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A Newsletter from the Connecticut Department of Energy & Environmental Protection
Exploring Long Island Sound - Issues and Opportunities

OCTOBER/NOVEMBER 2019
No. 62

Celebrating the 50th Anniversary of Connecticut's Tidal Wetlands Act

This issue of *Sound Outlook* is dedicated to celebrating the passage of Connecticut's Tidal Wetlands Act in 1969. After 50 years, it's easy to take this important piece of legislation for granted. So we hope this issue reminds readers that current efforts to protect and restore these vital natural resources would not be possible if not for the landmark protections provided by the Act .

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Inside

Connecticut's Tidal Wetlands Act

Blazed a Trail for Marsh Protection

These days, tidal wetlands are generally recognized as vital natural resources. From scientists to the average person on the street, many sing the praises of tidal wetlands for their value as:

- one of the most productive ecosystems on the planet, providing sources of nutrients for finfish, crustaceans, and shellfish that are commercially harvested and, therefore, economically valuable;
- important habitats for plants and animals, especially migrating shorebirds;
- playgrounds for human recreation and vistas for aesthetic enjoyment; and
- natural sediment sinks that reduce siltation in navigation channels and harbors, and floodwater sponges that reduce flood damage to neighboring properties.

A tidal wetland at Burying Hill Beach, Westport
Photo Credit: CT DEEP

However, tidal wetlands in Connecticut have not always enjoyed this rock-star status. On the contrary, these areas were once perceived as stinky, mucky wastelands, only good for breeding mosquitoes and other vermin. This misconception led to many wetlands in the state being drained or filled-in. It's been estimated that during the heyday of coastal development, tidal wetlands were lost at a rate of one acre per day, with 30 percent of Connecticut's marshes ultimately destroyed.

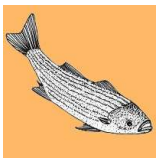
Luckily for the 70 percent of Connecticut's remaining tidal wetlands, several pioneering scientists at Connecticut College released *Bulletin No. 12: Connecticut's Coastal Marshes, A Vanishing Resource* in 1961, published "to bring to public attention the great urgency of protecting our remaining coastal marshes."

The Bulletin spelled out how tidal wetlands had been filled at an alarming rate as dumps for dredged material during construction of I-95, and for developing parking lots, local roads, and residential neighborhoods.

The Connecticut Tidal Wetlands Act of 1969 changed all that.

Develop Flyers to Create a Positive Change

Climate Change Update: SLAMM Map Viewer Provides Visual Tool for Predicting Marsh and Road Flooding

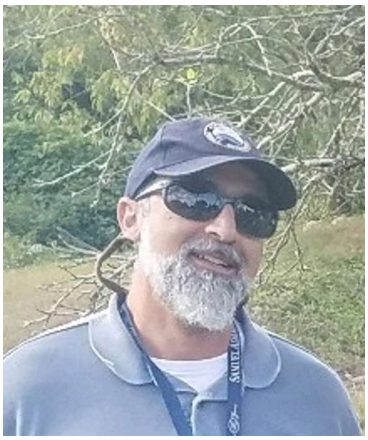


First Impressions

Sharing the "First Impressions" that Make an Environmental Difference

This column features the "First Impression" that set someone on his or her path to environmentalism. We hope *Sound Outlook* readers will relate to these "First Impressions" and recall their own experiences that led them to appreciate and care about Long Island Sound.

In keeping with this month's newsletter theme of "Celebrating Tidal Wetlands," we highlight the First Impression of Harry Yamalis, a Habitat Restoration Specialist at CT DEEP:



Harry's First Impression can be tied to Black Point in Niantic (East Lyme), where his family had a cottage during his childhood and young Harry could be found wandering through marshes and exploring

The same year the Beatles released *Abbey Road*, the Connecticut General Assembly released its own iconic album of sorts, a collection of policies and standards that issued a clarion call to protect and preserve tidal wetlands.

First of all, the Tidal Wetlands Act (TWA) defined how to identify a tidal wetland. While it's not necessarily an "Octopus's Garden," a "wetland" is an area:

- that borders on or lies beneath tidal waters (such as, but not limited to banks, bogs, salt marsh, swamps, meadows, flats), or other low lands subject to tidal action (and, possibly, areas *formerly connected* to tidal waters) **AND**
- whose surface is at or below an elevation of one foot above local extreme high water **AND**
- upon which may grow (or be capable of growing) some, but not necessarily all, of a list of specific plants that includes
    - salt meadow grass (*Spartina patens*),
    - spike grass (*Distichlis spicata*),
    - black grass (*Juncus gerardi*),
    - saltmarsh grass (*Spartina alterniflora*),
    - saltworts (*Salicornia Europaea*, and *Salicornia bigelovii*),
    - switch grass (*Panicum virgatum*),
    - marsh elder/high-tide bush (*Iva frutescens* var. *oraria*), and
    - cattails (*Typha angustifolia*, and *Typha latifolia*).

The TWA warned that state's remaining wetlands were in jeopardy of being lost through unregulated dredging, dumping, and filling, and established state policy to preserve tidal wetlands and prevent their destruction. Otherwise, Connecticut's economy and the Long Island Sound ecosystem could suffer dire consequences from continued loss of tidal wetlands . So, from 1969 on, the State of Connecticut would "Carry That Weight" of regulating certain activities undertaken *in or on tidal wetlands*. These activities include:

- draining, dredging, excavation, or removal of soil, mud, or sand from any wetland;
- dumping, filling, or depositing of any soil, stones, sand, gravel, mud, aggregate of any kind, rubbish, or similar material, either directly or otherwise onto the wetland; or
- the erection of structures, driving of pilings, or placing of obstructions in or on the wetland, whether or not they change tidal ebb and flow.

