COGs to voluntarily provide the files, which are available in one location on the OPM website. The digital parcel files and associated assessor data, including the ownership, use and area of each property, might be used to help determine the total amount of open space in Connecticut.

Goal #2: Pursuant to CGS Section 23-8(b), "not less than eleven per cent of the state's land area is held by municipalities, water companies or nonprofit land conservation organizations as open space".

Technical Note: ****As of July 1 2021, it is estimated that land trusts held approximately 111,300 acres in fee and water companies in the state held approximately 103,800 acres of "undeveloped" Class I and Class II land. DEEP's 2021 Open Space Annual Report estimated that municipalities held approximately 84,435 acres as open space.

Forests

QUICK SUMMARY:
✓ COMPARED TO LAST REPORT
X COMPARED TO 10 YR. AVERAGE
— ON TRACK TO MEET GOAL

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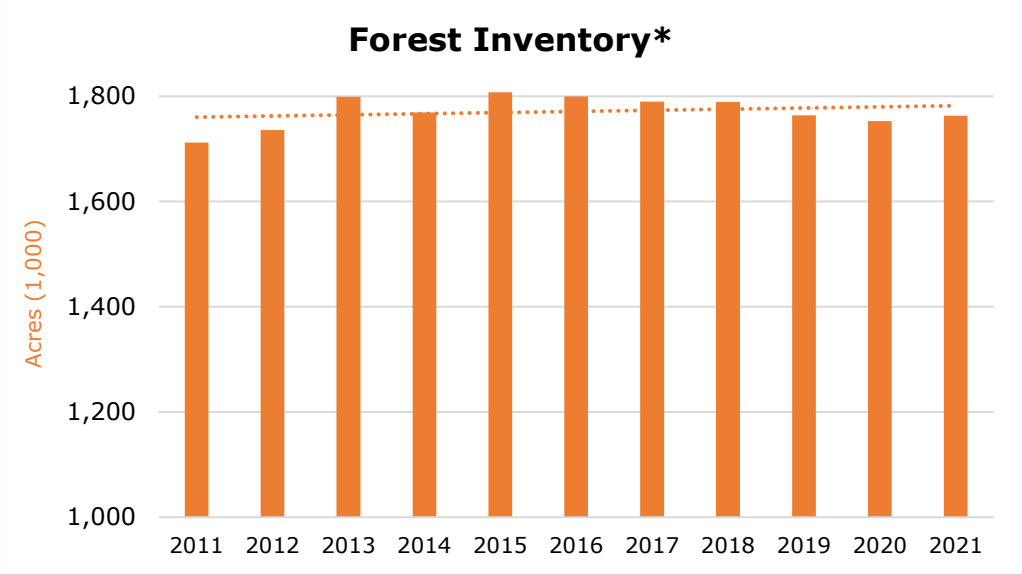
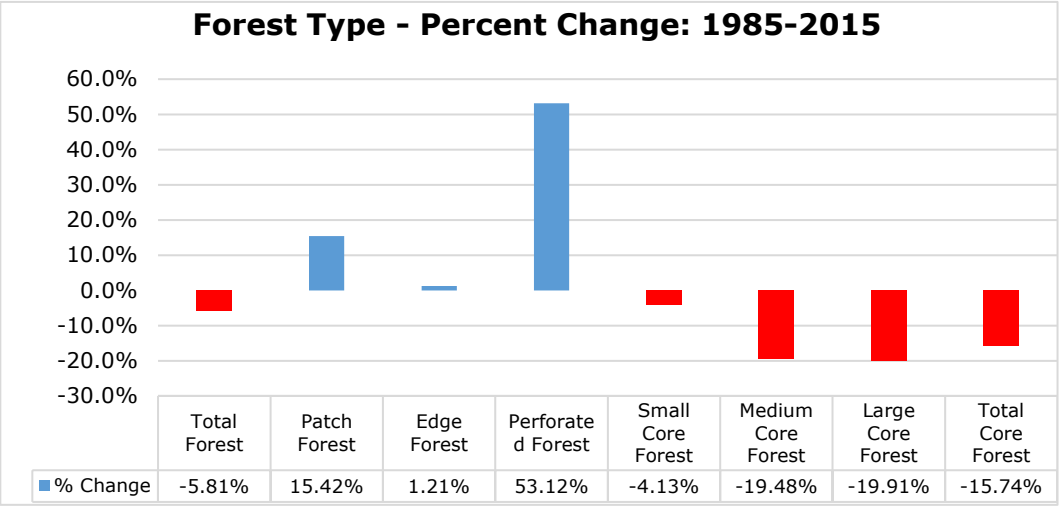
Forest acreage has generally declined over the last five years. The reduction of core forests is especially concerning.

Forests and other natural habitats reduce water quality impacts associated with development, impervious surfaces, and certain agricultural practices; and provide valuable habitat. Research is showing that visiting a forest has real, quantifiable health benefits, both mental and physical.[18]

Forest Inventory: It is estimated that forests cover between 57 – 60 percent of the land area in the state. The amount of forest land in Connecticut in 2021 (most recent data available) is estimated to have increased since the 2020 inventory.[19] Forest loss has stabilized somewhat from significant declines in forestland between the 1980s and early 2000s. In 1972, the first full year of the Council's existence, the amount of forest land in Connecticut was estimated to be 1,860,800 acres or roughly 59 percent of the area of the state.[20]





Core Forest Acres**: Core forests have been defined as forest features that are relatively far (more than 300 feet) from the forest-nonforest boundary. Core forests provide habitat for many species of wildlife that cannot tolerate significant disturbance. The loss of core forests diminishes the remaining forests' water purification and habitat values, and could result in heavier runoff, which might lead to poorer water quality.[21] Forests that are fragmented, or divided by roads and clearings, provide some forest functions but are not fully-

functioning forest ecosystems. Fragmented forests*** are known to provide substandard or poor habitat for some species of wildlife and, in many cases, less opportunity for a variety of recreational activities. Invasive species of plants and animals often colonize areas in the wake of activities that result in fragmented forests.

Edge forests comprise the majority of forest type in Connecticut. These are areas that are the boundary between core forest and non-forested land cover features. Medium (250-500 acres) and large (>500 acres) core forests have seen the greatest percentage decline since 1985. Perforated forests have seen the greatest percentage increase over that same time period; however, perforated forests only make up about five percent of forest type in Connecticut. Overall, total core forest area has declined by more than 15 percent over the last 35 years.[22]

Connecticut's forests offer an ability to sequester and store carbon above and below ground in their roots, trunks and branches and as long-lived wood products (e.g., carbon stored in lumber and furniture). Carbon sequestration rates and storage vary by stand age, tree species, growing conditions (including soil type, regional climate, topography), and disturbance regimes (natural or silvicultural).[23] In the northeastern United States, carbon sequestration rates typically peak when forests are around 30–70 years old, but trees continue to sequester carbon through their entire life span. Approximately 85 percent of Connecticut's forests, by area, are over 61 years of age. Carbon sequestration is also impacted by the type of trees that comprise the forest. Forests comprised of Oak/Hickory and Maple/Beech/Birch groups store a significant amount of carbon per hectare. These forest types combined comprise about 74 percent of Connecticut's forests, by area.[24]

The Council recently developed a position paper that examined the potential applicability of the Connecticut Environmental Policy Act (CEPA) for state sponsored forestry, forest management and tree maintenance activities. The Department of Energy and Environmental Protection (DEEP) is aware that tree removal operations on a significant scale can affect the land and water and requires that forestry plans include consideration of wetlands, erosion, invasive species, endangered species, riparian corridors and many other factors that are normally considered in most environmental impact evaluations. Furthermore, forestry and forest management operations could serve short term to the disadvantage of long-term environmental goals, such as retention of trees for their value as carbon sinks, retaining wildlife habitat, providing water purification for associated water bodies and protecting wetlands and riparian corridors.

Goal: "Keeping forest as forest" is the overarching goal of Connecticut's 2020 Forest Action Plan.

Technical Note: *The vertical axis in the "Forest Inventory" chart above has been shortened, beginning at 1,000 (1,000 acres) or one million acres rather than the customary zero. **Estimates of core forest acres were derived from data of the University of Connecticut's (UConn) Center for Land Use Education and Research (CLEAR), which uses satellite imagery to identify forests that are at least 300 feet from non-forest development, such as roads, buildings and farms. ***Fragmented forests consist of patch forest, which is forest along the edge of an interior gap in a forest that are degraded by "edge effects"; edge forest, which is forest along the exterior perimeter of a forest that are degraded by "edge effects"; and perforated forest, which consists of small, isolated fragments of forest that are surrounded by non-forest features and completely degraded by "edge effects"**.**

Farmland

QUICK SUMMARY:
X COMPARED TO LAST REPORT
X COMPARED TO 10 YR. AVERAGE
X ON TRACK TO MEET GOAL

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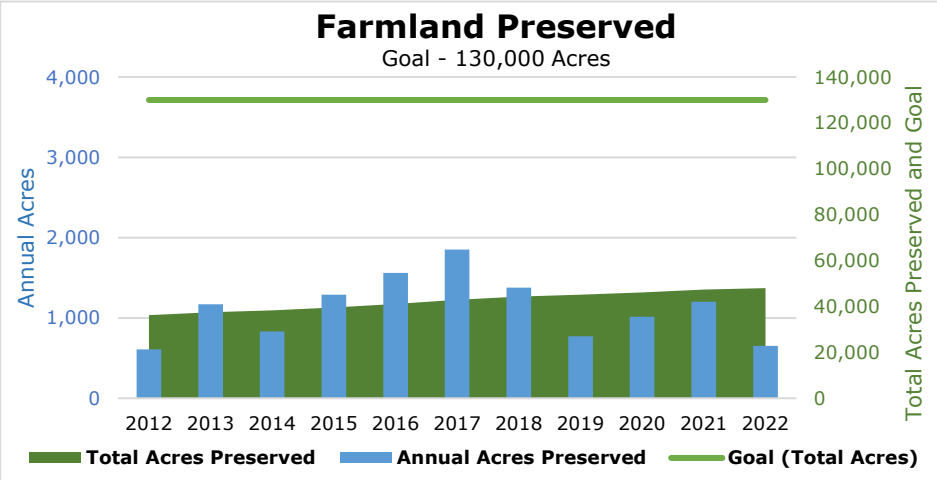
Less agricultural land was preserved in 2022 than last year and the previous ten-year average.



In 2022, Connecticut preserved just 652 acres of agricultural land.[25] This is approximately 54 percent of the 1,204 acres preserved in 2021, and a 44 percent decline from the previous ten-year average of 1,168 acres.

The cumulative acreage preserved by the Connecticut Department of Agriculture (DoAg), which began preserving agricultural land by purchasing development rights in 1978 has increased slowly and now totals approximately 48,000 acres. Council projections prepared in 2022 indicate that it would take approximately 70 years to achieve the state's farmland preservation goal of 130,000 acres, based on the average annual acquisition rate for the last ten years. During that time, additional farmland can be expected to be lost to development.

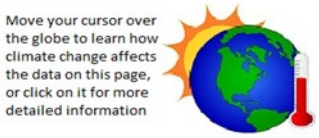
In addition to the production of food and agricultural products, Connecticut's farms have a role in mitigation, adaptation, and resiliency to the negative impacts of climate change. Well managed farms store carbon from the atmosphere in soils and plants, capture and store water from extreme precipitation events, and provide for bio-mass derived renewable energy. Soil is one of the sinks for atmospheric carbon, and one that can be managed to mitigate the effects of climate change.[26]

From 1985 to 2015, it is estimated that Connecticut lost approximately 45,000 acres of "agricultural fields",[27] which represents a loss of approximately 16 percent. The rate of farmland loss may change as demand for locally produced food and agricultural products increases or as development pressure increases, such as electricity generation. As detailed in the solar photovoltaics indicator, there are provisions for the DoAg to review certain solar proposals* on agricultural land and determine if such development would have a "materially affect" on the status of such land as prime farmland.

Goal: The DoAg adopted a farmland preservation goal 130,000 acres in total.

Technical Note: *Some of the proposals on agricultural land included some type of agricultural co-use activities at the sites. The potential agricultural viability of the co-use activities is unknown.

Wetlands



Inland Wetlands:
Inland wetlands are defined, in Connecticut, as land, including submerged land (not including tidal wetlands) "which consists of any of the soil types designated as poorly drained, very poorly drained, alluvial, and floodplain by the National Cooperative Soil Survey, as may be amended from time to time, of the Natural Resources Conservation Service (NRCS) of the United States Department of Agriculture (USDA)".[28] According to data from the USDA's NRCS, there are or were approximately 95,000 acres underlain by alluvial and floodplain soils and 366,000 acres underlain by poorly drained and very poorly drained soils in Connecticut. Collectively, the area underlain by these soils is estimated to account for approximately 14 percent of the total area in Connecticut.

Implementation of the inland wetlands law has been problematic.
In 1972, the state legislature enacted the Inland Wetlands and Watercourses Act (IWWA), which provides a regulatory process to protect wetlands. Activities that are likely to affect inland wetlands and watercourses are regulated by each town's municipal inland wetlands agency; however, there is no standard requirement for regulation of the upland area adjacent to identified wetlands. Regulated activities include, but are not limited to, filling, dredging, clearing, grubbing, grading, piping, culverting, channelizing, diverting, damming, dewatering or otherwise temporarily or permanently altering inland wetlands and watercourses. A report by the Council in 2008, *Swamped*, identified a number of problems with how the law was being implemented. Though some improvements have been made, there remain structural impediments to efficient implementation.

- The requirement that at least one member of a municipal inland wetlands agency be trained is not enforced.*
- Continued funding for the online training program, which was available online for most of 2022, for municipal inland wetland officials has not been secured.
- Forms that are required to be submitted by municipalities on the actions of their inland wetlands agencies are not submitted electronically. This requires the limited staff resources at the Department of Energy and Environmental Protection (DEEP) to convert the written filings to electronic records.

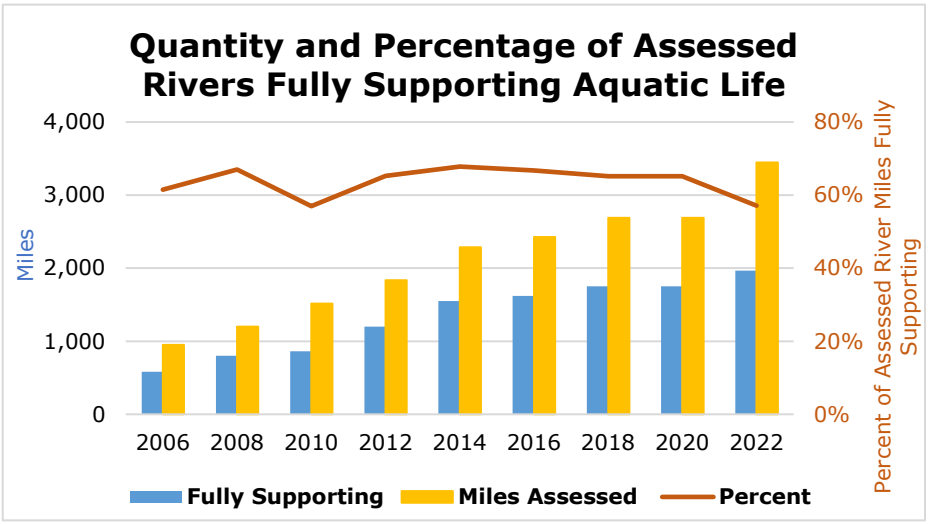
Tidal Wetlands:
Tidal wetlands are defined in the Tidal Wetlands Act by their current or former tidal connection, and their capacity to support certain wetland vegetation. Unlike inland wetlands, tidal wetlands are regulated by DEEP and not by municipal inland wetlands agencies. Tidal wetlands are threatened with inundation due to the projected rise in sea level due to climate change that will result in the loss of habitat for marsh-dependent species.

Wetlands serve many functions; one of them being their unique ability to store and sequester carbon. Tidal wetlands remove more carbon dioxide (CO_2) from the atmosphere per hectare than forests. Likewise, forested wetlands, which comprise most of the inland wetlands in the state serve as important carbon sinks and continue to sequester carbon as organic matter within the forested system (both above and below ground). Although coastal wetlands are generally better carbon sinks than freshwater wetlands, the substantial extent of forested wetlands across the state should be recognized as important to greenhouse gas (GHG) mitigation strategies and incorporated into inland wetland protection efforts in Connecticut. [29]

Technical Note: *Connecticut General Statutes (CGS) Section 22a-42(d) requires that at least one member of the inland wetlands agency or staff of the agency be a person who has completed the comprehensive training program. An online course would fulfill that training requirement as well as for duly authorized agents (pursuant to CGS Section 22a-42a(c)(2)). The unreliableness of municipal data led the Council to drop its tracking of "reported" wetland actions.