In reviewing permit applications under the TWA, DEEP must consider the effect of the proposed work on public health and welfare, marine fisheries, shellfisheries, and wildlife, and the protection of life and property from flood, hurricane, and other natural disasters . If "Something" proposed within a wetland results in significant adverse impacts to natural resources or diminishes the wetland's values and functions, the proposed project cannot be allowed.

However, state authority is not enough to fully protect these critical natural resources. That's "Because" activities proposed adjacent to tidal wetlands, such as land disturbance and construction of buildings, parking lots, and driveways can also have adverse effects on wetlands. And those activities are regulated locally through planning and zoning authorities, not by CT DEEP.

at the water's edge:

My parents bought a Black Point cottage when I was 4 years old, and I remember going there every summer after that and chasing crabs. Constantly. I wasn't a swimmer, I just chased crabs. And I was curious about what I was chasing, too. I tried to identify everything I caught, figure out what was living on the seaweed.

His childhood fascination with marine life prompted Harry to take a marine biology course while attending East Hartford High School, where he was able to put his crab-chasing skills to good use for class credit. But even then he didn't think of it as a career path:

During my senior year in high school I took a one-semester class in marine biology and loved it. Others in the class were afraid of collecting specimens, but I wasn't. I remember getting stuck in the mud with waders on, chasing down oyster toadfish in the creeks of Barn Island on a field trip. But as a kid I didn't know what jobs were available in the environmental field, I just didn't think that much about the future.

Harry graduated from high school and attended the West Hartford campus of the University of Connecticut (UConn) for two years. It was not an inspiring experience for Harry, as there were no dorms or real opportunities to bond with classmates:

I actually didn't do that well academically when I was at UConn, I just wasn't into it. It was more like a continuation of high school: you go to school, you go to your part-time job, you go home and do homework, and the next day you do it all

A tidal wetland in the Patchogue River, Westbrook
Photo Credit: CT DEEP

Therefore, municipalities are also responsible for ensuring that adjacent upland development does not harm tidal wetlands. The Connecticut Coastal Management Act contains policies and standards regarding tidal wetlands that must be applied during the municipal coastal site plan review process. Generally speaking, land use boards and commissions in coastal municipalities must ensure that upland development will not result in degradation of tidal wetlands, and that tidal wetlands are preserved, protected, and, to the extent practicable, restored. Often this is accomplished through setback and buffer requirements written into local zoning regulations. However, there is no minimum statewide setback from the edge of tidal wetlands, so these local setbacks and buffer areas vary from town to town. Other local protections include reduced impervious cover adjacent to wetland areas and improved stormwater management (please see the CT DEEP's Coastal Management Manual Fact Sheet on Tidal Wetlands for more information).

Connecticut's tidal wetlands have enjoyed 50 years of protection and restoration thanks to the TWA. But, "Oh! Darling," it's essential that state regulators, local land use authorities, property owners, scientists, and nature buffs all "Come Together" to continue to preserve these rock-star resources.

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William Niering: The Ultimate "Marsh Elder"

No tribute to the protection and preservation of tidal wetlands in Connecticut would be complete without acknowledgement of William Niering and his significant contributions to the study and understanding of wetland systems. Dr. Niering's research on tidal wetlands, conducted while he was a professor at Connecticut College, is still internationally renowned, and was instrumental in getting the Tidal Wetlands Act passed by the Connecticut General Assembly in 1969. He also worked with the DEEP in establishing Connecticut's tidal wetlands restoration program, the first of its kind in the nation!

On a fundamental level, Dr. Niering taught us about the important role tidal wetlands play in the overall health of Long Island Sound's ecosystem. Once

again.

Luckily, a friend was attending the University of North Carolina (UNC) in Charlotte and brought home an application for UNC in Wilmington, which inspired Harry to apply and take his First Environmental Step:

Sophomore year I had to declare a major, and I was still deciding whether I wanted to pursue an electronics/computer track or go into environmental/marine science. I had done well in my high school marine biology class and I enjoyed getting my hands on things. Ultimately, I decided that I didn't want to sit at a computer all day, although sometimes my job morphs into exactly that. But back then, UConn only offered a graduate level degree in marine science and I had no interest in graduate school at that point. But UNC/Wilmington offered an undergraduate degree in marine biology, so I applied and was accepted into the program.

Once at UNC/Wilmington, Harry found his niche. Not surprisingly, his grades improved too:

I had a great time at UNC. I didn't have a part-time job and was able to focus on school work. I enjoyed just about every class I took, so much so that I actually decided to apply to graduate schools. And it all happened because, just by chance, I heard about UNC because my friend had the application.

Harry applied to several graduate schools and was accepted into a program at the Florida Institute of Technology. His timing was perfect, as a graduate student's departure during the middle of the 1996 summer term created a fortuitous opening:

William Niering
Photo Credit: Connecticut College

considered wastelands and mosquito breeding grounds that should be filled, ditched, and drained, tidal wetlands enjoyed a new-found lofty status thanks to Dr. Niering's research and awareness. He opened our eyes to the benefits of tidal wetlands as nurseries for commercially important fish; as habitats for countless animal species, especially for migrating shorebirds and waterfowl; as "treatment plants" reducing pollutants like nitrogen; and as sponges absorbing storm-related flooding. His ground-breaking findings and commitment to continued research helped establish a program to preserve and protect these vital ecosystems.

Dr. Niering passed away in August of 1999 at the age of 75, but his legacy lives on, in every acre of tidal wetland preserved under the Connecticut Tidal Wetlands Act, in every acre of tidal wetland restored under Connecticut's pioneering program, and in every elementary school student who appreciates the importance of these beautiful resources. The DEEP is proud to honor his memory.

A tidal wetland at the Town Beach in Waterford
Photo Credit: CT DEEP

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SPOTLIGHTED COASTAL RESOURCE:
Protecting and Restoring
Tidal Wetlands through Enforcement

Florida Tech paid my full tuition and set me up in school housing on oceanfront property--how do you say no to that?! I think I took one elective that had one extra lab credit hour, so my total out-of-pocket expense for graduate school was the cost of one credit.

Living on prime waterfront property didn't come without a price...part of Harry's graduate school assistantship was being lab manager at the marine science lab property, more property management-focused than research-oriented. But his position enabled him to work with the aquaculturists and scientists at the lab, learning from them about research grants and applying for funding which would become useful later in his career. He also identified a need at the lab property, which helped him bring about a significant Behavior Change:

There was no recycling program at the lab, so I started one. It was just a matter of amending the contract with the waste hauler to provide recycling bins. So we made it easy for people to do the right thing.

As Harry's graduate studies were coming to an end, he had an opportunity to convert his Master's Degree project into a PhD project, but he decided instead to start a career. In 1999 he secured a six-month internship with the U.S. Fish and Wildlife Service (USFWS) conducting sea turtle research in the Ten Thousand Islands (Naples) area of Florida, and continued to apply for full-time work. He was set to interview for a National Park Service position located in the U.S. Virgin Islands, but a hurricane struck the islands and diverted funding, eliminating that position before interviews even started.

Although the Connecticut Tidal Wetlands Act has been in effect for 50 years, there are occasions when fill material is placed in tidal wetlands without a permit. On those occasions, DEEP Land and Water Resources Division (LWRD) staff can use a combination of notices of violation, court hearings, consent orders, fines, and coordination with property owners and municipal officials to resolve noncompliance issues and require that the impacted wetland is restored. The following three cases are recent examples of successful resolution of unauthorized fill activities in tidal wetlands.

Fairfield

In response to a complaint received on August 17, 2018, LWRD staff inspected 170 Kenwood Avenue in Fairfield and discovered unauthorized fill placed within state-regulated areas. Consequently, DEEP issued a Cease and Desist Order on September 7, 2018 for the unlawful placement of rock and soil fill within tidal wetlands and the unlawful construction of a shoreline flood and erosion control structure which was failing into Ask Creek. The order to immediately remove the fill placed within tidal wetlands and waterward of the coastal jurisdiction line required a mandatory hearing, which was held on September 17, 2018. As a result of the hearing, the property owner signed a Consent Order which required the submission and execution of a restoration plan to remove the fill and restore the tidal wetlands. These inspection photographs show the unauthorized fill that had been placed at the site, and the restored wetland area:

170 Kenwood Avenue, Fairfield
Photo Credit: CT DEEP LWRD

Greenwich

On June 11, 2018, the Department received a complaint regarding construction of retaining walls along the shoreline at 29 Davenport Avenue in Greenwich. In response, LWRD staff conducted a meeting at the site with Greenwich Zoning Enforcement, where they confirmed unauthorized construction of two stone retaining walls acting as flood and erosion control structures; one was constructed within tidal wetlands and waterward of the coastal jurisdiction line (CJL), and the other was constructed within the coastal hazard area landward of CJL. The Department issued a Notice of Non-Compliance which required the property owner to submit and carry out a restoration plan to remove the wall located within state regulated areas, re-grade the slope, and plant native tidal wetlands species. Additionally, the Town did not approve retention of the unauthorized wall within the coastal flood zone, so its removal was included in the approved restoration plan. The last follow-up inspection photograph taken on August 17, 2019 shows the area after being replanted with native tidal wetland species. The tidal wetland restoration will be monitored over the next two years:

So Harry moved back to Connecticut, and in February 2000 he joined the Technical Services section of the Coastal Management Program at DEP as a Habitat Restoration Specialist with a special focus on tidal marshes. An early work-related field trip brought Harry full circle to his marine biology class:

During my first year working for DEP I went to Barn Island to do fieldwork. A bus from East Hartford High School was parked there, and I bumped into that same marine biology teacher!

Harry's responsibilities over his almost-20 years with DEP/DEEP have evolved from initially sitting at his computer all day tracking the status of projects to actually designing them. The tracking database he developed now makes it easier to identify how many acres of habitat have been restored, and helps identify areas that could be the next restoration candidate. Harry is very excited at the prospect of one project in particular:

Leete's Island marsh in Guilford is probably one of the marshes in Connecticut that's in the worst condition. It's about 35 acres of privately owned wetland but it's definitely worth the public expenditure to restore the habitat. A few years back we had applied to the USFWS for restoration funds to get this project underway. It was denied primarily because there was no conservation easement to permanently protect the property. Didn't think an easement would be necessary, or worth the cost because tidal marshes don't have a lot of cash value and are already protected by state and federal law (for now, as some people would respond). Even the Leete family insisted that if an easement was to be added

to the land record, it must allow for continued access to the marsh for hunting, fishing, crabbing, and passive recreation by anyone. So we went back to the drawing board and developed an even larger scope with more restoration potential, and sought funding without that conservation easement requirement. We're still trying to secure funds for design and construction of the restoration project, which is all currently moving along. We have some very good leads right now and I am very much looking forward to getting that project underway.

Harry explains that there is a wide range of activities that can be undertaken to restore a tidal wetland, and not all of it involves restoring tidal flow to the system. The first step in a restoration project is conducting an extensive study to make sure other problems, like flooding on neighboring properties, don't occur:

Wetland restoration can take many forms. Sometimes you want to adjust the amount of water coming in and going out of the marsh, so you replace or maintain water control structures like culverts and tide gates, or remove or punch holes through dikes that were built historically. But other times internal marsh manipulations can restore the marsh. For example, you can alter the marsh surface, either adding a thin layer of dredged material to raise the elevation of a wetland, or other times removing fill. Sometimes you just want more water within a marsh, not coming in or going out but just staying within the marsh, so you can create ponds, maybe near a Phragmites-dominated area so the salt water will stunt the phrag's growth. And maybe you can use the material excavated from creating the pond to fill a

29 Davenport Avenue, Greenwich
Photo Credit: CT DEEP LWRD

Westbrook
In response to a complaint received on March 19, 2019, LWRD staff inspected 193 Old Mail Trail in Westbrook and discovered fill placed within tidal wetlands and waterward of the coastal jurisdiction line without authorization, for which a Field Notice of Violation was issued. The investigation also revealed an outstanding violation for the same site, which the respondent had failed to address. Consequently, the respondent was required to restore the site by removing the unauthorized fill and unauthorized structures and re-grading and planting the regulated area with native tidal wetlands plants. Monitoring of the tidal wetlands restoration will continue for an additional two years:

193 Old Mail Trail, Westbrook
Photo Credit: CT DEEP LWRD

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Learn More about Tidal Wetlands with these Publications

In addition to Connecticut College Bulletin No. 12 *Connecticut's Coastal Marshes* mentioned above, many Connecticut tidal wetland aficionados are likely to have several--or all--of these publications on their bookshelves and bookmarked on their computers.