Rivers, Lakes, and Estuaries

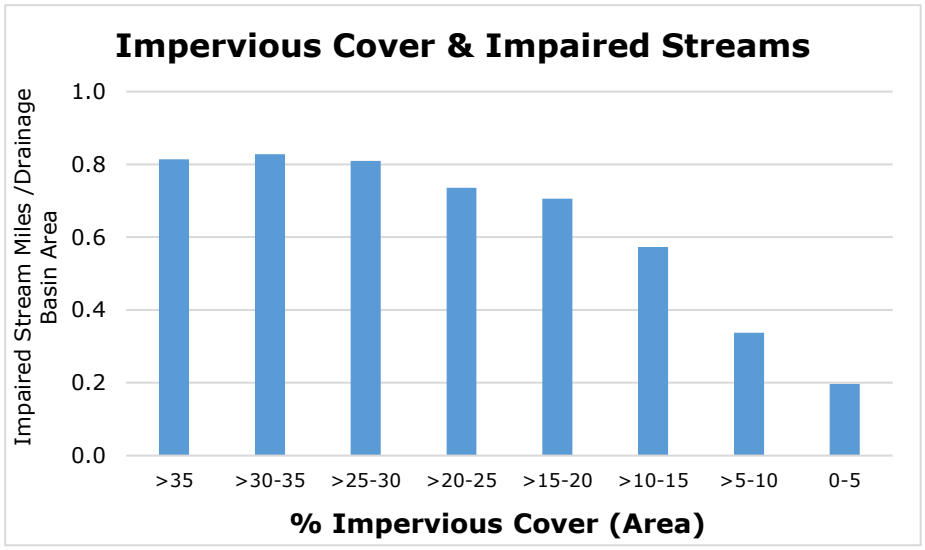
Move your cursor over the globe to learn how climate change affects the data on this page, or click on it for more detailed information



The Department of Energy and Environmental Protection (DEEP) assesses* water quality for each designated use (aquatic life, recreation, and fish consumption) for some waterbodies in the state as either fully supporting, not supporting, insufficient information, or not assessed, which characterizes whether or not the water is suitable for that designated use. Water quality in the state has improved over the last few decades as a result of protective laws, remediation efforts, and investment in wastewater treatment infrastructure. While there has been an increase in the number of river miles assessed, there has been little change in the percentage of assessed river miles that fully support aquatic life. In addition, there has been little change in percentage of assessed lakes and estuaries that "fully support" aquatic life in recent years.[30]

Impervious cover, wastewater treatment outflows, stormwater drainage systems and over land flow are primary factors in the transport of pollutants to surface waters!

The Council assessed the relationship between the percent of impervious cover (2012 data**) and the stream/river miles (2020 data) that do not support aquatic life or recreation for each impervious cover grouping. The ratio of the number of impaired stream/river miles divided by the total area of drainage basins for each impervious cover grouping highlights the relative impact that impervious cover has on water quality.



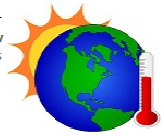
Goal: Attainment, wherever possible, of "water quality, which provides for the protection and propagation of fish, shellfish and wildlife and provides for recreation in and on the water".

Technical Note: *Section 305(b) of the Federal Clean Water Act (CWA) requires each state to monitor, assess and report on the quality of its waters relative to designated uses. **Based on data from the Connecticut Environmental Conditions Online (CT ECO).

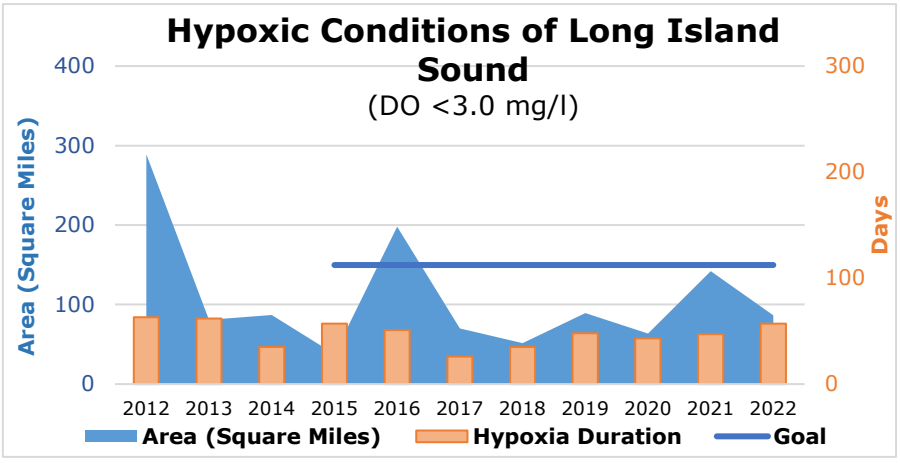
The Water of Long Island Sound

QUICK SUMMARY:
- ✓ COMPARED TO LAST REPORT
- ✓ COMPARED TO 10 YR. AVERAGE
- ✓ ON TRACK TO MEET GOAL

Move your cursor over the globe to learn how climate change affects the data on this page, or click on it for more detailed information



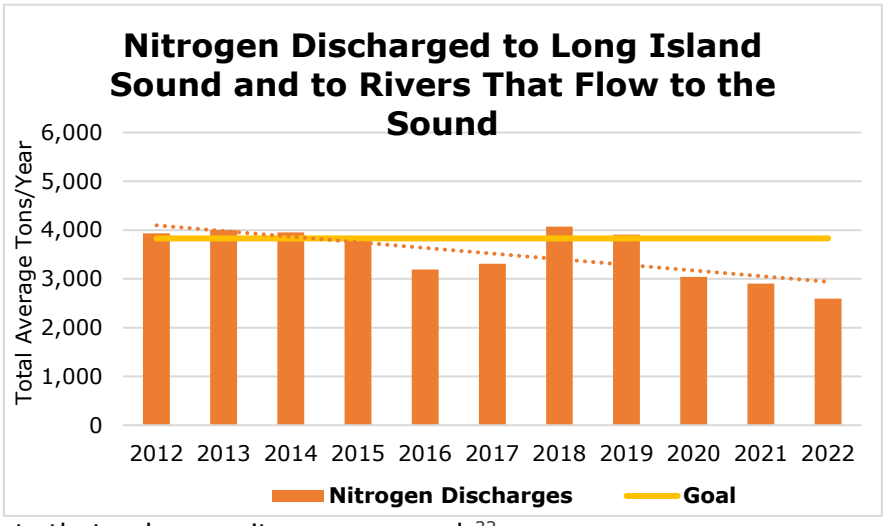
The area of Long Island Sound with hypoxic conditions decreased in 2022.



The maximum area of Long Island Sound with hypoxia, which is water with a dissolved oxygen (DO) concentration less than 3.0 milligrams per liter (mg/l), decreased from 142 square miles in 2021 to approximately 87 square miles in 2022. The area of hypoxia for 2022 was also approximately 22 percent lower than the ten-year average. However, the duration of the hypoxic conditions increased from 47 days in 2021 to 57 days in 2022. Most, if not all, of the hypoxic conditions are found in the western basin of the Sound, which is also affected by contributions from New York State. The primary cause of hypoxia is nutrient pollution, primarily nitrogen and phosphorus, from runoff and wastewater treatment effluent that fuels the growth of phytoplankton in the Sound. The average dissolved nitrogen concentration at the bottom of the Sound was approximately 0.2 mg/l in 2022.[31]

Goal: The goal line on the top chart is an approximation of the maximum area of the hypoxia target adopted in the 2015 edition of the Long Island Sound Study's Comprehensive Conservation and Management Plan to "measurably reduce the area of hypoxia in Long Island Sound … by 2035, as measured by the five-year running average size of the zone."

Nitrogen discharged in 2022 was almost 11 percent lower than in 2021 and 28 percent lower than the previous ten-year average.



Connecticut has reduced nitrogen discharges over the last decade by investing in nitrogen-removal technology at sewage treatment plants and implementing a Nitrogen Control Program; however, reducing nitrogen discharges from non-point sources remains a challenge. The decline in nitrogen discharged in 2022 is attributed to warmer weather, which is more conducive to nitrogen removal, and because 64 municipalities out of 78 participating in nitrogen credit exchange program upgraded projects that enhance nitrogen removal.[32]

Goal: Substantial reduction of nitrogen discharges is a goal that is shared by Connecticut and New York. Connecticut established a reduction goal of about 6,670 tons annually by 2014, which is the result of a 63.5 percent reduction from the point source baseline of 10,500 tons per year. Therefore, Connecticut's goal was established as a maximum of 3,830 tons per year.[33] Nitrogen discharges "upstream" of Connecticut also contribute to the nitrogen loading.

The Warming and Rising Waters of Long Island Sound

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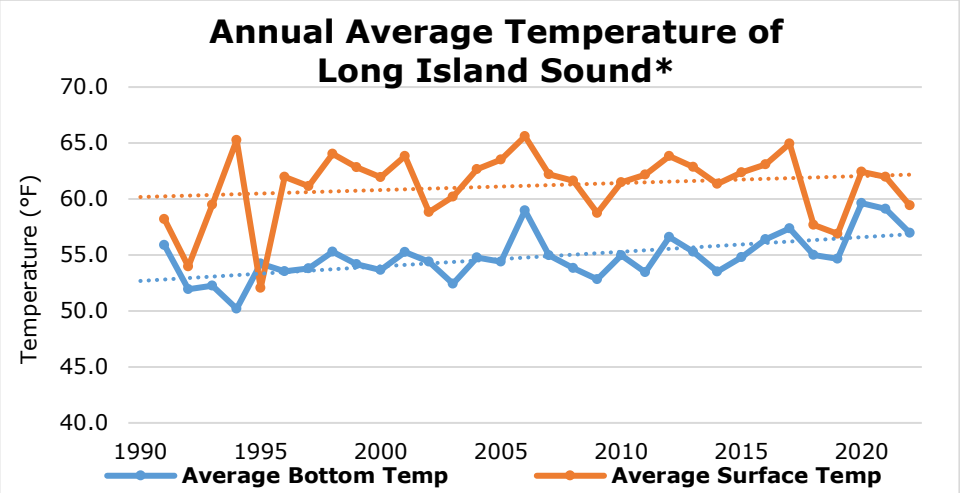
Annual average bottom and surface water temperature decreased from the previous year.

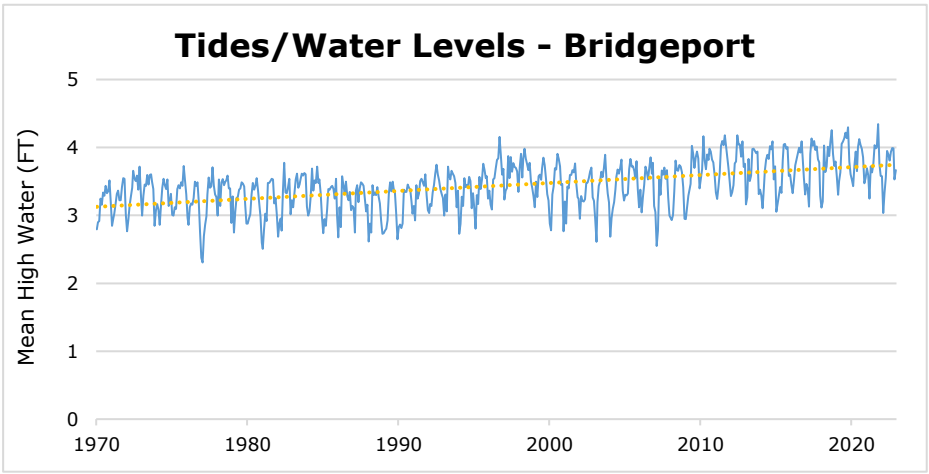


In 2022, the annual average surface water temperature for the Sound (59.43°F) was less than the average for the previous 30 years (61.37°F), while the annual average bottom water temperature for the Sound (56.97°F) was greater than the average for the previous 30 years (54.73°F).[34]

Annual variations in water temperature and water levels in the Sound are less important than longer term trends. The trend for average annual bottom and surface temperature of the water in Long Island Sound has been rising, with the average bottom temperature rising at a faster rate than the surface water. While the long-term impact of warmer water in the Sound is unknown, species diversity and biomass remain high, although there has been a shift to more warm water tolerant species.

Water levels in the Sound are also increasing.

The average monthly value for mean high water (MHW) for 2022 at Bridgeport was 3.69, which was higher than the average monthly MHW for the previous 50 years (3.43).[35] As depicted in the chart, the trend for water levels at Bridgeport over the last 50 years has increased. The natural "migration" of wetlands landward in response to sea level rise is prevented in many places by fill and development. In addition, shore birds that nest in coastal areas, such as the piping plover, might be displaced.



Goal: While there is no established goal for water temperature or sea level rise in Long Island Sound, it is assumed that an increase in both temperature and water level is not a desired outcome.

Technical Note: *The vertical axis in the average temperature of Long Island Sound chart above has been shortened, beginning at 40.0°F rather than the customary zero. The relative sea level trend for Bridgeport is 3.16 millimeters (mm)/year with a 95 percent confidence interval of +/- 0.37 mm/year based on monthly mean sea level data from1964 to 2022, which is equivalent to a change of 1.04 feet in 100 years.[36]

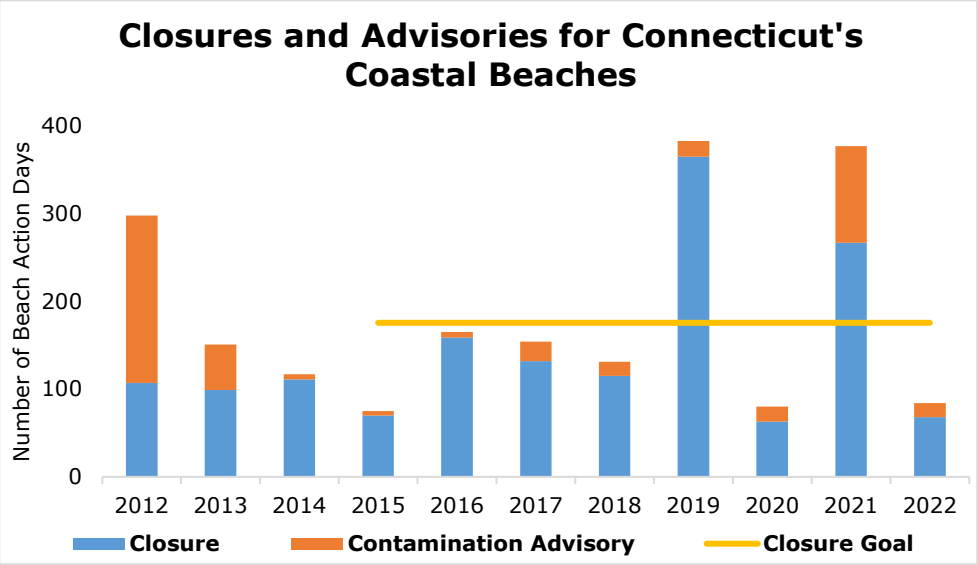
Swimming

QUICK SUMMARY:

- COMPARED TO LAST REPORT
- COMPARED TO 10 YR. AVERAGE
- ON TRACK TO MEET GOAL

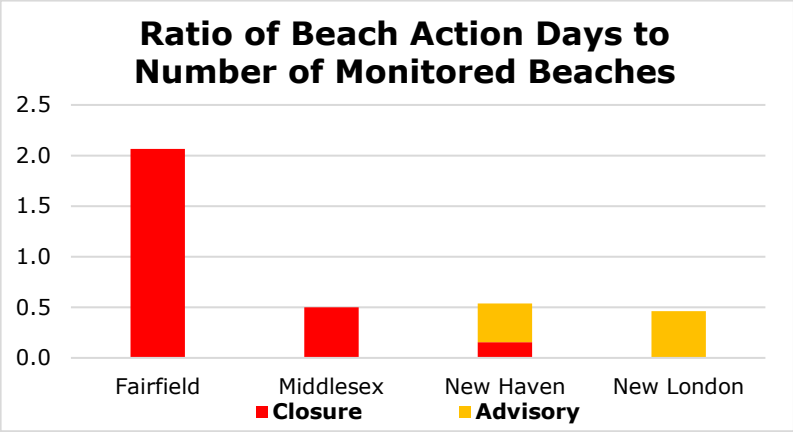
Move your cursor over the globe to learn how climate change affects the data on this page, or click on it for more detailed information

Coastal swimmers saw less beach actions in 2022.



There were 84 beach action days in 2022, 68 (81 percent) of which were closures and 16 (19 percent) were advisories, which was approximately 56 percent less than the previous ten-year average. Of the 84 beach action days, 57 percent were "preemptory actions" while 43 percent were due to elevated levels of bacteria.[37] There were four days during or just before the reporting period where daily rain totals exceeded one inch. The chart above displays both closings and advisories at Connecticut's public coastal beaches since 2012, which from a water quality perspective are functional equivalents. This is different than prior years when only closings were displayed. The beach-specific advisories or closings* are issued by the reporting state or local government entity.