Life and Death of the Salt Marsh by John and Mildred Teal is a seminal book originally published in 1969 that influenced a generation of wetland ecologists. Fifty years ago, the book was dedicated "To the Conservation Commission of the town of Falmouth, Massachusetts, and to other conservation-minded groups for their efforts in PRESERVING SALT MARSHES."

The Audubon Society Nature Guides: Wetlands by William A. Niering is described as "a comprehensive field guide, fully illustrated with color photographs, to the trees, wildflowers, fishes, insects, birds, and other natural wonders of North America's rivers, lakes, and swamps." The guide includes color plates and

mosquito ditch or fill an area where standing water is breeding mosquitoes. Usually you think you need tidal flow for improvement, but sometimes you can get away with just manipulating the marsh's internal hydrology.

Harry laments that his wetland restoration database shows that zero acres of tidal wetland have been restored during the past three years, but he acknowledges it's partly a result of different priorities and project complications:

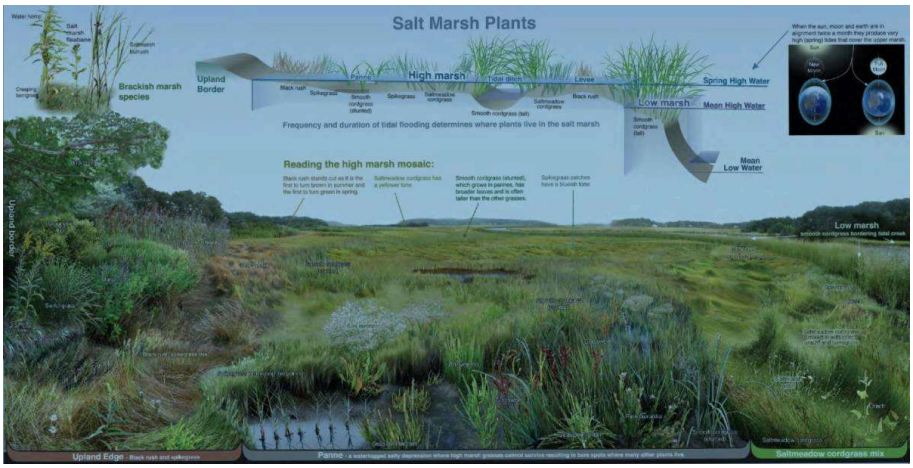
The Wetland Habitat and Mosquito Management (WHAMM) Program of the DEEP's Wildlife Division has seen changes in scope and reductions in funding, and remaining WHAMM staff are being focused on mosquito control projects statewide on state lands, not just on coastal projects. Plus, the "easy" marsh restoration projects are done; the next ones are really complicated and have some roadblock associated with it that we need to get around, whether it's the need to close down a major road to replace a water control structure, unmotivated property owners, or opposition from local homeowner associations (and similar groups). And that's if we can get funding to design the project and hire a contractor for construction. We also try to partner with municipalities because some of these things are best handled locally.

Another early work-related experience provided a call-back to getting stuck in the mud during that high school marine biology class: Harry visited Bluff Point in Groton in early spring and this time fell into a cold, wet mosquito ditch. Perhaps it was the universe paying him back for the transgressions he committed in this youth at Black Point, when, as a little boy

background information about tidal wetlands as well as bogs, swamps, floodplain forests, rivers, streams, lakes, and ponds.

Tidal Marshes of Long Island Sound (Bulletin No. 34) is a publication of the Connecticut College Arboretum and contains information about the ecology, history, and restoration of, well, the tidal marshes of Long Island Sound. The bulletin also explores some emerging tidal wetland issues, including the threat of sea level rise.

Salt Marsh Plants of Long Island Sound (Bulletin 40) is another in the Connecticut College series and provides a field guide to the tidal wetland plants common around Long Island Sound. This spectacular centerfold of salt marsh plants in their habitat locations by artist Edward Henrey contained in the bulletin helps put the tidal wetland landscape in perfect perspective:



"Salt Marsh Plants in their Habitats" by Edward Henrey
This image depicts where marsh plants are located in relation to the environment and to each other
It reinforces the concept that elevation is the key element in marsh plant distribution, and the fact that the solar and lunar cycles control the tides that drive the marsh
Select the illustration for larger view

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who didn't know better, he didn't always have the best intentions when fishing and collecting crabs. But now as a habitat restoration specialist at DEEP and a Co-Chair of the Long Island Sound Study's Habitat Restoration and Stewardship Work Group, Harry is uniquely suited to make amends for those transgressions by improving the health of tidal wetlands, providing fish passage, and restoring other habitats including beaches, riparian buffers, and dune vegetation.

And he can still be found wandering through marshes and exploring at the water's edge.

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Look Out For These Other Upcoming Events!

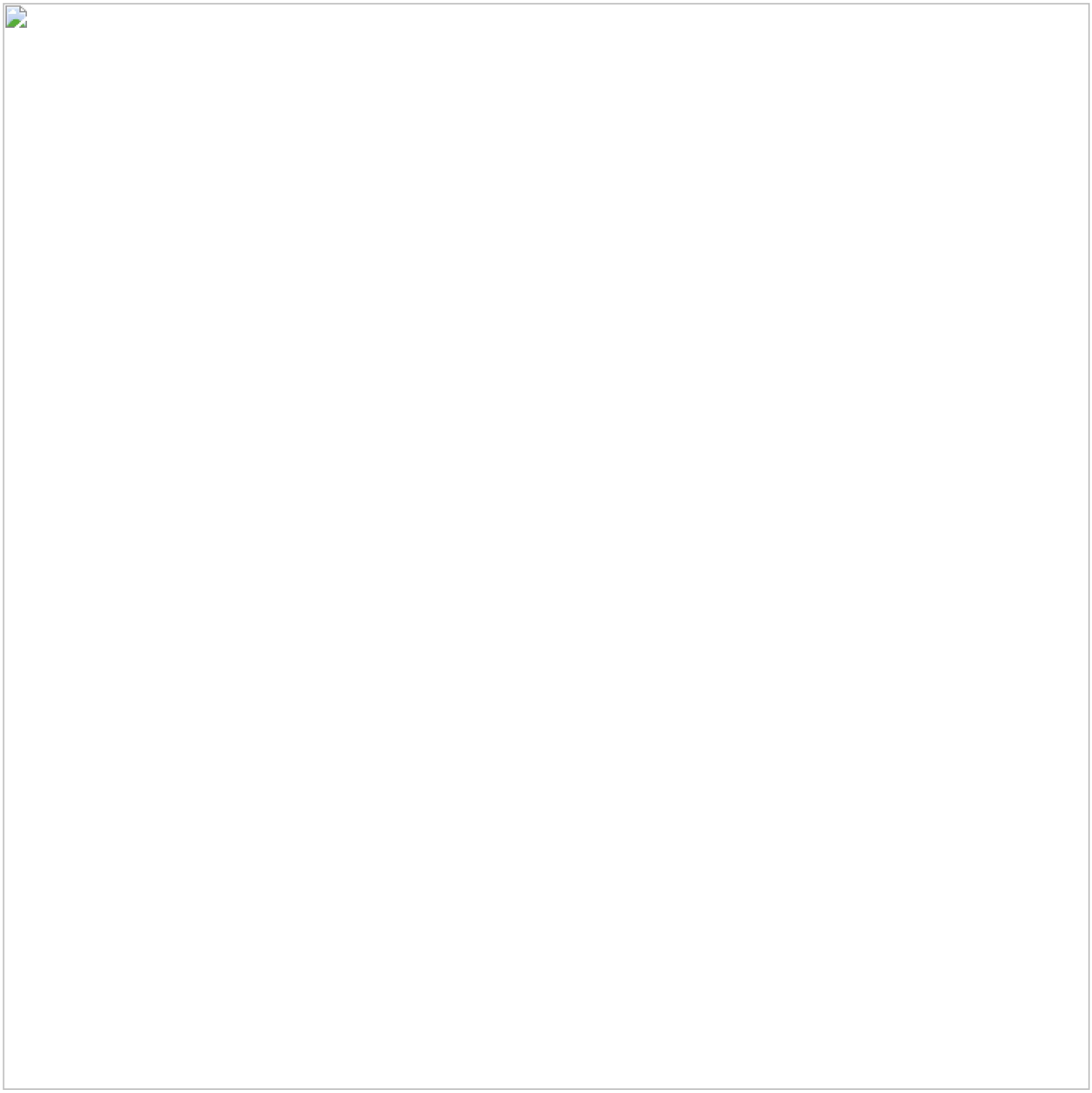
Long Island Sound Study (LISS)
Committee Meetings

Please be sure to check the Calendar of Events on DEEP's website

SPOTLIGHTED COASTAL ACCESS:
These Destinations Provide Breathtaking Views of Tidal Wetlands in Connecticut

The following public access destinations sport some of the finest examples of tidal wetlands in Connecticut. Each was highlighted in an earlier issue of *Sound Outlook*. Select the destination name to read its Coastal Public Access Guide description, and select the *Sound Outlook* issue link to read the previous article. And, most importantly, get out there and explore these incredible natural resources.

Barn Island, Stonington (*Sound Outlook* June 2004)



Tidal wetland at Barn Island
Photo Credit: CT DEEP

Mamacoke Island, Waterford (*Sound Outlook* October/November 2018)

A tidal marsh at Mamacoke Island

The rare, unditched salt marsh connecting the mainland portion of the Conservation Area to Mamacoke Island is a sight to behold
Photo Credit: Connecticut College Arboretum

Hammonasset Beach State Park, Madison (*Sound Outlook* February 2002)