Because the number of beaches varies by county, the Council utilizes a ratio of beach action days (closures and advisories) to the number of reporting beaches in each county to illustrate the relative impact that pollution has on coastal recreation waters. Typically, the western half of the coastline, which has more impervious surfaces, sees the most beach actions.



Goal: The goal for keeping beaches open is to reduce the number of beach closings in half by 2035 (from 2014, with the number for 2014 calculated using a five-year rolling average). This goal was identified in the 2015 edition of the Long Island Sound Study's Comprehensive Conservation and Management Plan.

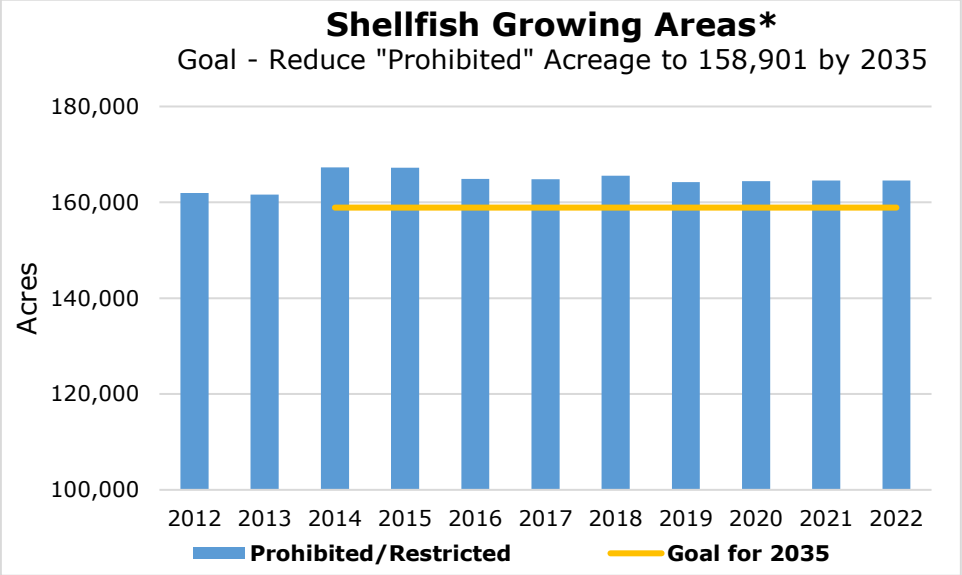
Technical Note: *During a beach closure, water conditions are deemed unsafe for swimmers and other users. A beach advisory is a warning and users decide whether they wish to risk going into the water. An action can be based on a model or policy. The data, derived from the U.S. Environmental Protection Agency (EPA) Beach Advisory and Closing Online Notification (BEACON2) system, includes information on pollution occurrences in coastal recreation waters for 73 reporting beaches along the Connecticut shoreline in 2022. "Preemptory actions" might be issued to inform the public of possible fecal contamination, based on past experience, prior to receiving confirmation of the water quality sample from a laboratory.

Clamming and Oystering

QUICK SUMMARY:
- X COMPARED TO LAST REPORT
- ✓ COMPARED TO 10 YR. AVERAGE
- — ON TRACK TO MEET GOAL

Move your cursor over the globe to learn how climate change affects the data on this page, or click on it for more detailed information

The area of the Sound designated as prohibited or restricted for harvesting shellfish was slightly greater in 2022 than in 2021.



The acreage of shellfish growing areas that are designated as "restricted", which includes "prohibited", "restricted relay", and "conditionally restricted relay" designations increased by two acres in 2022 from the previous year.[38] The area of restricted/prohibited shellfish growing areas is determined by bacteria contamination, which is an indicator of poor water quality, possibly because of sewage contamination and/or polluted runoff.

Changes in the classification of shellfish growing area are related to improvement or decline in water quality, based upon the results of water quality monitoring and/or updated sanitary survey findings. The Connecticut Department of Agriculture's (DoAg) Bureau of Aquaculture (BoA) monitors water quality and classifies shellfish growing areas according to their potential for yielding healthful, uncontaminated shellfish.

Water quality assessment criteria for shellfishing as a designated use only applies to inner-shore, and mid-shore estuarine waters where shellfish growth is viable, which is approximately 50 percent of Connecticut's estuarine waters. Only about 20 percent of the estuarine waters identified as assessed in the 2022 Integrated Water Quality Report can fully support shellfish harvesting from Class SA waters.** Meanwhile, the percent of estuarine waters that can fully support shellfish harvesting from Class SB waters remains unchanged from the 2020 report at approximately 62 percent.[39]

Goal: The goal for marine shellfishing, adopted in the 2015 edition of the Long Island Sound Study's Comprehensive Conservation and Management Plan, is to "upgrade 5 percent of the acreage restricted or closed for shellfishing in 2014 by 2035". The "restricted or closed" acreage in 2014 totaled 167,264 acres, which included areas designated by DoAg as "prohibited", "restricted relay", and "conditionally restricted relay". Therefore, the goal is a reduction of restricted or closed acreage to 158,901 acres by 2035, shown on the chart as a gold horizontal line. There is a total of approximately 390,000 acres of shellfish beds managed by the DoAg, BoA.

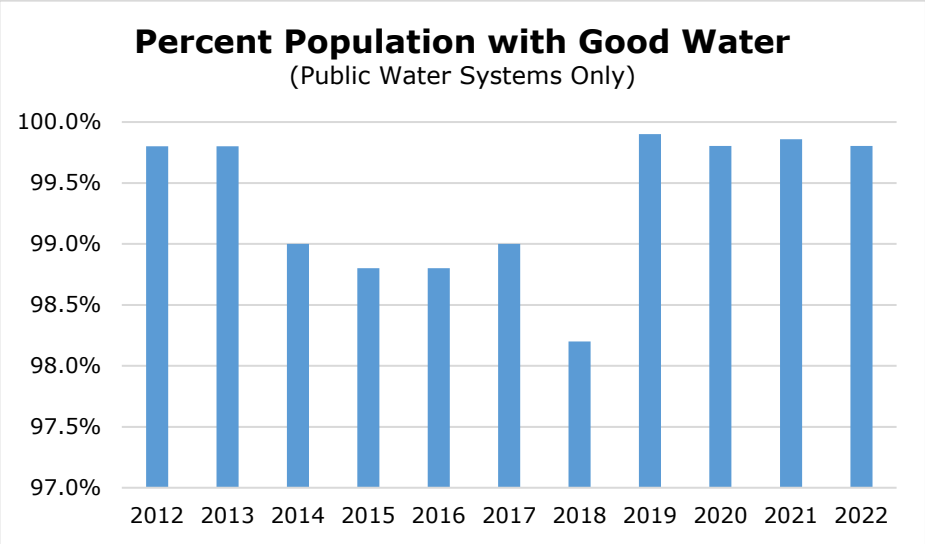
Technical Note: *The vertical axis in the chart above has been shortened, beginning at 100,000 acres rather than the customary zero. **SA waters allow shellfish harvesting for direct human consumption where authorized, whereas SB waters allow shellfish harvesting with depuration or relay where authorized. Depuration is the action or process of freeing something of impurities. In the case of shellfish, this usually means moving the shellfish to areas with better water quality.

Drinking Water

QUICK SUMMARY:
- COMPARED TO LAST REPORT
- COMPARED TO 10 YR. AVERAGE
- ON TRACK TO MEET GOAL

Move your cursor over the globe to learn how climate change affects the data on this page, or click on it for more detailed information

Drinking water quality in 2022 was very good, but chloride was again the most common contaminant detected in public water systems.



This indicator shows that 99.8 percent of the time, the population served by Community Water systems and Non-Transient Non-Community Water systems demonstrated full compliance with applicable standards, after weighting the reports to account for the number of people served by each system over time. Data for 2022 show a slight increase in the number of violations, based on the number of people served, from 2021 levels.[40] By far, the most common problem during 2022 in water systems was excessive levels of chloride, which is typical of most years.

In June 2022, the Connecticut Department of Public Health (DPH) updated the "Drinking Water Action Level for Per And Polyfluoroalkyl Substances (PFAS) and renewed its recommendation to all public water systems to test the water delivered to their customers for PFAS.[41]

About 80 percent of people in Connecticut are supplied by the public water systems included in the chart above. The remainder of the population primarily relies on private wells, which are not monitored by any government agency and are not counted in this indicator. An unknown but potentially significant number of private wells are contaminated by pollution or naturally occurring toxins, such as arsenic and uranium. A recent United State Geological Survey study of groundwater samples collected from more than 2,000 private wells in bedrock aquifers in Connecticut found that 3.9 percent of collected samples contained arsenic concentrations greater than the U.S. Environmental Protection Agency's (EPA) maximum contaminant level (MCL) of 10 micrograms per liter (µg/L), and 4.7 percent of collected samples contained uranium concentrations greater than the EPA MCL of 30 µg/L.[42] The DPH provides guidelines for testing of private wells.

Public Act 22-58 made several changes affecting water quality testing for private and semipublic wells, including a requirement that property owners test the water quality of their newly constructed private or semipublic wells, and provide prospective homebuyers and renters with educational materials on well testing.

Goal: It is assumed that the goal is for everyone to have safe drinking water.

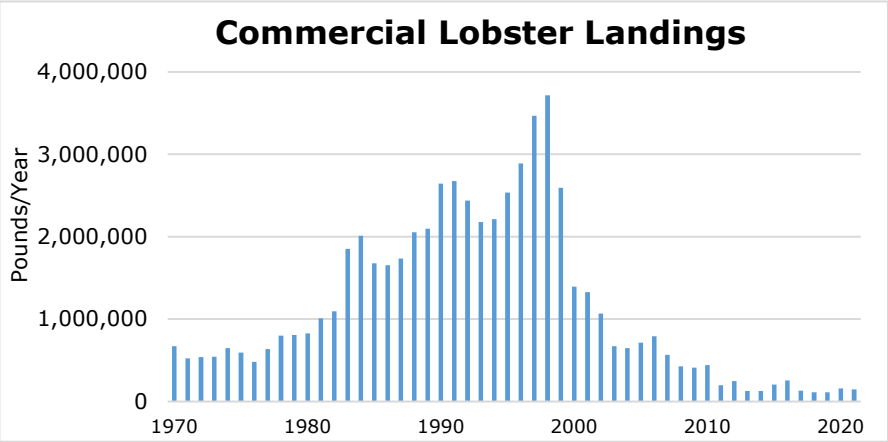
Technical Note: *The vertical axis in the chart above has been shortened, beginning at 97 percent rather than the customary zero. This allows the reader to see year-to-year differences, which would be nearly imperceptible if the chart began at zero. The chart above does not include "Transient Non-Community Systems" that do not meet the definition of a non-transient, non-community water system such as restaurants, parks, etc.

Lobster and Fishes of Long Island Sound

QUICK SUMMARY:
X COMPARED TO LAST REPORT
X COMPARED TO 10 YR. AVERAGE
— ON TRACK TO MEET GOAL

Move your cursor over the globe to learn how climate change affects the data on this page, or click on it for more detailed information

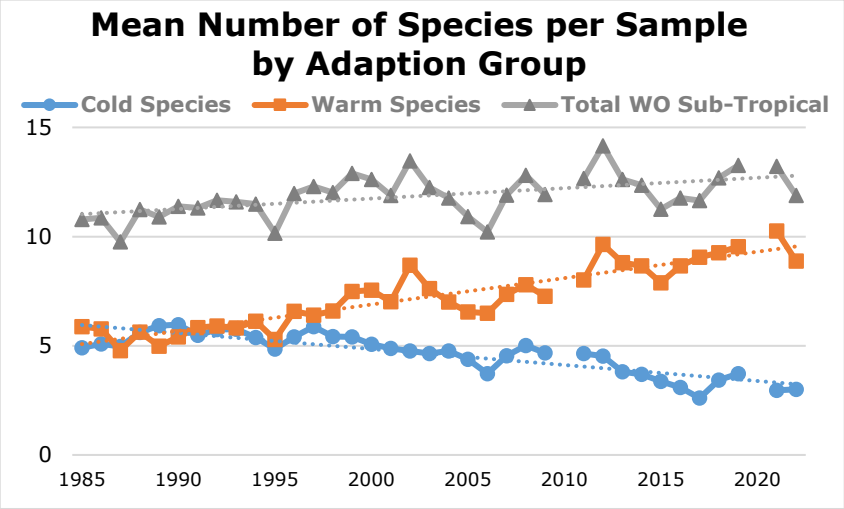
Long Island Sound's species are trending towards animals that prefer warm water.



Lobster, which thrive in cold water, have become less common in Connecticut waters. Lobster landings in the state have declined dramatically from a high of over 3.7 million pounds in 1998 to a low of approximately 111,000 pounds in both 2018 and 2019. In 2021 (most recent data available), lobster landings reached approximately 149,000 pounds, a decrease of approximately seven percent from 2020 levels and an approximately eleven percent decrease from the previous ten-year average.[43]

Researchers have investigated several possible causes for the dramatic downturn in lobster populations since 1998 including disease, changes in water quality, changes in climatic conditions and other human impacts to Long Island Sound, such as the presence of pesticides. The increase in water temperature may not negatively affect the availability of thermally suitable habitat; however, warmer temperature has been linked to the increased prevalence of epizootic shell disease, caused by bacteria.[44]

The decline in lobsters was also confirmed by Department of Energy and Environmental Protection's (DEEP) spring and fall trawl surveys. DEEP surveys marine fish, squid and lobster populations, usually every spring and fall, by towing nets from a research vessel.* The chart shows the mean number of fish species caught in each tow during the spring and fall surveys combined. The well-documented trend toward species that favor warm water is apparent.[45]



The impacts of warmer water temperatures have had mixed effects on species found in Connecticut waters. As depicted above, the trend indicates that the mean number of warm-adapted species has increased while the mean number of cold-adapted species has declined since 1985.** Overall, finfish diversity in Long Island Sound remains high, indicating that the Sound is healthy.

Technical Note: *Data from 2010 and 2020 are missing for the marine species chart because no fall and/or spring surveys were conducted those years. **Finfish species captured in the Connecticut DEEP Long Island Sound Trawl Survey were divided into adaptation groups based on their temperature tolerance and seasonal spawning habits.

Piping Plovers

QUICK SUMMARY:

✓ COMPARED TO LAST REPORT
✗ COMPARED TO 10 YR. AVERAGE
✓ ON TRACK TO MEET GOAL

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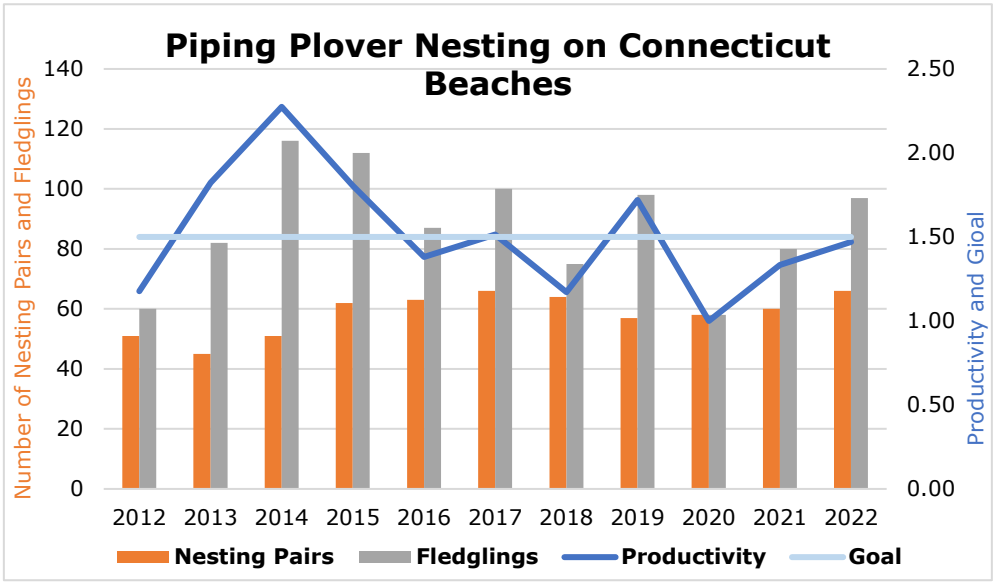
The number of plover chicks to reach flight age or "fledge" in 2022 was up from 2021.