The marsh at Hammonasset
Photo Credit: Emily Hall

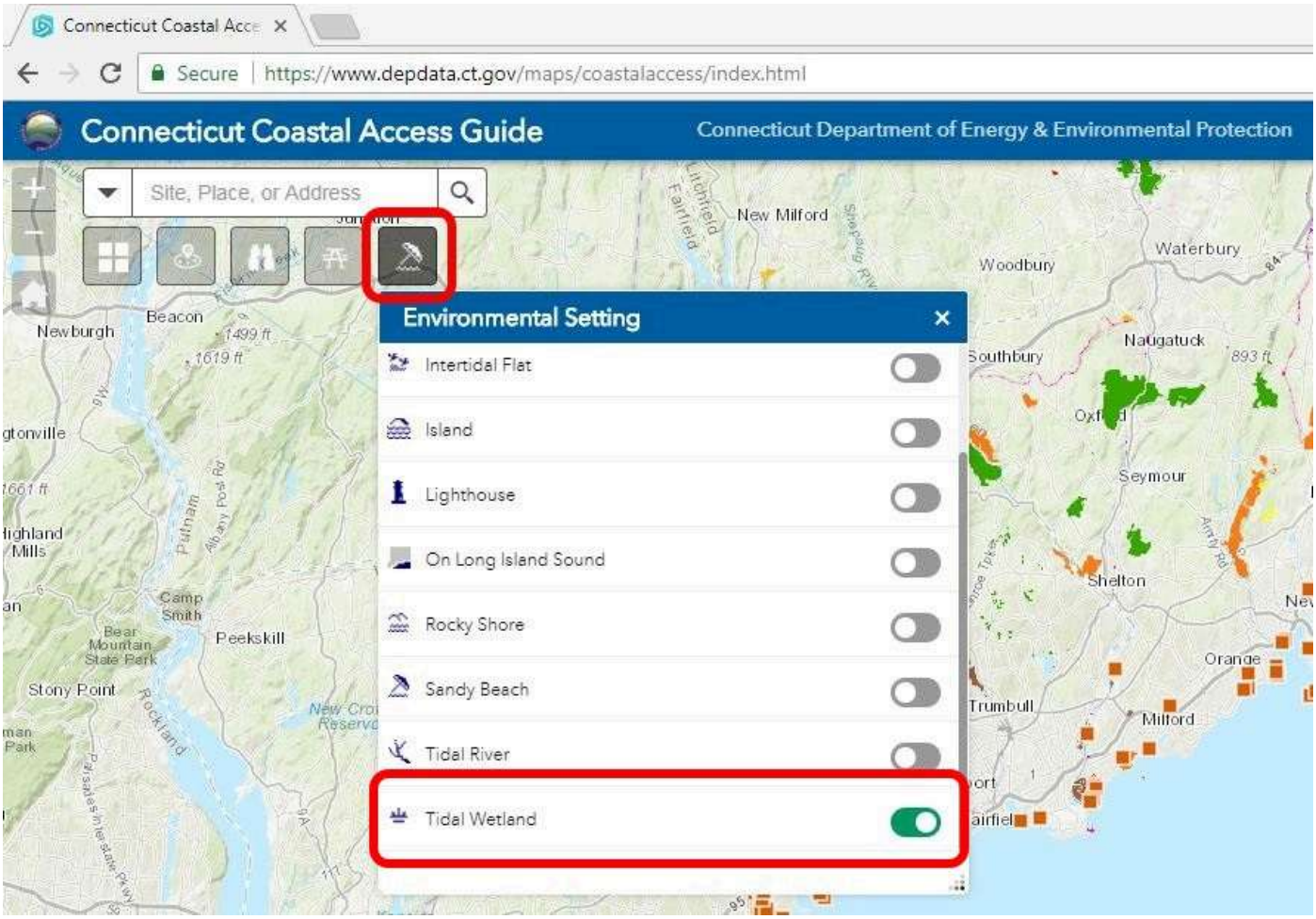
Rocky Neck State Park, East Lyme (*Sound Outlook* June 2003)

A tidal wetland at Rocky Neck
Photo Credit: CT DEEP

Great Island State Boat Launch, Old Lyme (*Sound Outlook* June 2008)

A view of a portion of the Connecticut River Tidal Wetland Complex from the Great Island Boat Launch
Photo Credit: CT DEEP

There are countless other public access sites along Connecticut's coast that boast beautiful tidal wetlands. To find them, go to the Connecticut Coastal Access Guide and click on the "Environmental Setting" button, then turn on the "Tidal Wetland" button. The Access Guide will magically display all sites that allow you to g et out there and experience, in-person, 50 years of tidal wetland protection!



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Marsh "Youngers": Madison Elementary School Students Develop Flyers to Create a Positive Change

Madison Public Schools' 4th Grade Students were very busy this past school year, undertaking a "Create a Positive Change Campaign" as responsible and active citizens in an effort to help save a part of Connecticut's shoreline.

The students were charged with reflecting on the yearlong question, "How do our actions and choices impact the world around us?" and created a series of flyers to try to convince their audience to take action.

The topics covered by the "Create a Positive Change Campaign" include:

- Wetlands destruction and protection;
- Invasive species;
- Human impact on horseshoe crab population size (medical discovery/bait use);
- Erosion and impact on the shoreline;
- Positive steps to minimize the impact of natural disasters; and
- Renewable and nonrenewable resources (mining/deforestation).

WETLANDS ARE IMPORTANT!

Do Something Now!!!

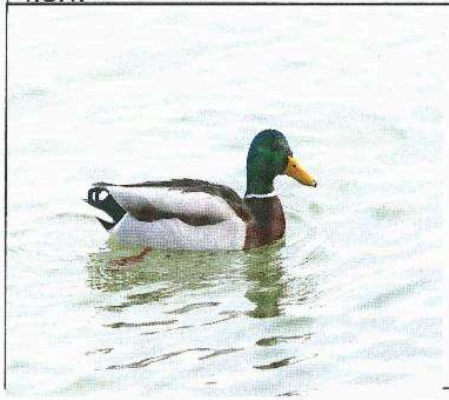
Imagine you are a bird that lives in a marsh. It is a bright sunny day. The only sound is the chirping of a sparrow high above you and the croaking of a bullfrog hidden under the tall bladelike grass. And then you hear a sound you've never heard. The roaring of the engine of a huge bulldozer. It comes over and flattens the tall grass killing tons of small animals. You quickly fly away before your home is crushed. You survive but you are homeless.

A wetland is full of tons of animals like birds, fish and many insects.

Wetlands act like a giant sponge to help stop powerful storms.

Wetlands can help slow down powerful storms like hurricanes and floods. In fact, wetlands needs floods and hurricanes otherwise they would go dry. Wetlands provide ingredients in medicine we use to stay healthy along with rice,salt and fish.

- Wetlands absorb greenhouse gasses
- With wetlands gone hurricanes are more severe



To help stop wetlands from disappearing:

CALL the EPA (Environmental Protection Agency) 203-245-5632

- Don't put paint or oils in the drain.
- Don't litter.
- If you see anyone doing something illegal report to park ranger.