In 2022, piping plovers in Connecticut raised an average of 1.47 chicks per nest. While productivity was good in 2022, it was slightly less than the goal and less than the previous ten-year average of 1.52. Some of the causes for the lower than average productivity in 2022 was attributed to predation, human/pet interaction, and the use of drones, which piping plovers may perceive as aerial predators.[46] In 1984, only 30 nesting piping plovers were observed in Connecticut. In 2022, 66 pairs successfully raised 97 young plovers on Connecticut beaches. Scientists estimate that each pair must successfully raise an average of 1.20 young per year to maintain a stable population and an average of 1.50 young per year to successfully increase the population of piping plovers to sustainable levels. Since protection and monitoring efforts began in 1984, nesting success has generally improved, resulting in more returning adults in subsequent years. However, the modest size of the population requires that the species continue in threatened status at the state and national level.

Piping plovers are small shorebirds that nest only on sandy beaches with sparse vegetation. The piping plover population is, according to the United States Fish and Wildlife Service (USFWS), "an indicator of the health of the fragile beach ecosystem."[47] Their habitat is a narrow strip squeezed between a rising Sound and higher ground. If their habitat is able to migrate upslope and inland in response to sea level rise, breeding areas could increase. However, habitat loss is anticipated on 45 percent of sandy ocean beaches that are already developed. Coastal flooding during breeding season might also affect piping plover breeding success by flooding nests and thereby increasing chick mortality.[48]

Goal: The goal for piping plover was derived from the Piping Plover Atlantic Coast Population Revised Recovery Plan (1996). That Plan's goal calls for 2,000 pairs along the east coast with 625 pairs throughout New England, and a five-year average productivity of 1.5 fledged chicks per pair.

****UPDATE****

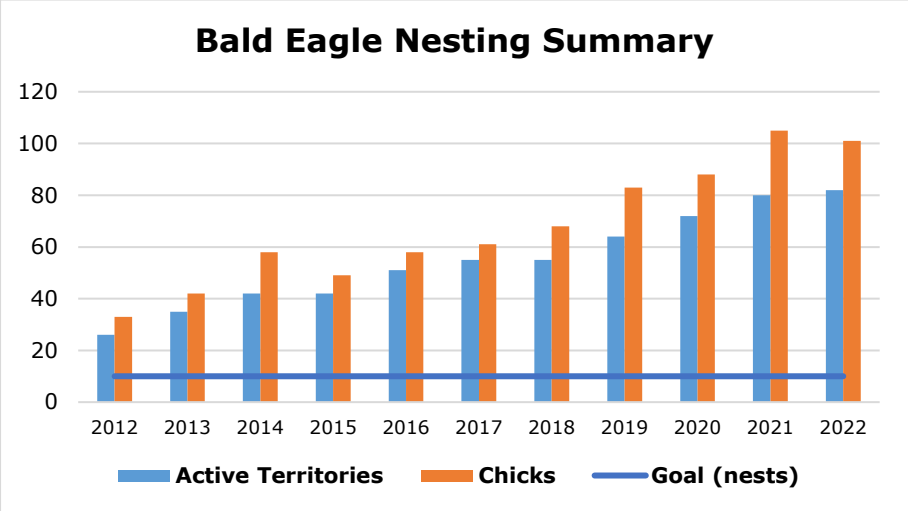
According to the U.S. Fish and Wildlife Service's 2019 Atlantic Coast Piping Plover Abundance and Productivity Estimates, there were 2,008 breeding pairs along the Atlantic coast, with over 980 breeding pairs in New England![49]

Raptors Rebound

QUICK SUMMARY:
- ✓ COMPARED TO LAST REPORT
- ✓ COMPARED TO 10 YR. AVERAGE
- ✓ ON TRACK TO MEET GOAL

Move your cursor over the globe to learn how climate change affects the data on this page, or click on it for more detailed information

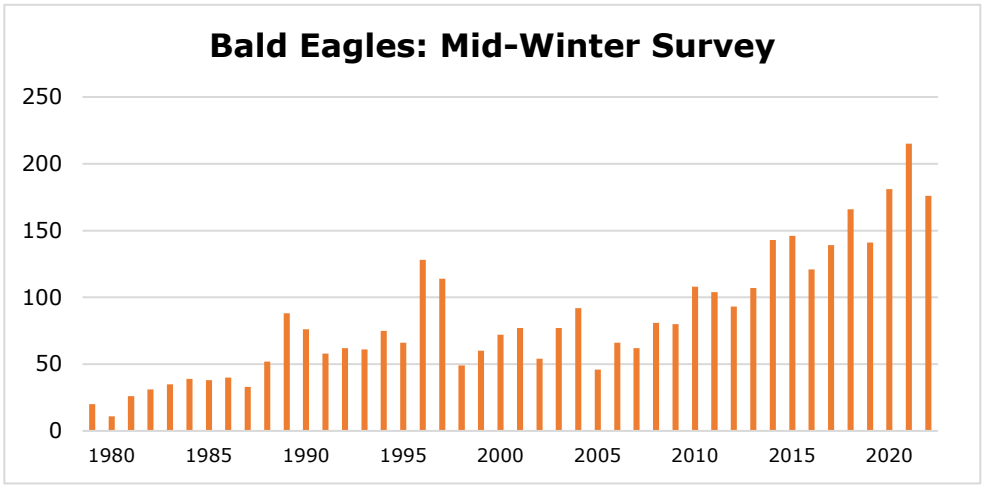
Bald eagles and ospreys continue their dramatic comeback!



2022 was another record year for bald eagles in the state, with at least 82 active territories across 67 towns. Over the past three decades, at least 933 chicks have been produced by Connecticut nests.

The population of bald eagles is included as an indicator because the eagle is representative of species that require large areas of relatively undisturbed land near rivers or lakes where the birds can find adequate supplies of fish and other prey that are – very importantly – only minimally contaminated.

Goal: Territories are resource areas used by eagles that have only one active nest. The goal for bald eagles is derived from the 1983 Northern States Bald Eagle Recovery Plan, prepared by the United States Fish and Wildlife Service (USFWS). The Plan established a goal of 20 breeding birds (10 nests) for Connecticut. According to experts in the Bald Eagle Study Group, Connecticut could eventually host up to 200 nesting eagles (100 nests).



The 2022 mid-winter survey in Connecticut recorded 176 eagles throughout the state. Since 1979, observations of eagles during the Midwinter Eagle Survey have increased significantly.[50]

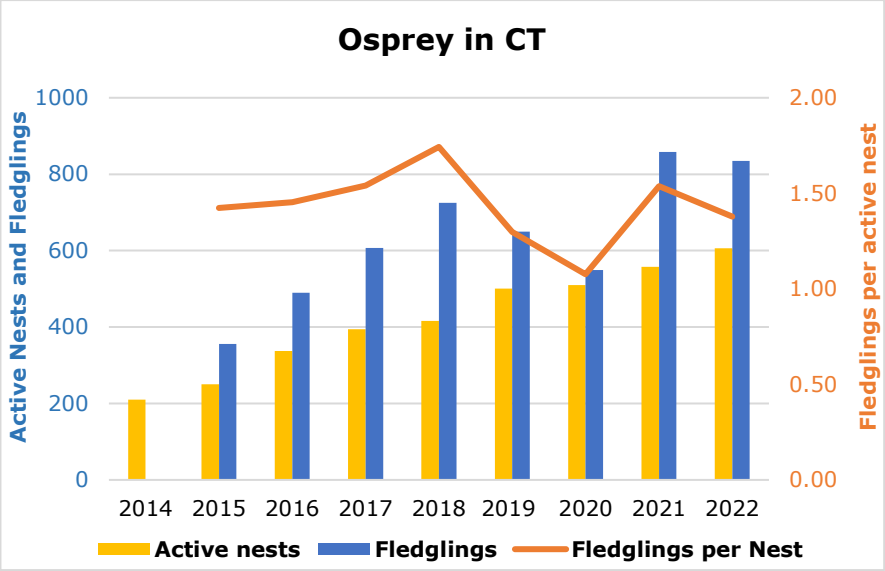
By the 1950's, the bald eagle was no longer a nesting species (extirpated) in Connecticut. The bald eagle was first declared an endangered species with the passage of the federal Endangered Species Act in 1973. Populations eventually began to recover due to the ban on the pesticide DDT, over five decades ago; the successful reintroduction programs of fostered chicks and fledglings; and habitat and nest protection measures. In 1995, the U.S. Fish and Wildlife Service reclassified the bald eagle from endangered to threatened in the lower 48 states. Populations continued to recover enough that, in 2007, the bald eagle was officially removed from the federal Endangered Species List; however, bald eagles are still protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. When Connecticut's first official Endangered, Threatened, and Special

Concern Species List was passed in 1992, the bald eagle was classified as "endangered". Because of the increase in nesting pairs in recent years, the bald eagle's status in the state was reclassified as "threatened" in 2010.[51]

Osprey:

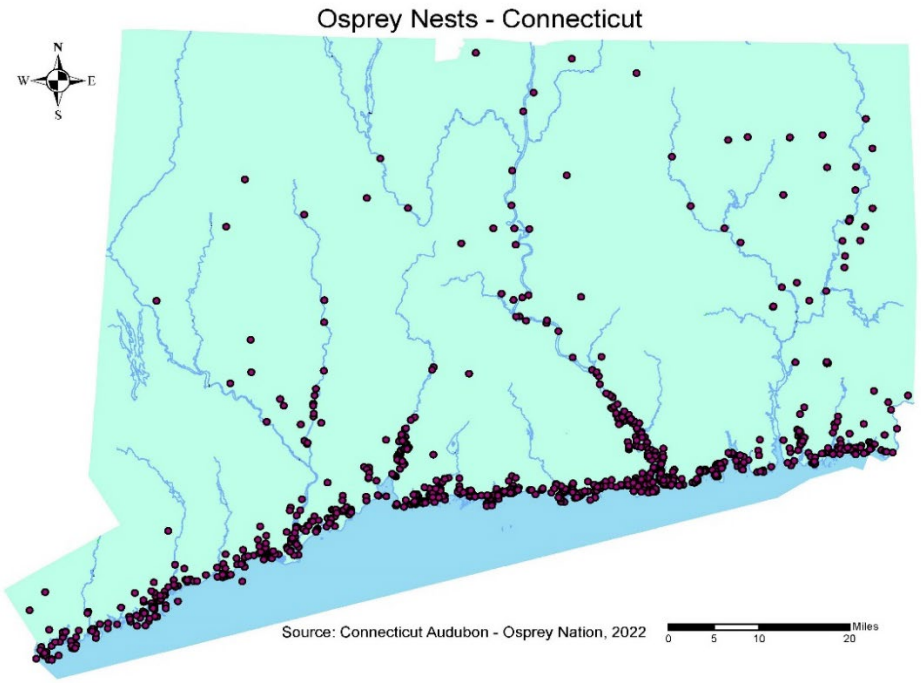
QUICK SUMMARY:

- ✔ COMPARED TO LAST REPORT
- ✔ COMPARED TO 10 YR. AVERAGE
- — ON TRACK TO MEET GOAL



Another large fish-eating bird of prey, the osprey*, has rebounded in similar fashion to the eagle. From a low of nine nesting pairs in 1974, ospreys, counted by the Connecticut Audubon Society's volunteers, were seen at more than 606 active nests in 2022, meaning they were occupied by an osprey pair. The 606 active nests produced 835 observed fledglings resulting in a productivity rate of 1.38 fledglings per active nest.[52]

Osprey, also known as the "fish hawk" feed primarily on fish; consequently, osprey nests are typically located along the Connecticut shore or proximate to water.



Goal: There is no established goal for ospreys in Connecticut, but ospreys are a "sentinel species," meaning their health indicates the health of the environment around them. Ospreys are being monitored by the Department of Energy and Environmental Protection (DEEP), the Connecticut Audubon Society, and volunteers.

Technical Note: *Data on fledglings for Osprey for 2014 was not available. Osprey counts in 2020 might have been affected by the COVID 19 pandemic.

Forest Birds

QUICK SUMMARY:

✓ COMPARED TO LAST REPORT

X COMPARED TO 10 YR. AVERAGE

— ON TRACK TO MEET GOAL

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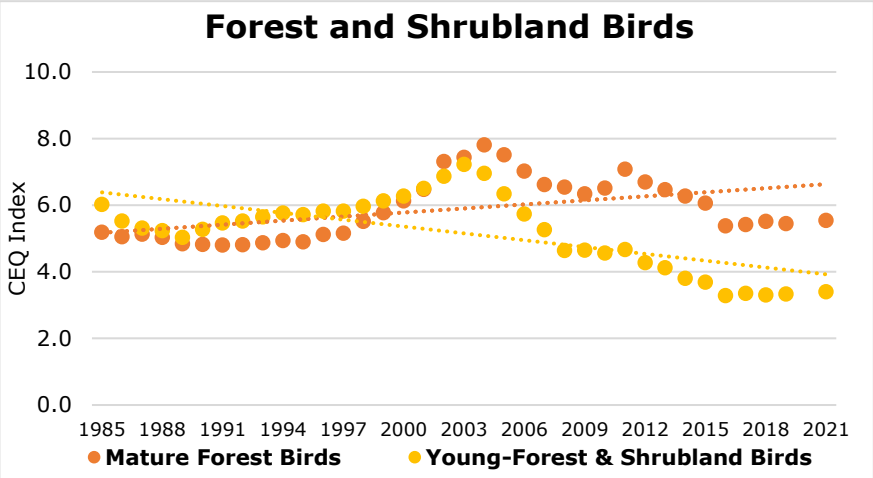
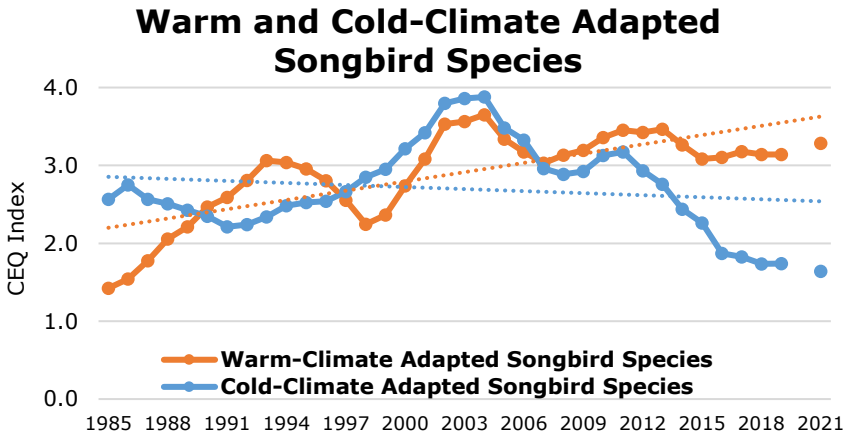
Young forest and shrubland birds are on the decline.



The population trend of songbird species that typically inhabit mature forests has increased over the last 35 years while the population trend of songbird species that typically inhabit forests that are young or dominated by shrubby vegetation, sometimes known as "shrublands", has declined over the last 35 years. As the amount of young forest and shrubland habitat has declined in Connecticut, so have the wildlife species that depend on it. However, the trend for both songbird species groups has generally declined since 2004. Most of the mature-forest bird species are affected greatly by forest fragmentation. Predators, invasive species, overpopulating deer and human activities and other intrusions into the forests cause nesting success to falter. The true forest birds, those that are not adapted to disturbed roadside or suburban habitat, will succeed in the long term only in forests that are not fragmented (i.e., core forests). Nationally, it is estimated that there has been a net loss of 2.9 billion breeding birds since 1970. It is estimated that approximately 63.5 percent of Eastern forest avifauna, which is comprised of 63 species, are in decline.[53]

Historic data indicate that the composition of Connecticut's songbird population is changing. Over the last 35 years, the trend for songbirds that prefer warmer climates is increasing, while the trend for cold-adapted songbird species is declining, based on the CEQ index. The CEQ index is used to assess the presence and abundance of a total of eighteen warm-climate adapted and cold-climate adapted songbird species.[54]



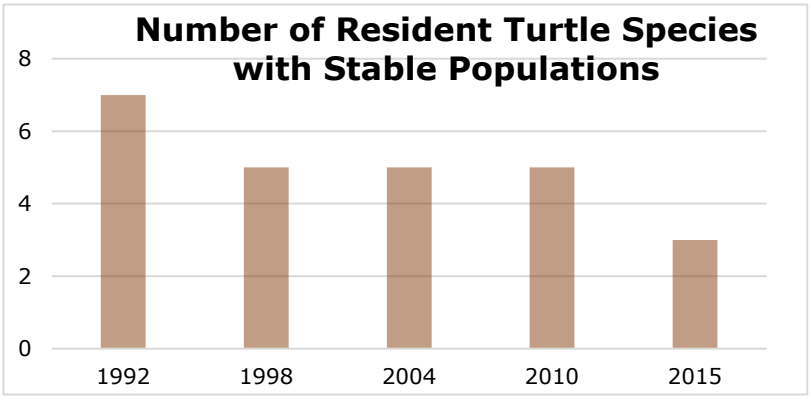
Goal: The goal for a variety of landbird species identified in the Partners in Flight Landbird Conservation Plan 2016 is to prevent further decline, stabilize populations in the short-term, and then reclaim a portion of their populations within 30 years.

Technical Note: *The Council calculates index values (using advice from statistics experts) to show the combined population trends of several species (for mature forest birds: Hairy Woodpecker, Wood Thrush, Eastern Wood-Pewee, Red-eyed Vireo, Scarlet Tanager, Black-and-white Warbler, Veery, Ovenbird; for bird species that typically inhabit forests that are young or dominated by shrubby vegetation: American Redstart, Blue-winged Warbler, Chestnut-sided Warbler, Eastern Towhee, and Yellow Warbler. Survey data were not available for 2020.

Wildlife
State-Listed Species

Resident Turtles

QUICK SUMMARY:
- COMPARED TO LAST REPORT
- COMPARED TO 10 YR. AVERAGE
- ON TRACK TO MEET GOAL

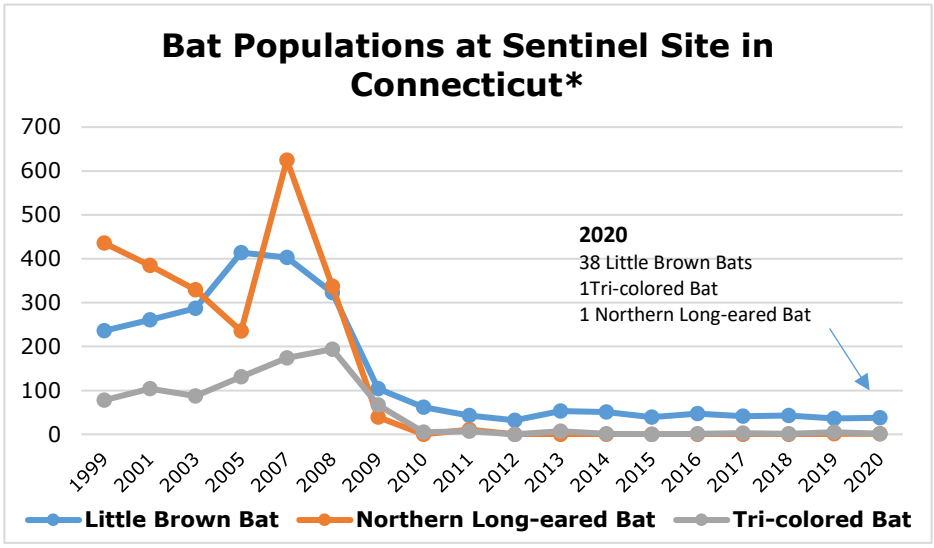


Five of the eight turtle species that live in Connecticut year-round are listed as endangered, threatened, or of special concern. Turtles are excellent indicators of ecological health. This indicator includes the eight species of turtle that live in Connecticut (but not the four marine species that visit Long Island Sound in summer, all of which are threatened or endangered). In 2015, five of the eight resident turtle species were listed as endangered or of special concern: bog turtle (endangered), eastern box turtle, wood turtle northern, diamondback terrapin, and spotted turtle (species of special concern).[55] Turtle species in Connecticut have declined, in part, because of poaching, and the degradation and segmentation of their habitat. The ability for turtles to sustain a stable population will be difficult because turtles take a long time to reach sexual maturity and have low survivorship when newly hatched.

Goal: The goal for all endangered and threatened species is for recovery of their populations to a stable, sustainable level.

Bats

QUICK SUMMARY:
- COMPARED TO LAST REPORT
- COMPARED TO 10 YR. AVERAGE
- ON TRACK TO MEET GOAL



Eight of the nine bat species are on the latest list of species that are endangered, threatened, or of special concern. Bat populations in Connecticut have experienced a catastrophic decline that led to the classification in 2015 of three more bat species as endangered in Connecticut and has raised concerns about the future of bats in the state. This decline in bat population, between 2007 and 2010, is primarily due to an epidemic fungal disease called white-nose syndrome (WNS). The chart depicts data for the winter population of three cave-dwelling bat species at a sentinel hibernation site monitored by the Department of Energy and Environmental Protection (DEEP).[56] This sentinel cave is one of Connecticut's best remaining overwintering sites for cave bats. Due to the COVID 19 pandemic, there were no hibernacula entries in 2021 and 2022. On November 29, 2022, the U.S. Fish and Wildlife Service published a final rule to reclassify the northern long-eared bat as endangered under the Endangered Species Act.[57]

Goal: The goal for bats is for recovery of all nine species to a stable, sustainable population.

Technical Note: *The horizontal axis for bats displays every other year between 1999 and 2007.

Invasive Insects

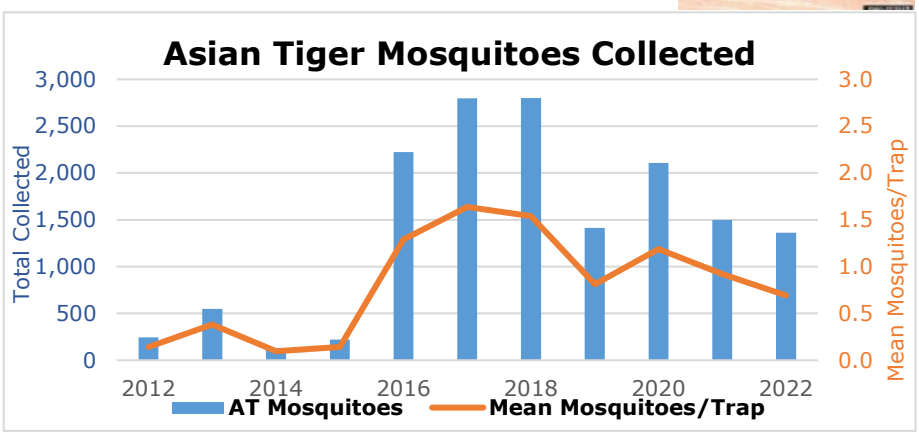
Move your cursor over the globe to learn how climate change affects the data on this page, or click on it for more detailed information

The "Invasive Disruptors" described in this section are two examples of species that are not native to Connecticut that have the potential to upset the ecological balance or threaten public health.

Asian Tiger Mosquitoes[58]

QUICK SUMMARY:

- ✓ COMPARED TO LAST REPORT
- ✓ COMPARED TO 10 YR. AVERAGE
- — ON TRACK TO MEET GOAL



The range of the Asian tiger mosquito is expanding in the United States, including Connecticut and other northeastern states. Infection rates of mosquito-borne diseases, such as Dengue and Zika, could rise over the long term, as a warming climate creates more favorable habitats for mosquitoes. Connecticut is expected to get warmer and wetter over the coming century, enhancing mosquito populations by creating more suitable habitat. Precipitation during the summer months and winter temperatures impact the number of mosquitoes in the state. Additional information about mosquito management in Connecticut can be found on Department of Energy and Environmental Protection's (DEEP) website or the Connecticut Agricultural Experiment Station (CAES) - portal.ct.gov/CAES.

Emerald Ash Borer

QUICK SUMMARY:

- X COMPARED TO LAST REPORT
- X COMPARED TO 10 YR. AVERAGE
- — ON TRACK TO MEET GOAL

It is assumed that the emerald ash borer (EAB), which attacks ash trees almost exclusively, is now present in every town in the state. In Connecticut, ash trees make up just slightly less than three percent of the trees in the forest, most of which are white ash. However, the loss of ash trees in a forest stand also reduces vital habitat and allows undesirable invasive plants to fill the gaps that are created. Movement of ash, in particular as firewood, nursery stock, logs and wood packaging materials, has been cited as the most likely means by which EAB has spread so rapidly.[59] Parasitoid wasps were released in the Northeast United States, including Connecticut, as a biological control for EAB; however, the long term success of such control measures is unknown.[60] Additional information about the emerald ash borer in Connecticut can be found on DEEP's website or CAES - portal.ct.gov/CAES.

Technical Note: Collection data for mosquitoes for 2016-2018 has been modified from previous reports because of the introduction of new data from a trapping site in Bridgeport. Information on other invasive species can be found in the Council's 2022 special report *Invasives: Previously Described and Newly Arrived*.

Waste Diversion

QUICK SUMMARY:

✓ COMPARED TO LAST REPORT
✓ COMPARED TO 10 YR. AVERAGE
✗ ON TRACK TO MEET GOAL

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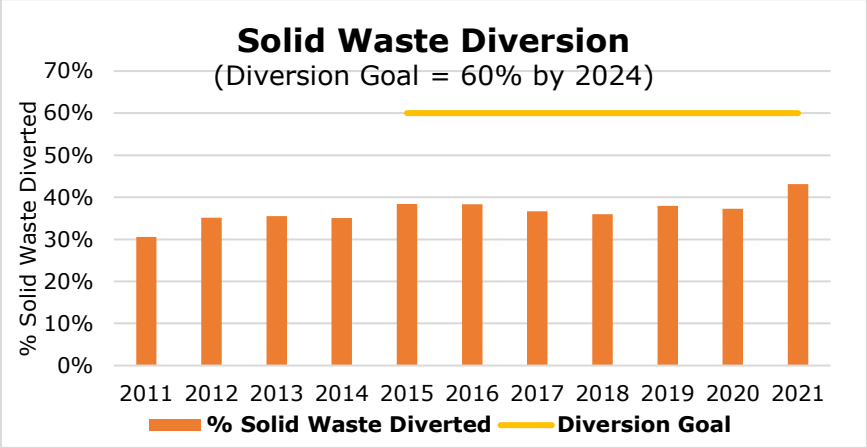
Solid waste management is a significant challenge in the state.

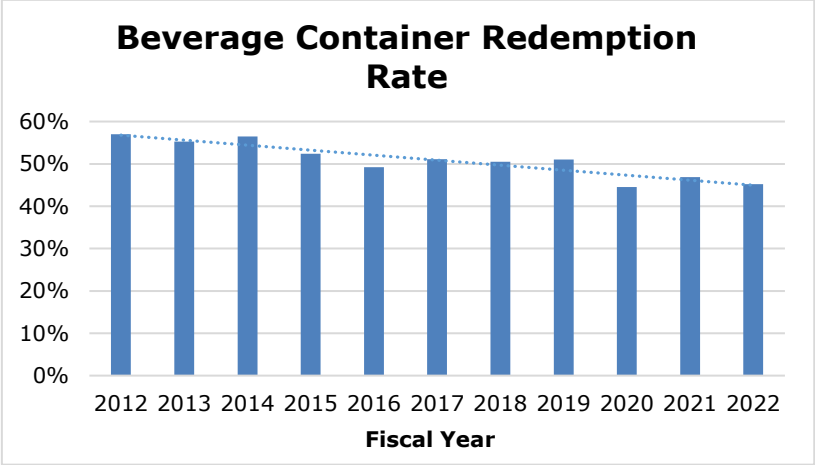


In 2021, (most recent data available) approximately 43 percent of the state's solid waste was diverted** from disposal. Almost 1.8 million tons of the state's solid waste were disposed of at one of the resource recovery facilities (RRF) in the state, while more than 350,000 tons were transported out of state for disposal. In addition, approximately 460,000 tons of designated recyclables and an estimated 70,000 tons recovered through the beverage container redemption program were sent to end markets and reuse facilities.[61] With the closure of the Material Innovation and Recycling Authority's RRF in Hartford in July 2022, and limited capacity for additional material at the other in-state RRFs, an estimated 860,000 tons of solid waste might be exported out of state for disposal in the near term.[62]

Beverage Container Redemption

QUICK SUMMARY:

✗ COMPARED TO LAST REPORT
✗ COMPARED TO 10 YR. AVERAGE
— ON TRACK TO MEET GOAL



The redemption rate in Connecticut in fiscal year (FY) 2022 was 45.2 percent, which was lower than in FY 2021, continuing the trend of decline for more than a decade.[63] The redemption rate for FY 2022 was also less than the ten-year average of 51.4 percent. In the Council's 2020 special report, *Low Deposit, Low Return*, the Council recommended ways to increase the redemption rate and divert more beverage containers from disposal. Public Act 21-58 revised the beverage container redemption program with several provisions to expand the deposit to more types of beverage containers, increase the beverage container deposit and expand the capacity of redemption centers. Public Act 22-118 expanded the availability of grants under the beverage container recycling grant program to be used to expand redemption centers and to eliminate the $150,000 funding cap.

Goal: The diversion goal of 60 percent by 2024 was established with the adoption of Public Act 14-94 and is identified in Connecticut's 2016 Comprehensive Materials Management Strategy, The Connecticut Solid Waste Management Plan.

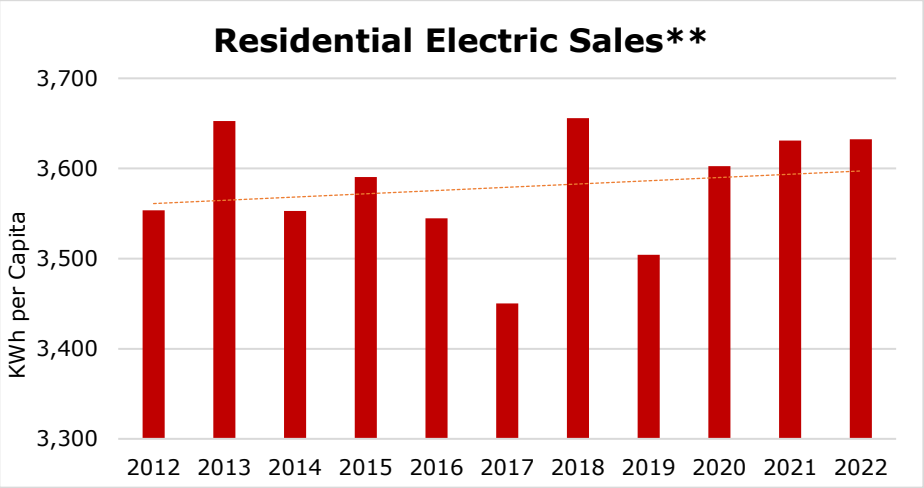
Technical Note: *Personal Impact indicators illustrate trends in behavior or practices that can be expected to influence the condition of tomorrow's air, water, land and wildlife. **"Diversion" includes the reduction of materials before it makes it into the waste stream for disposal (i.e., reuse, recycling, composting). Estimated "Diversion" is based on the 2005 baseline of 3.8 million tons, which is a planning value taken from the Solid Waste Management Plan; it is not actual solid waste generation.

Electricity at Home and Work

QUICK SUMMARY:
- XX COMPARED TO LAST REPORT
- XX COMPARED TO 10 YR. AVERAGE
- — ON TRACK TO MEET GOAL

Move your cursor over the globe to learn how climate change affects the data on this page, or click on it for more detailed information

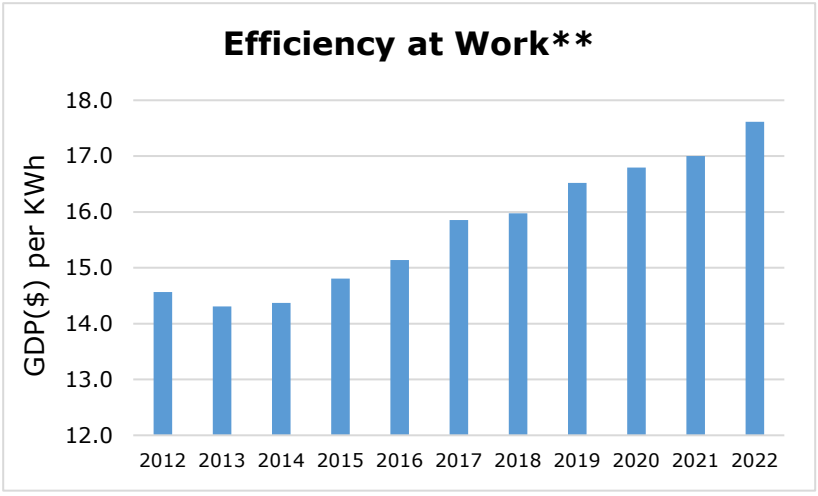
Connecticut residents' electric consumption increased slightly in 2022 to an average of 3,632 kilowatt-hours (KWh) per person.



In 2022, Connecticut's residential sector consumed approximately 13,172 million KWh, an increase of 0.6 percent from 2021 (13,092 million KWh) and 2.7 percent greater than the previous ten-year average (12,825 million KWh).[64] The use of fossil fuels for electric generation increases air pollution, especially from marginal units used to meet peak demand. Increasing the efficiency of electricity generating units, using renewable and zero carbon resources, reducing electricity use and peak demand, and carbon capture and sequestration are all viable strategies to reduce air pollution from electricity generation. The increase in residential electric sales in 2022 is likely in response to more people working from home[65] and warmer than average annual temperature. In 2022, there were 21 days with temperatures greater than 90°F, which was greater than the 20-year average (16.54) and the 60-year average (15.23). Typically, the hotter the summer, the more electricity is used by residents to cool their homes, which means more electricity that needs to be generated, and the more greenhouse gas emissions that are potentially released to the environment.