One of the "Create a Positive Change" Flyers developed by Madison Elementary School 4th Grade Students

The 4th Grade teachers of Madison Public Schools should be commended for fostering a sense of responsible citizenship in their students, and the students should be commended for tackling so many worthy topics. We are confident that

Connecticut's coastal resources are in good hands with these future environmental stewards. Somewhere, William Niering is smiling.

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Climate Change Update:
SLAMM Map Viewer Provides Visual Tool for Predicting Marsh and Road Flooding

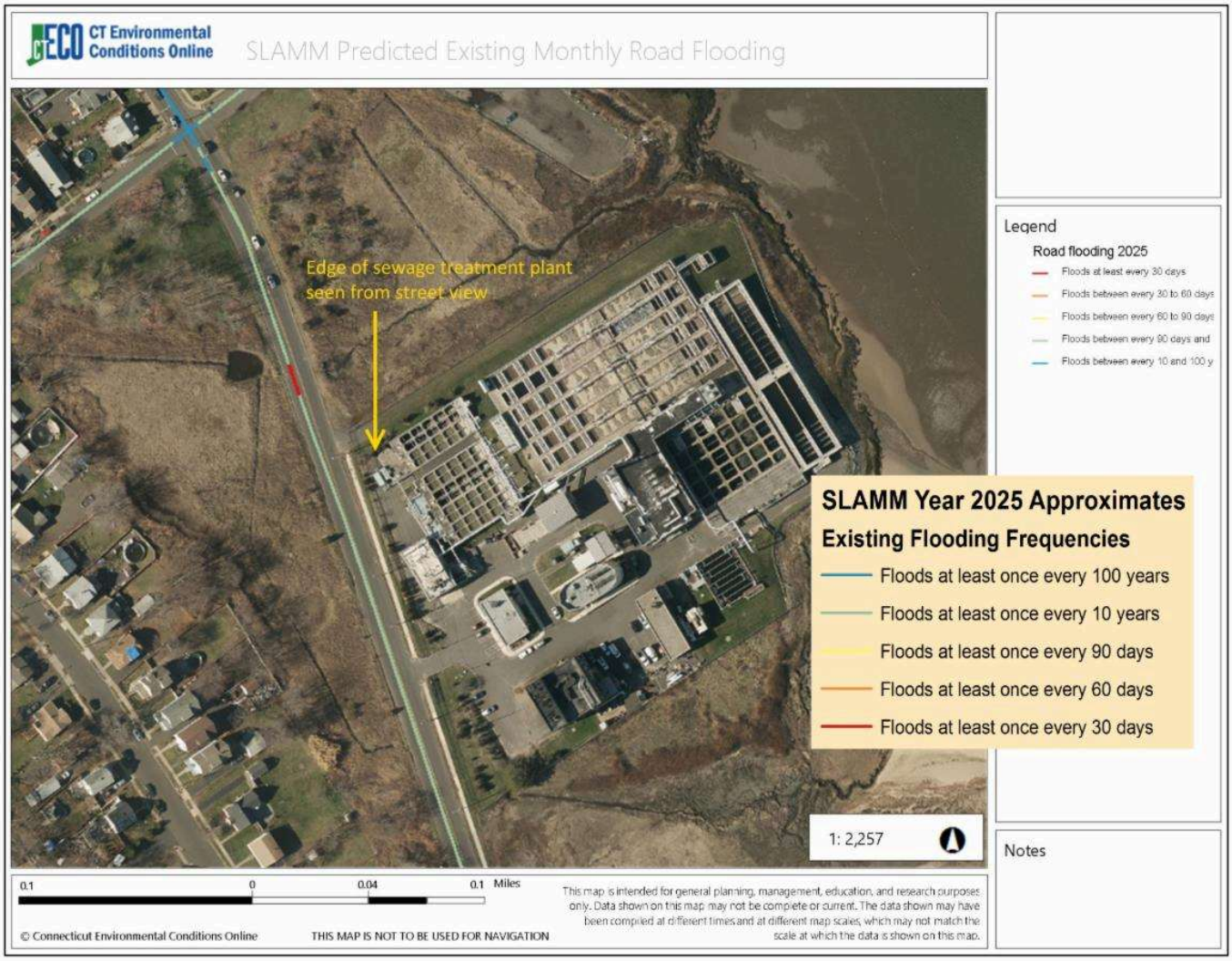
Regular readers of *Sound Outlook* are, no doubt, aware that the Sea Level Affecting Marshes Model (SLAMM) is a widely adopted and effective model to predict the exposure of wetlands and infrastructure to long-term sea-level rise. (Please see the October 2014 issue , February 2016 issue , and February 2017 issue of *Sound Outlook* for more information on SLAMM.) Connecticut DEEP staff have been working for several years to better understand how Connecticut's coastal area marshes and roads may respond to sea level rise, and have applied SLAMM to Connecticut's shoreline.

Frequent tide-generated "nuisance" or "sunny-day" flooding on Chaffinch Island Road, Guilford
which has been alleviated by elevating the roadway
Photo Credit: Joel Stocker

In an effort to help state agencies, municipal land use officials, and the general public visualize the expected response to sea level rise, an online geospatial data viewer, d eveloped by the UConn Center for Land Use Education and Research (CLEAR) that uses the CT ECO platform, has been released that d escribes the effects of sea level rise on Connecticut's coastal roads and 21 of the state's largest marshes .

The Sea Level Rise Effects on Roads and Large Marshes viewer website provides a screening-level tool to identify areas potentially well-suited to accommodate the upland migration of Connecticut's largest coastal marshes, and the vulnerability of coastal area roads to regular tidal and episodic coastal storm flooding with sea level rise. SLAMM viewer users should note some very i mportant information describing intended uses and limitations of the data presented in the viewer. An archived webinar presentation hosted by UConn CLEAR on October 16, 2019 that explains how to use the viewer is also available.