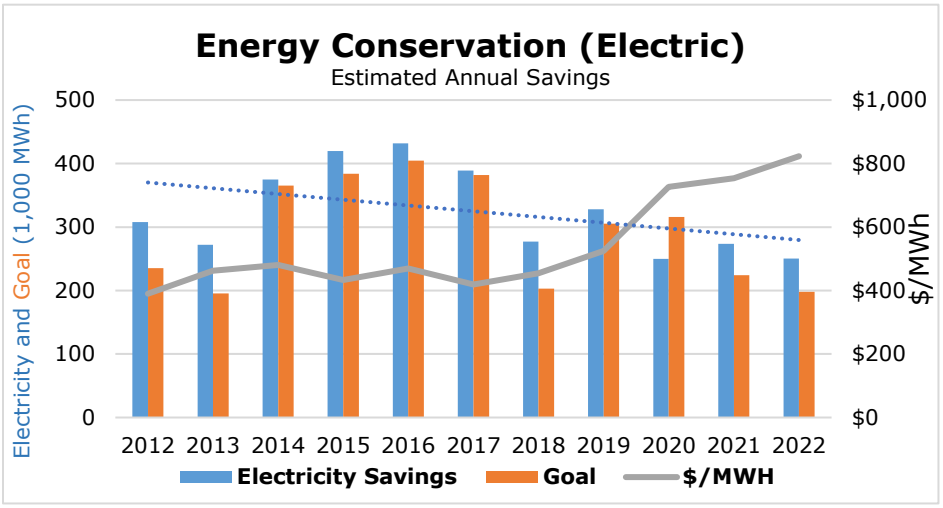
Connecticut's commercial and industrial sectors are using electricity more efficiently in 2022.

QUICK SUMMARY:
- ✓ COMPARED TO LAST REPORT
- ✓ COMPARED TO 10 YR. AVERAGE
- — ON TRACK TO MEET GOAL



In 2022, Connecticut's commercial and industrial sectors consumed approximately 14,335 million KWh.[66] The consumption of electricity in the commercial sector decreased by 1.5 percent, while the industrial sector increased 0.4 percent from 2021 levels. Connecticut's 2022 annual average Gross Domestic Product (GDP) was calculated at approximately $252,533 million (chained 2012 dollars).[67] Overall, there was an increase in efficiency (GDP $/KWh) of 3.5 percent from 2021 to 2022.

Estimated annual savings from electricity conservation measures have generally been declining since 2016.



QUICK SUMMARY:

COMPARED TO LAST REPORT

COMPARED TO 10 YR. AVERAGE

ON TRACK TO MEET GOAL

As mentioned above, reducing electricity demand, especially peak demand, is an effective strategy for reducing air emissions from fossil fueled electric generation. Estimated annual savings from electric efficiency measures in Connecticut in 2022 (250,189 megawatt hours (MWh)) was approximately 23,000 MWh less than in 2021 (273,318 MWh), and less than the ten-year average of 332,342 MWh.[68] Connecticut's energy-efficiency programs have helped small and large businesses, homeowners and renters, and state and local governments better manage their energy use. However, over the last ten years, the expenditure of funds (annual spending) for each MWh of electricity conserved (annual savings) has more than doubled. Programs and services for energy efficiency, both electricity and natural gas, are administered and delivered by Connecticut's electric and gas utilities but funded from a "Public Benefits Charge" on electric bills and through a conservation charge included in natural gas rates.

The Independent System Operator for New England (ISO-NE) estimates that the cumulative annual energy savings, net of embedded expiring measures, is expected to increase over the next ten years; however, the rate at which additional measures are applied in future years is expected to decline.[69] Energy efficiency measures are important because residential and commercial buildings use approximately 74 percent of all electricity and 39 percent of all energy use in the United States. In Connecticut, the approximately 1.4 million households and 140,000 businesses together account for more than 70 percent of Connecticut's 750 trillion BTU of annual energy consumption.[70] With widespread adoption of existing energy-efficiency building technologies, greater use of more energy efficient multi-family housing and the introduction and use of new energy efficiency technologies, energy use in homes and commercial buildings could be reduced by 50 percent.[71]

Goal: Public Act 18-50 introduced a new policy of the state to reduce energy consumption by 1.6 million MMBtus (one million British Thermal Units), or "the equivalent megawatts of electricity," annually each year for calendar years commencing on and after January 1, 2020 through calendar year 2025. Specific goals for electric savings vary for each year based on a number of factors, including the proposed budget.

Technical Note: *Personal Impact indicators illustrate trends in behavior or practices that can be expected to influence the condition of tomorrow's air, water, land and wildlife. **The vertical axis in the charts above "Residential Electric Sales" and "Efficiency at Work" have been shortened, beginning at 3,300 KWh/capita and 12.0 GDP($)/KWh, respectively, rather than the customary zero.

Personal Impact*

Zero Carbon Energy

QUICK SUMMARY:

XX COMPARED TO LAST REPORT
XX COMPARED TO 10 YR. AVERAGE
— ON TRACK TO MEET GOAL

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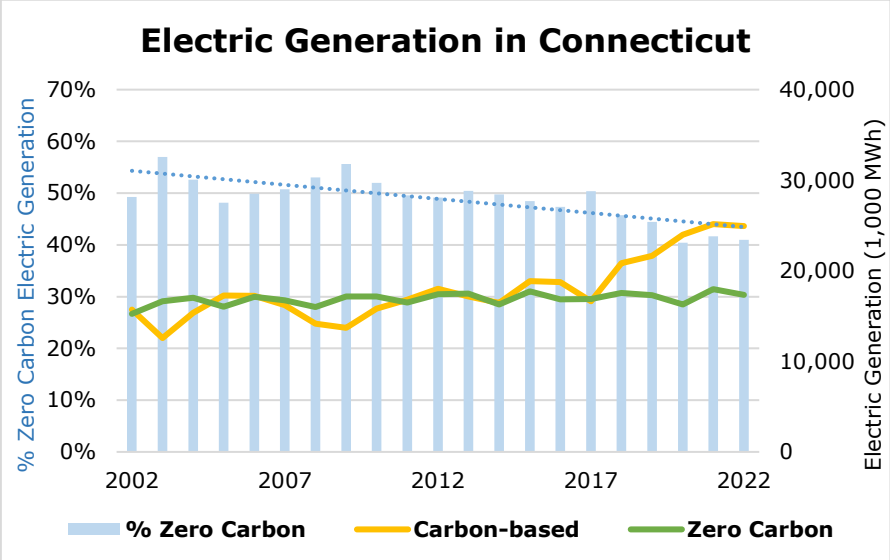
The ratio of zero carbon electricity to total electricity generation in Connecticut has been generally declining.



In 2022, electricity (megawatt-hour – MWh) from both utility scale zero carbon** and carbon-based electric generation resources located in the state decreased from 2021. The amount of zero carbon electricity, as a percentage of the total amount of electricity generated in the state, also decreased in 2022.[72] Including out-of-state generation resources, it is estimated that in 2021, approximately 62 percent of the electricity supplied to electric customers in the state was from zero carbon resources.[73]

Zero Carbon Goal - Consumption

In 2022, Public Act 22-5 was enacted that requires the reduction of greenhouse gas (GHG) emissions to a level of zero percent from electricity supplied to electric customers in the state by 2040. The state had procured approximately 710 megawatts (MW) of grid-scale solar capacity, 1,108 MW of offshore wind capacity, and the environmental attributes from the electric generation from Millstone.*** In August 2022, the Department of Energy and Environmental Protection (DEEP) announced that 170 MWs of solar and land-based wind energy projects selected by DEEP had been terminated and that the procurement of additional zero carbon resources was likely.[74] If the remaining procurements are developed, it would eventually increase the amount of zero carbon energy available for the state's residents and businesses; however, it might still leave the state short of its zero percent GHG emission target by 2040. The shortfall is more likely if one or more of the Millstone units are retired and/or the projected increases in electric demand for transportation (~431,000 EVs by 2031)[75] and thermal (97 GWH by 2031)[76] are accurate. The use of intermittent renewable technologies will require a significant amount of energy storage and/or upgrades to the electric transmission system.

Goal: Connecticut General Statute, Section 16-245a requires that a minimum percentage of electricity, which is sold to Connecticut customers, must be generated from renewable energy sources. That minimum amount is 24 percent for 2022 and will escalate to 40 percent in 2030 (Class I). As mentioned above, Public Act 22-5 requires the reduction of GHG emissions to a level of zero percent from electricity supplied to electric customers in the state by 2040.

Technical Note: *Personal Impact indicators illustrate trends in behavior or practices that can be expected to influence the condition of tomorrow's air, water, land and wildlife. **Includes utility scale renewables that generate no carbon and nuclear generation, and it is not the same as Class I or Class 2 renewable sources. Zero carbon generation does not include biomass (wood, municipal solid waste), fuel cells operating on natural gas, biogas, and landfill gas. ***Includes the environmental attributes associated with the facilities through 2029.

Personal Impact*

Solar Photovoltaics

QUICK SUMMARY:
- ✓ COMPARED TO LAST REPORT
- ✓ COMPARED TO 10 YR. AVERAGE
- — ON TRACK TO MEET GOAL

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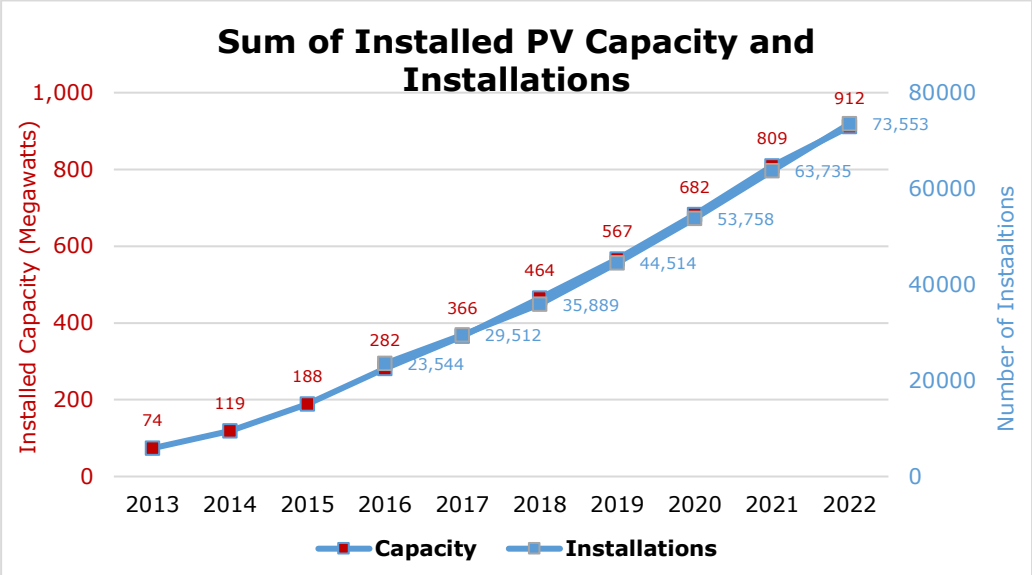
The number of solar installations throughout Connecticut increased in 2022.



Thousands of Connecticut homes and businesses now use the sun to generate much of their own electricity. Through December 2022, total installed solar photovoltaic (PV) capacity from over 73,500 installations exceeded 912 megawatts (MW) in the state.[77] On January 1, 2022, the new Residential Renewable Energy Solutions (RRES) program replaced the previous net metering and Residential Solar Investment Program, administered by the Green Bank, for residential renewable energy projects. In 2022, 5,998 solar PV installations with a total capacity of 47,133 kilowatts (kW) were deployed throughout Connecticut as part of the RRES Program.[78] The RRES program offers residential solar installations the opportunity to sell the energy produced and the renewable energy certificates (RECs) at a fixed 20-year price by selecting one of two incentive rate structures (tariffs).

Public Act 22-14 expanded the Non-Residential Energy Solutions program (NRES) and Shared Clean Energy Facility (SCEF) program. The new law also increased the maximum size of individual projects under the programs; expanded the programs capacity; allows commercial and industrial customers in the NRES program to use their entire rooftops to site projects and increases the proportion of SCEF projects that must benefit low-income customers.

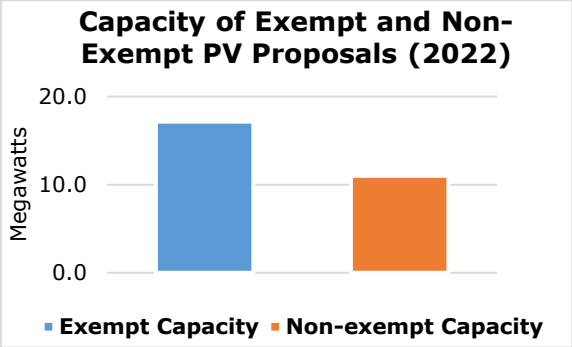
Utility Scale and Behind-The-Meter Solar PV

The Independent System Operator for New England (ISO-NE) projected that a total of approximately 1,880 MW of solar PV capacity could be installed in Connecticut by 2031.[79] The environmental and social impact of solar PV installations in Connecticut is mixed. The primary advantage of solar PV technology is that it produces electricity with zero emissions – no air pollution, wastewater, or noise. The 912+ MW of installed PV capacity in the state in 2022 is calculated to produce more than 1.16 million megawatt-hours (MWh) of electricity, which is calculated to potentially displace over 310,000 metric tons of carbon dioxide equivalent (CO_2e) emissions.[80]

An issue with land-based solar PV installations, primarily utility scale installations, is the impact such development has on farmland, forests, shrublands, and the species that inhabit these ecosystems. This is significant since the preservation of forests, open space, and farmland are state policy priorities and important as a mitigation strategy to address climate change.

Regulation of Certain Solar PV Systems

As a result of citizens' concerns regarding the proliferation of land-based solar PV systems in Connecticut, the Council issued a special report in 2017, *Energy Sprawl in Connecticut*, that identified deficiencies in state policy regarding the selection and siting of land-based PV installations and recommendations to ensure prime farmland and core forest habitats were protected. In response to citizen concerns, Public Act 17-218 was enacted, which requires certain solar projects to acquire written confirmation that the subject proposal would not "materially affect" the status of such land as prime farmland or core forest. Since Public Act 17-218 was enacted, the capacity of individual commercial PV projects, submitted to the Connecticut Siting Council (CSC) for regulatory approval through the Petition for Declaratory Ruling process, has decreased.



Certain provisions of Public Act 17-218, which require written determination regarding the "material affect" to core forest and prime farmland, only apply to certain commercial solar PV proposals, such as projects with a proposed capacity greater than two MW that seek approval from the CSC by Petition for Declaratory Ruling. In 2022, there were 13 proposals for solar projects submitted to the CSC; ten of those projects were exempt from the provisions of Public Act 17-218. All of the exempt projects were less than two MWs.[81]

Energy Storage

To more efficiently manage electricity generated by intermittent renewable generation and to improve energy management and reliability, Public Act 21-53 was enacted that requires the state to develop and implement one or more programs, and associated funding mechanisms, for electric energy storage resources connected to the electric distribution system. In 2022, Connecticut's Public Utilities Regulatory Authority (PURA) launched a statewide electricity storage program (Energy Storage Solutions) for all Eversource Energy (Eversource) and United Illuminating (UI) residential, commercial, and industrial customers. The nine-year program, administered by the Connecticut Green Bank along with Eversource and UI, will continue through at least December 31, 2030. In 2022, approximately 201 MWh of energy storage resources were submitted, approved or completed throughout Connecticut, with approximately 99 percent of the capacity serving the commercial and industrial sector.[82]

Goal: Public Act 21-53 established three goals for the deployment of energy storage systems in Connecticut: 1) 300 MW by December 31, 2024; 2) 650 MW by December 31, 2027; and 3) 1,000 MW by December 31, 2030.

Technical Note: *Personal impact indicators illustrate trends in behavior or practices that can be expected to influence the condition of tomorrow's air, water, land and wildlife.

Personal Impact*

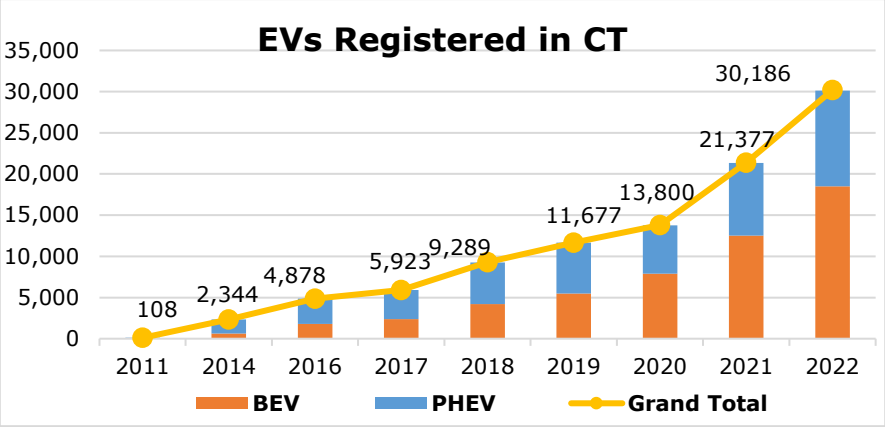
Transportation

QUICK SUMMARY:

- ✓ COMPARED TO LAST REPORT
- ✓ COMPARED TO 10 YR. AVERAGE
- ✗ ON TRACK TO MEET GOAL

Move your cursor over the globe to learn how climate change affects the data on this page, or click on it for more detailed information

Transportation contributes significantly to Connecticut's economy-wide emissions of greenhouse gases (GHG).



The number of electric drive vehicles (EVs)** registered in the state increased by approximately 41 percent from 2021 to 2022, although the number of registered EVs represents less than three percent of all registered vehicles in the state.[83] Significant reductions of GHG emissions in the transportation sector are necessary and achievable by reducing the combustion of fossil fuels through increased fuel efficiency, use of mass transit, and use of EVs that operate on electricity or "green" hydrogen. While there has been substantial growth in EVs in the state, it would be challenging to achieve the goal of 125,000 EVs in Connecticut by 2025[84] since that would require more than a 300 percent increase in just three years. Public Act 22-25 includes provisions to increase the number of EVS in the state fleet and promote the installation and use of EV charging.

Goal: Public Act 22-25 requires that an increasing percentage of all cars and light duty trucks purchased or leased by the state be battery electric vehicles: at least 50 percent by 2026, at least 75 percent by 2028, and 100 percent by 2030. In 2022, the Connecticut Department of Administrative Services (DAS) had 21 EVs, which represents approximately 0.6 percent of their vehicle fleet and the Connecticut Department of Transportation (CTDOT) had 12 EVs and 11 electric buses.[85]

Driving: The recent trend of driving more changed in 2020 and 2021.

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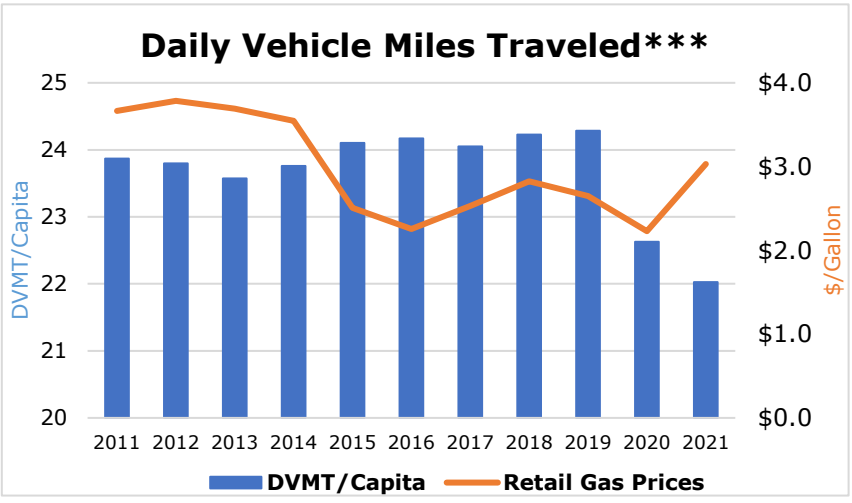
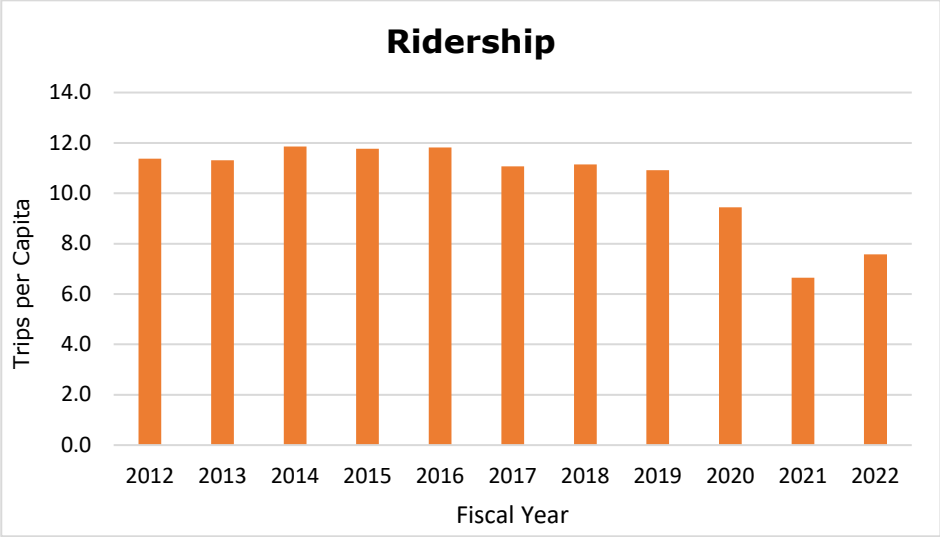


In 2021 (most recent data available), the average daily vehicle miles traveled (DVMT) per capita was 22.03.[86] From 2012 through 2019, the DVMT generally increased, which was consistent with the decrease in bus ridership depicted in the chart below. However, in 2020 and 2021, DVMT decreased, which might be due to fuel prices,[87] a change in commuter driving, and the impact of the COVID 19 pandemic as more people were learning and working from home, compared to previous years. In the past, as residents drove more, gasoline consumption increased, which caused more air pollution.

Goal: The Governor's Executive Order 21-3 focuses on climate change, greenhouse gas emissions, and climate resiliency. Section 8 of that Executive Order directed the CTDOT to establish a Vehicle Miles Traveled (VMT) reduction target. CTDOT proposes a VMT per person reduction of five percent by 2030 (from the 2019 baseline of 24.28 daily person miles), which equates to 23.07 daily person miles.[88]

Ridership: People got on the bus more often in 2022 than in 2021 but less than the previous ten-year average.



QUICK SUMMARY:

✓ COMPARED TO LAST REPORT

X COMPARED TO 10 YR. AVERAGE

— ON TRACK TO MEET GOAL

In fiscal year (FY) 2022 (July 2021 through June 2022), total ridership (27.5 million passenger trips) on fixed route, commuter, and Americans with Disabilities Act (ADA) transit services increased from FY 2021 (24 million passenger trips). In FY 2022, average per capita passenger trips were 7.6, which is approximately 14 percent higher than 2021 (6.65), but approximately 29 percent lower than the ten-year average (10.74).[89] Some reasons for the general decline in ridership in FY 2022 compared to the previous ten years include the impact of COVID 19, alternate work arrangements (teleworking), and the success in ride sharing efforts. It should be noted that buses were fare free from April 1, 2022 through June 30, 2022, and that was extended through March 31, 2023.[90]

Technical Note: *Personal Impact indicators illustrate trends in behavior or practices that can be expected to influence the condition of tomorrow's air, water, land and wildlife. ** Electric drive vehicles (EVs) include plug-in hybrid electric (PHEV), battery electric (BEV), electric motorcycles, and fuel cell electric (FCEV) vehicles. Electric motorcycles and fuel cell electric vehicles are included in the total number of EVs registered in the state. "Green" hydrogen refers to the production of hydrogen from sources other than fossil fuel. ***The vertical axis in the chart above has been shortened, beginning at 20 DVMT/capita rather than the customary zero. The CTDOT collects traffic volumes on a sample of Connecticut roadways (both state and local), on a three-year cycle, which are used to develop the DVMT.

Compliance

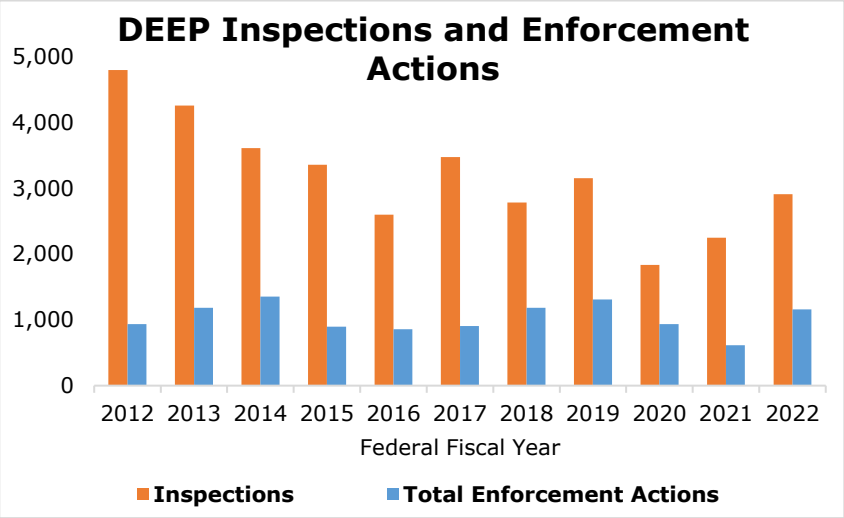
QUICK SUMMARY:

✓ COMPARED TO LAST REPORT

✓ COMPARED TO 10 YR. AVERAGE

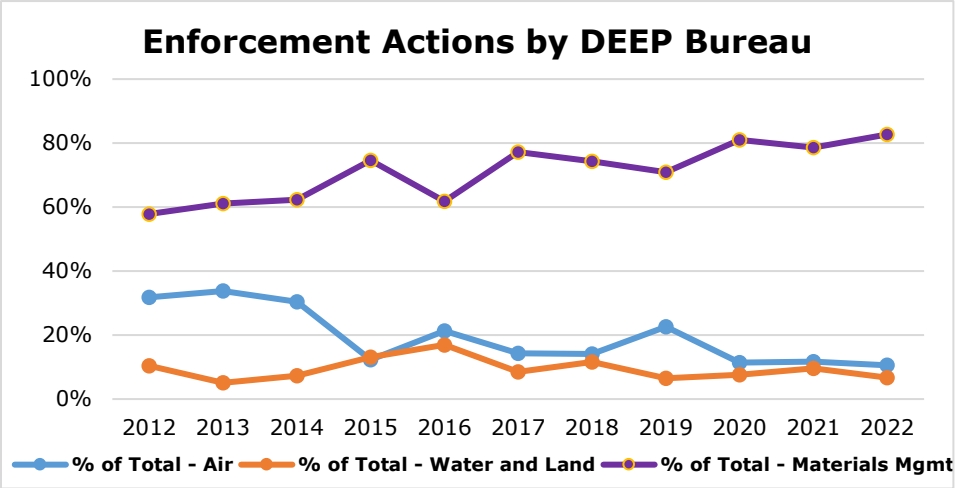
— ON TRACK TO MEET GOAL

In 2022, the number of inspections and enforcement actions by DEEP increased from 2021.



In the 2022 Federal Fiscal Year (FFY 22: October 1, 2021 – September 30, 2022), there were more than 2,907 inspections* performed by the Department of Energy and Environmental Protection (DEEP), an increase of almost 30 percent compared to the previous year. There had been a decline in the number of inspections performed by DEEP over the last ten years. In FFY 22, there were also 1,156 enforcement actions, which included 1,037 "Informal Enforcement Actions", consisting of Notices of Violation (NOV), Notice of Non-Compliance (NON), and warning letters; 115 "Formal Enforcement Actions"; and four "Referrals" to the Attorney General/Environmental Protection Agency. As depicted in the chart below, the Bureau of Materials Management was responsible for 956 or approximately 83 percent of the enforcement actions. Of this total, the Underground Storage Tank section was responsible for approximately 600 enforcement actions.[91]

The Informal Enforcement Actions are enforcement tools, generally issued whenever DEEP detects one or more violations with a permit, at a facility, or a permitted use. Informal Enforcement Actions can be issued for relatively minor or major violations; in cases of the latter type, the recipient might also receive an order, which might carry a financial penalty.



Technical Note: *FFY 2022 is the first year DEEP is reporting Emergency Response Unit (ERU) data. To ensure consistency with previous data, 1,739 inspections and nine (9) NOVs attributed to the ERU were subtracted from the total number of inspections and enforcement actions reported in FFY 2022.

This page explains how climate change affects the environmental indicators in this report.

Bald Eagles and Osprey: Climate change affects the survival of bald eagles on multiple levels, according to scientists. As climate change progresses, the National Audubon Society's climate model projects that bald eagles will have just 26 percent of their current summer range by 2080. It is possible that the birds will adapt and reclaim summer terrain as new areas become hospitable, but it isn't known whether the birds will be able to find the food and habitat they need to survive.

Climate Changers: Greenhouse gases (GHG), including carbon dioxide (CO2), from human activities are the most significant drivers of observed climate change. Carbon dioxide is generated as a result of the combustion of fossil fuels and to a lesser extent, the clearing of land for agriculture, industry, and other human activities. As described in a recent study released by the Governor's Council on Climate Change, average temperatures in Connecticut could increase by 5°F (2.7°C) by 2050 compared to the 1970-1999 baseline in Connecticut.

Degree Days: Degree days are defined as the number of degrees by which the average daily temperature is higher than 65°F (cooling degree days) or lower than 65°F (heating degree days).

Drinking Water: Extreme rainfall events lead to more runoff when the soil simply is not able to absorb the precipitation at the rate it is falling. In urban, suburban, and agricultural areas, this runoff can pick up pollutants from the landscape and carry them to nearby rivers and other waterways, potentially affecting the quality of drinking water. In addition to more intense storms and flooding, more frequent or longer dry spells are also projected in many climate change scenarios, which makes the scarcity of water a concern.

Electricity at Home and Work: Increases in temperature will likely increase energy demand, as well as change our ability to produce electricity and deliver it reliably. In a warmer climate, more electricity will be used for air conditioning and less natural gas, oil, and wood for heating. To the extent that the increased demand is met by sources that are carbon-based, climate warming could be exacerbated.

Farmland: Climate change may benefit some plants by lengthening growing seasons. However, other effects of a warmer climate, such as less carbon sequestration in the soil, more pests, droughts, flooding, less predictable weather patterns, and changes in ground-level ozone concentrations will be less beneficial for agriculture.

Forest Birds: Climate change affects birds both directly and indirectly. As temperatures warm, some bird species will benefit from milder winters and extended breeding seasons. Others, such as northern birds associated with forest habitats, will likely decline in Connecticut, due in part, to increased competition and increased frequency of droughts and extreme storm events that might inflict higher mortality during the breeding seasons.

Good Air Days: The number of days with bad air is related to a number of factors, including ambient air temperature, concentrations of air emissions, wildfires, weather patterns, etc. Elevated temperatures can directly increase the rate of ground-level ozone formation, which is formed when nitrogen oxides and volatile organic compounds react in the presence of sunlight and hot weather.

Invasions: Climate change threatens to increase the extent, frequency, and severity of invasive species. The milder winters and extended spring that comes with climate change are helping invasive species extend their ranges, pushing aside native species and transforming habitats. The removal of temperature or moisture constraints will allow species to move into and successfully invade new areas.

Lobsters: Climate change is increasing the water temperature of Long Island Sound. Water temperature can have a significant impact on lobster's health and ecology (e.g., recruitment, behavior and distribution).

Piping Plovers: Coastal-nesting birds, such as the piping plover, are among the species most threatened by climate change. Rising sea levels might reduce nesting areas available for many coastal and nesting birds.

Preserved Land and Forests: The climate influences the structure and function of forest ecosystems and plays an essential role in forest health. Forests are sensitive to changes in temperature and precipitation and are greatly affected by fragmentation and land-use change, invasion by nonnative species, forest diseases and insect pests, and extreme weather events. Land conservation can help to reduce the impacts of climate change by absorbing carbon dioxide.

Renewable Energy: Renewable energy is one of the most effective tools against climate change. Zero carbon energy sources provide a tremendous resource for generating clean and sustainable electricity without toxic pollution or global warming emissions. Solar panels, wind turbines, hydroelectric facilities and other technologies do not release any emissions as they generate electricity.

Rivers and Streams: Rivers and streams are affected greatly by fluctuations in precipitation and evaporation patterns around the world. Warming temperatures are altering the water cycle and shifting precipitation patterns. Changes in the timing and location of precipitation combined with rising levels of water pollution will strain ecosystems and threaten the survival of many fish and wildlife species. An increase in severe storms due to climate change will degrade water quality and increase the risk of catastrophic floods; while frequent droughts, enhanced evaporation, and decreases in overall annual rainfall would result in reduced water levels in streams, rivers, and lakes.