In addition to the map viewer itself, the SLAMM viewer website provides some background on sea level rise and coastal roads. The following map example generated from the SLAMM viewer shows predicted road flooding on First Avenue in West Haven, with the red section showing a portion of the road predicted to flood at least once every 30 days (i.e., monthly) by the year 2025:



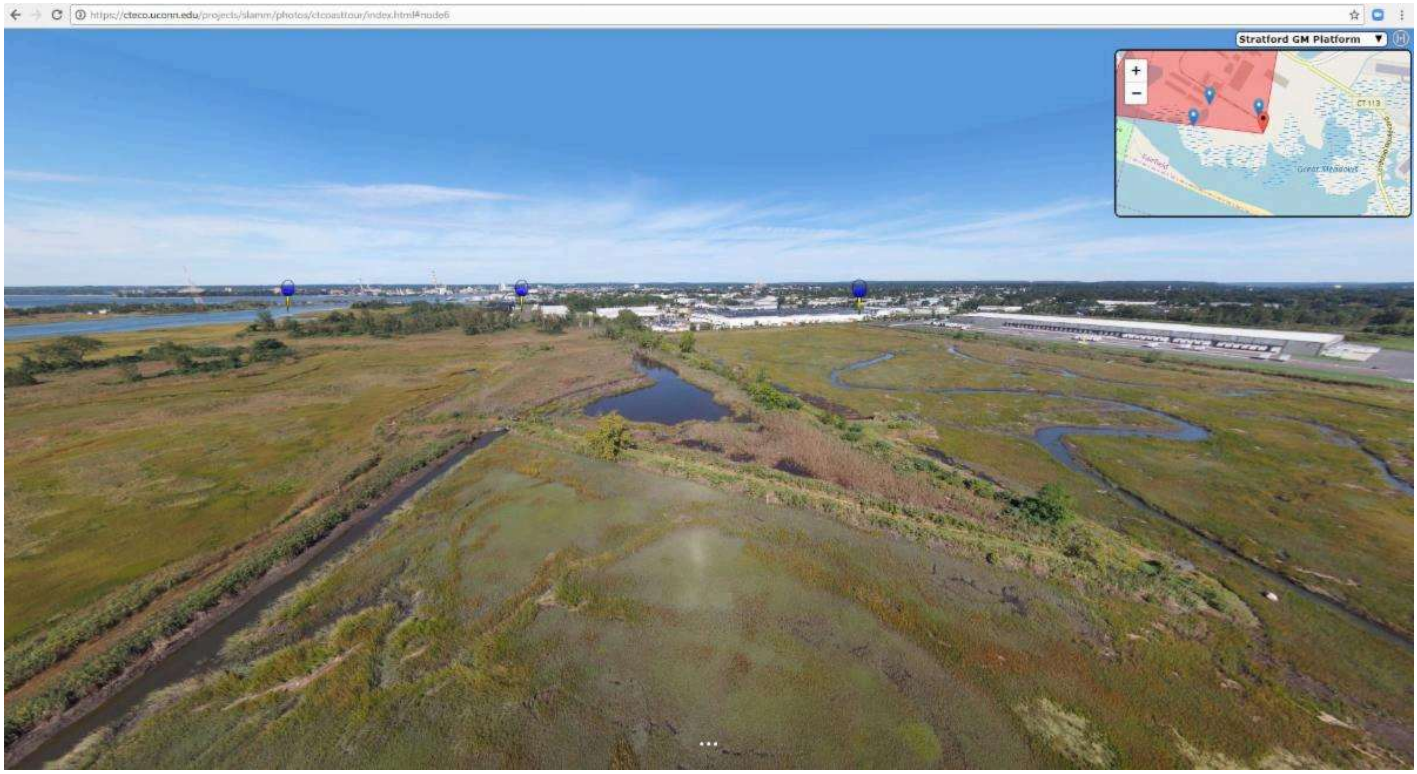
SLAMM map generated from Map Viewer shows predicted flooding on First Avenue in West Haven

A site visit to First Avenue in West Haven conducted during an extreme high tide on October 28, 2019 shows "nuisance" or "sunny-day" flooding, requiring the City's Department of Public Works to temporarily close the road to traffic until the tide water recedes:

Tide-generated "nuisance" or "sunny-day" flooding on First Avenue in West Haven, October 28, 2019
Photo Credit: Mark Paine, City of West Haven

While the tide-related flooding on First Avenue in West Haven does not occur in the exact location predicted by the SLAMM viewer, the site visit confirms that the model is useful in identifying areas of concern. However , the depth and duration of road flooding depicted in this model are largely unknown. Determining more precise extent and severity of future road flooding will require additional site-scale investigation.

Another component of the SLAMM viewer website is the spectacular panoramic views of the Stratford, Guilford, and Old Saybrook marsh complexes :



An example of a 360-degree panorama of the Stratford project marsh
Credit: CT ECO/Joel Stocker

These panoramic views can be helpful in identifying barriers to the flow of tidal water within marshes altered through human disturbance, and potential obstacles and impediments to the landward migration of tidal marshes in response to sea level rise.

A tidal marsh migrating upland from the stone wall into the forest at Barn Island, Stonington
Photo Credit: Ron Rozsa

The SLAMM viewer website also provides background information on sea level rise and coastal marshes, and contains information regarding soils suitable for marsh migration.

Understanding how salts are retained in terrestrial soils a s coastal saltwater moves inland and stays longer on the ground will be an important factor in successful marsh migration to upland areas, *if* property owners are willing to allow marshes to migrate.

Please see the October/November 2017 issue of *Sound Outlook* for a previous article about a study of private landowners' willingness to adopt certain conservation strategies that would allow tidal marshes to migrate landward in the face of sea level rise.

For more information about the SLAMM viewer or the model itself, please contact David Kozak at david.kozak@ct.gov or 860.424.3608.

Visit the DEEP website at www.ct.gov/deep

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