Swimming, Clamming and Oystering: As the atmosphere warms, changes to the amount, timing, distribution, and intensity of precipitation will continue. As more intense precipitation leads to increased runoff, more pollution is washed into waterways, including sediments, nitrogen from fertilizers, disease pathogens and pesticides, which affects water quality. The same factors that affect beaches present problems for shellfish beds.

Transportation - Driving and Riding: Combustion of fossil fuels, such as gasoline and diesel, releases GHG emissions into the atmosphere. Both nationally and in Connecticut, the transportation sector is the greatest contributor of GHG emissions.

Warming and Rising Waters: Global mean sea level has risen about 8–9 inches (21–24 centimeters) since 1880, with about a third of that coming in just the last two and a half decades. The rising water level is mostly due to a combination of meltwater from glaciers and ice sheets and thermal expansion of seawater as it warms. The Connecticut Institute for Resilience and Climate Adaptation (CIRCA) recommended that Connecticut plan for and expect 50 centimeters (20 inches) of sea level rise by 2050 with further increases following that date.

Waste Diversion: Recycling and waste reduction have many direct benefits; however, the indirect benefits are also significant. Recycling and waste diversion reduce GHG emissions that would be created by the production, transport, and disposal of municipal solid waste. Increasing recycling and source reduction has been identified as a key strategy for reducing GHG emissions in Connecticut's Climate Change Action Plan.

Water of Long Island Sound: Climate change has a variety of direct and indirect effects on ocean ecosystems. Increasing temperatures have the capability to make coastal and marine ecosystems more vulnerable to hypoxic conditions, as well as drive the expansion of hypoxic environments. In

general, warmer water holds less dissolved oxygen than colder water. As the estuaries and oceans heat up, less oxygen is held, stratification of the Sound waters intensifies, and deeper waters then lose even more oxygen.

Wetlands: Wetlands play a role in our ability to manage risks from climate change. Wetlands are an important sink for GHG, where carbon is stored and prevented from entering the atmosphere. Wetlands provide important functions including cleaning up polluted water. slowing and storing floodwaters and snow melt, recharging groundwater, and supporting habitat for many different native plant and animal species.

Remedying the Deficiencies of Existing Programs and Activities

The Council acknowledges the efforts of the Governor and Legislature in enacting legislation in recent years to address the critically important issue of climate change. Consistent with its charge to recommend actions to improve state environmental programs, the Council recommends the following:

- **Agricultural Land and Core Forests** - Protect agricultural land and core forests by expanding the forest and farmland protections of Public Act 17-218 to include any solar energy project within the jurisdiction of the Connecticut Siting Council.

- **Invasive Species** - Protect Connecticut from invasive species by enhancing education and increasing resources to combat invasive species.

- **Land Preservation**
  1) Enhance land preservation efforts by allocating resources so that the Department of Energy and Environmental Protection and its conservation partners can better track and preserve, through acquisition or easement, priority conservation land;
  2) Refine the Department of Agriculture's (DOA) Farmland Preservation Program and the Community Farms Preservation Program to preserve significantly more acres of farmland; and
  3) Clarify the intent of Connecticut General Statute Section 7-131n that any conversion of park land owned or in the care of municipalities be maintained as parks or if they must be converted for some other use, that parks be replaced at a greater than one-to-one ratio.

- **Solid waste and Recycling** – Increase the diversion of solid waste (recycling, composting, source reduction, etc.) and the redemption of beverage containers.

- **Ridership –** Enhance ridership of public transportation by serving people with unmet transportation needs and attracting more people that have transportation options.

- **Wetlands** - Increase staff resources within the Land and Water Resources Division at the Department of Energy and Environmental Protection (DEEP) designated specifically to assisting municipal wetland officials and commissions. Such assistance should include 1) conducting audits of permits issued by inland wetlands agencies to provide targeted education, 2) expanding the training program for municipal officials, 3) assessing the possibility of using electronic submission of the "Activity Reporting Form" to enhance municipal participation and to increase the efficiency of the reporting process, and 4) helping to ensure compliance with applicable wetlands laws.

Research and Reports

The Council published the 2021 *Environmental Quality in Connecticut* annual report in April 2022. In this year's annual report, the Council included new data and charts on greenhouse gas emissions by economic sector, forest birds, forest acreage, and environmental enforcement actions. The Council also notes that there was no new data for wetlands, bats and turtles. The inclusion of biological indicators requires considerable care in the selection of appropriate species, and the Council is grateful for the advice it received from experts.

In 2022, the Council developed a special report on invasive species in Connecticut, *Invasives: Previously Described and Newly Arrived*, which is an update to the 2002 special report by the Council, *Great Infestations*. It has been 20 years since the Council released *Great Infestations* and in the intervening years, those that were identified in that initial report have prospered and many new invasive species, both animal and plant, have taken up residence in our state. None have been extirpated and it is not realistic to expect that they will be. In fact, it is to be expected that more will arrive as a consequence of the warming climate that is gradually making Connecticut more hospitable to species that do not tolerate cold weather. The 2022 report examined the adverse impacts of invasives on all the state's land forms and ecosystems, from its waterways to its natural lands and also its working lands and developed landscapes. The 2022 report also included recommendations, including actions to improve how the state addresses the control of invasive species; the restoration of the position of invasive plants coordinator; establishment of a repository for data on invasive species within the state; and an expansion of the state's education efforts about invasive species. Public Act 22-118 established the Office of Aquatic Invasive Species, within the Connecticut Agricultural Experiment Station, with certain responsibilities, including: coordinating research efforts for aquatic invasive species control and eradication; serve as a repository for state-wide data on the health of rivers, lakes and ponds in relation to the presence of aquatic invasive species; perform regular surveys on the health and ecological viability of waterways in the state in relation to the presence and threat of aquatic invasive species; educate the public and advise municipalities on management of aquatic invasive species; and serve as a liaison with state agencies, including the Department of Energy and Environmental Protection (DEEP).

Advice to Other Agencies

Council staff reviewed proposals to the Connecticut Siting Council; Environmental Impact Evaluations and notices prepared by other agencies, consistent with the requirements of the Connecticut Environmental Policy Act; proposed transfers of state-owned land; and proposed projects funded through the Local Bridge Program and submitted comments when deemed appropriate. The Council provided training to several state agencies and updated some of the templates to assist state agencies to develop notices for publication in the *Environmental Monitor*.

The Council commented on several state activities and plans, including the following:

- white paper on the applicability of the Connecticut Environmental Policy Act (CEPA) regarding forest management and tree maintenance activities;
- comments regarding the Environmental Impact Evaluation (EIE) for the Ox Brook Flood Control Master Plan - Phase 1;
- comments regarding DEEP's Hazard Tree Mitigation Policy;
- comments regarding the replacement of the Forge Hill Road Bridge in Voluntown and the Poverty Road Bridge in Southbury;
- comments regarding the proposed land transfer by the Connecticut Department of Transportation in Waterford and North Canaan; and
- proposed legislation that could have impacted Connecticut's environment.

The Council also commented on four applications for a Certificate of Environmental Compatibility and Public Need and 23 Petitions for Declaratory Ruling to the Connecticut Siting Council.

Public Act 20-9, An Act Revising Provisions of the Transfer Act and Authorizing the Development and Implementation of a Release-Based Remediation Program, stipulated that the Council would be a member of a working group to develop regulations to implement a Release-Based Remediation Program. The Council has participated in the working group through the subcommittees and group meetings.

Citizen Concerns and Complaints

State law directs the Council to investigate citizen complaints alleging violation of any statute or regulation in respect to environmental quality. In 2022, staff investigated numerous complaints, including noise; wetland impacts; potential impacts of a telecommunications facility; solid waste; invasive species; property remediation; and water quality. The Council also addressed questions regarding the applicability of the Connecticut Environmental Policy Act to certain proposed state actions. Routine matters are usually addressed by providing the person who inquired/complained with the correct person or agency to handle the matter. The Council is appreciative of the assistance provided by the Departments of Energy and Environmental Protection (DEEP), Public Health, and Transportation; the Office of Policy and Management; and others to answer citizen inquiries and resolve complaints.

Every month the Council discusses the inquiries and complaints of environmental consequence that were presented to the Council by individuals and groups. In 2022, the Council held 12 regular meetings and two special meetings. Many times, citizen complaints and inquiries lead to special reports, such as the Council's 2020 special report *Low Deposit, Low Return*, on the problem with the State's beverage container redemption program.

In December 2021 and early 2022, the Council was also made aware of DEEP's tree removal activities at Housatonic Meadows State Park from citizens concerned about the removal of certain trees at the Park. The Council encouraged DEEP to develop a comprehensive tree policy that would provide for public safety while increasing opportunities for the conservation of trees, public notice and transparency. Public Act 22-143 (17) required DEEP to develop, finalize and publish on DEEP's Internet web site a hazardous tree mitigation policy that would apply to the designation, removal and mitigation of trees located in state parks and campgrounds. On August 1, 2022, DEEP issued its final Hazard Tree Mitigation Policy. The Public Act also required DEEP to implement a tree replanting demonstration project at Housatonic Meadows State Park, in consultation with state park or forest advocacy groups or organizations.

Council Duties

The main responsibilities of the Council on Environmental Quality are described in Sections 22a-11 through 22a-13 of the Connecticut General Statutes.

The Council is a nine-member board that works independently of the Department of Energy and Environmental Protection (except for administrative functions). The Chairman and four other members are appointed by the Governor, two members by the President Pro Tempore of the Senate and two by the Speaker of the House. The Council's responsibilities include:

1. Submittal to the Governor of an annual report on the status of Connecticut's environment, including progress toward goals of the statewide environmental plan, with recommendations for remedying deficiencies of state programs.

2. Review of state agencies' construction projects.

3. Investigation of citizens' complaints and allegations of violations of environmental laws.

4. Review of environmental impact evaluations that state agencies prepare for major projects under the Connecticut Environmental Policy Act (CEPA). The CEPA regulations were amended in September 2019.

5. Publication of the *Environmental Monitor*, the site where all state agencies must post their scoping notices and environmental impact evaluations under CEPA. The *Environmental Monitor* also is the official publication for notice of intent by state agencies to sell or transfer state lands.

6. Participation in studies and working groups on environmental issues, as directed by the legislature, such as the Release-Based Clean Up Program Regulation Development.

Keith Ainsworth
Keith Ainsworth has been an environmental and land use litigator of the New Haven Bar for nearly three decades. Keith has a broad conservation-based practice representing land trusts, non-profits, landowners and businesses in transactions and litigation throughout Connecticut before administrative agencies and state and federal courts. As a former chair of the Connecticut Bar Association Environmental Law section and a municipal first selectman (Haddam), Keith has a perspective from several sides of the table. A graduate of Tufts with a bachelor's degree in biology, environmental studies and English literature, Keith brings a scientific and analytical background to the law. Keith is a life member of the Madison Land Conservation Trust and served on the national leadership council of Trout Unlimited. Keith also serves as General Counsel to Vista Live Innovations, Inc., a private educational institute for adults with intellectual disabilities. Keith is also an avid outdoorsman and author of several volumes of poetry.

Alicea Charamut
Resident of Newington. Executive Director of Rivers Alliance of Connecticut. Board of Directors, Farmington Valley Chapter of Trout Unlimited. Secretary, Fisheries Advisory Council. Co-Chair, Water Planning Council Advisory Group. Advisory Board, Connecticut Institute of Water Resources.

David Kalafa
Resident of Middletown. Over thirty years working for the State of Connecticut developing and implementing policy for energy and conservation at the Office of Policy and Management and Department of Energy and Environmental Protection. Retired as Undersecretary for Comprehensive Planning and Intergovernmental Policy at the Office of Policy Management. Served on the State Water Planning Council and Governor's Climate Change Commission. Holds a Master of Public Administration from the State University of New York and a bachelor's degree in Economics from Skidmore College.

Kip Kolesinskas
Resident of Manchester. Consulting Conservation Scientist. Current projects include assisting agencies, non-governmental organizations, and private individuals with farmland protection, land access and affordability for new and beginning farmers, farmland restoration, and climate change adaptation strategies. Co-Chairs the Working Lands Alliance Steering Committee and has contributed to numerous publications and initiatives including Conservation Options for Connecticut Farmland, Planning for Agriculture-A Guide for Connecticut Municipalities, and the award-winning training videos for the Connecticut Department of Energy and Environmental Protection's (DEEP) Municipal Inland Wetland's Agency Training Program. Formerly United State Department of Agriculture Natural Resources Conservation Service State Soil Scientist for Connecticut and Rhode Island, where he worked extensively with farmers, educators, government and nonprofits to help them protect farmland and wetlands and use soils information to make better informed land use decisions. He is a recognized regional and national speaker on soils and land use planning, farmland protection, climate change adaptation, farmland access, and wetlands.

Matthew Reiser
Resident of Avon. Environmental, health and safety consultant with over 20 years of experience performing regulatory compliance auditing, planning, training and reporting; air, water and waste discharge permitting; and air, water and waste sampling for industrial, commercial, municipal and institutional facilities. Member, Connecticut Chapter of the Academy of Certified Hazardous Materials Managers and Connecticut Marine Trades Association Environment Committee.

Charles Vidich
Resident of Ashford. Environmental and land use consultant concerned with energy efficient and sustainable patterns of development. Served as manager of the United States Postal Service Corporate Sustainability Initiatives program with responsibility for sustainability, energy efficiency

and environmental management systems for the nation's 32,000 domestic and overseas Post Offices. Previously served as the principal planner for the Central Naugatuck Valley Council of Governments where he developed solar conscious land use ordinances and the nation's first comprehensive regional plan of development. Appointed to the Connecticut Land Use Education Council with the mission to improve the skills and resources available to local planning and zoning commissions. Received the Lifetime Achievement Award from the Environmental Protection Agency's National Sustainable Materials Management program. Appointed as a visiting scientist to the Harvard School of Public Health as well as the Harvard Humanitarian Initiative where he lectured on scientific approaches on the use of quarantine and the environmental control of communicable disease. He served as the pivotal expert witness in a celebrated Connecticut Supreme Court case that successfully overturned restrictive zoning regulations and in a federal district court case that successfully overturned discriminatory land use practices.

William Warzecha
Resident of Norwich. Retired from the Department of Energy and Environmental Protection with 36+ years of service. Early in his career, he served as the geologist/hydrogeologist to the Eastern Connecticut and King's Mark Environmental Review Teams applying his technical background and expertise mainly in the areas of water supply development, waste disposal, and geologic development concerns with respect to major land-use projects, watershed studies and natural resource inventories statewide and assisted staff of the Connecticut Geological & Natural History Survey on geologic studies and investigations. Retired as the supervising environmental analyst for the Department's Remediation Division primarily responsible for enforcing the state's ground water pollution and potable water laws, protecting the state's water resources, and overseeing the clean-up of soil and ground water at polluted industrial and commercial sites. He was a long-time Board member representing the City of Norwich to the Uncas Health District and is presently serving as a Trustee at the Norwich Free Academy and a member of the Board of Commissioners for the City of Norwich's Public Utilities and Sewer Authority. Holds a master's degree in Environmental Management and Policy and a bachelor's degree in Environmental Earth Science.

The Council acknowledges the contributions of environmentalists that have worked tirelessly to improve the quality of life for all species on Earth. The Council recognizes all the former members of the Council and staff, including Peter Hearn who supported the Council for 15 years and retired in 2022.

The Council appreciates the assistance of the many people in the Departments of Agriculture, Energy and Environmental Protection (DEEP), Transportation, and Public Health; the Connecticut Agricultural Experiment Station; the Connecticut Green Bank; and the Connecticut Siting Council, and others who, annually, provide data for this report.

It is appropriate to also acknowledge the many individuals and organizations that have contributed greatly to the stewardship of Connecticut's environment. This includes the many state employees who administered the environmental programs, put in place by the Legislature over the last five decades, who are now about to retire, or have retired, from a career of public service. The Council especially thanks the many citizens, businesses, and organizations who offered information and viewpoints about public policies, many of which led to the Council's special reports over the years. The Council also appreciates the work of its Executive Director, Paul Aresta in drafting this report for review by the Council and preparing the final version for publication.

Image Credits: The "warming earth" symbol used to denote indicators affected by climate change was created by the Council. The image of the Asian tiger mosquito is attributed to Susan Ellis. The image of the map of Connecticut with the status of Ospreys' nests was obtained from Connecticut Audubon, Osprey Nation Map. The image of the emerald ash borer was obtained from forestimages.org. The image on the cover of the Connecticut River near Old Saybrook was provided by Paul Aresta. The Council greatly appreciates their generosity in allowing the use of these excellent images in this report.

Resources

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