

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

SPECIAL ISSUE THEME: The Wrath of Irene

This special issue of *Sound Outlook* focuses on Tropical Storm Irene and the coastal hazards associated with this and other major storm events. The issue will highlight the vital role the Connecticut Coastal Management and Flood Management Programs play in hazard planning and storm response, explore the damage that occurred to Hammonasset Beach State Park during the storm, investigate the implications of storm-related flooding on water quality and infrastructure, and identify several tools that coastal residents and municipalities can use to prepare for future coastal hazards.

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**Connecticut's Coastal Management and Flood Management Programs Promote Appropriate Development in Coastal Hazard Areas...
In Light of Tropical Storm Irene, Now You Know Why**

Tropical Storm Irene was aptly named, as her ire blew in and rained down upon the entire State of Connecticut on Sunday August 28, 2011. Storm winds ranged from 40 to 50 miles per hour, creating waves as high as 8 to 10 feet.

During the height of the storm, approximately 2,000 people were evacuated from their homes to shelters throughout the state. Each of Connecticut's 169 municipalities experienced some level of power outage: Connecticut Light & Power reported more than 650,000 of its customers were without power, and more than 150,000 United Illuminating customers were also without service.

Irene was technically reclassified from a Category 1 Hurricane to a Tropical Storm by the time she reached Connecticut's coast, but that technical difference was lost on the residents who experienced her wrath first-hand. According to the Governor's Office, more than 300 homes in Connecticut, including several in the Cosey Beach area in East Haven (see images) had been destroyed or significantly damaged by Tropical Storm Irene. It is also estimated that the storm will cost



Connecticut cities and towns at least \$15 million in overtime and damage to public buildings.

The property damage, loss of life, and cost associated with Tropical Storm Irene could have been worse if not for Connecticut's [Flood Management](#) and [Coastal Management](#) programs. These programs are essential tools that help state and municipal officials plan for and avoid significant damage to life and property resulting from major coastal



Tropical Storm Irene caused significant damage at Cosey Beach, East Haven
[View Larger Image](#)

storm events like Tropical Storm Irene, as well as reducing public cost in protecting future development from coastal flooding and erosion hazards. These programs encourage officials to be pro-active in planning for these hazards, rather than relegating them to cleaning up the post-disaster aftermath.

In keeping with this critical purpose, DEEP's Flood Management Program oversees the state's participation in the National Flood Insurance Program (NFIP). The NFIP is a federal program created by Congress to mitigate future flood losses nationwide through sound, community-enforced zoning regulations and ordinances, and to provide access to affordable, federally backed flood insurance protection for property owners. The NFIP is designed to provide an insurance alternative to disaster assistance to meet the escalating costs of repairing damage to buildings and their contents caused by floods. Participation in the NFIP is based on an agreement between local communities and the federal government that specifies that those communities that adopt and enforce a floodplain management ordinance to reduce future flood risks to new construction in



Damage from Tropical Storm Irene on Cosey Beach Avenue, East Haven
[View Larger Image](#)

mapped 100-year floodplains will be eligible for federal flood insurance as a financial protection against flood losses. For more information, please see [The Torrent](#), DEEP's newsletter resource for Connecticut's floodplain managers, containing educational, professional and networking information on the state's floodplain management issues.

In addition, the Office of Long Island Sound Programs (OLISP) strives to ensure that coastal flood hazard areas are developed in such a way that hazards to life and property are minimized through implementation of the Connecticut Coastal Management Act. This is the basis for OLISP to routinely recommend that

- residential structures be located out of V-zones (areas of the greatest coastal hazard where high-velocity waves compound flooding impacts) if a reasonable alternative location exists;

Sound Tips:

Prepare for the Next Major Storm!

With the memory of Tropical Storm Irene fresh in our minds, now is the time to plan for future emergencies. Prepare before the next major coastal storm hits by following these simple, common-sense approaches to stay safe:

Remain calm; don't panic.

Develop and consult your [Disaster Survival Checklist](#) which describes the actions you should take and items you should keep ready in the event of an emergency.

Follow the advice of state and local emergency officials.

If told to evacuate, do so! Evacuations are not called for lightly, and remaining in-place during an evacuation can put you and your family at serious risk, and place extra burden on emergency officials.

Monitor official emergency alert notifications, including the [Emergency Alert System](#), the [National Weather Service](#), or [NOAA Weather Radio](#).

For more information about how to keep yourself and your family safe, as well as some additional guidelines for storm-related questions, please visit the following websites:

[Connecticut Guide to Emergency Preparedness](#)

Connecticut Insurance Department [Storm](#)

- dunes be preserved and protected so they can do the job nature intended them to do and protect whatever is located behind them;
- barrier beaches be preserved and protected so they can freely migrate landward without stranding coastal structures;
- coastal homes are set back from the high tide line as far as possible (and not built out over the water) to eliminate the need to build a new seawall;
- coastal septic systems be properly designed and located so they don't break out of the ground during flooding events, and that material contained in the septic system doesn't leave the system and mix with flood waters;
- conversions of summer vacation homes to year-round residences be avoided in order to reduce the density of the coastal population during severe winter storms;
- existing population density in coastal flood hazards areas is not increased during renovations by adding more bedrooms to existing homes;
- hotels, assisted living facilities, and other residential-type uses that house vulnerable populations or visitors unfamiliar with the area (both of which need evacuation assistance) be avoided in coastal hazard areas; and
- development in coastal flood hazard areas provide detailed evacuation plans, ensuring that evacuation routes themselves are not subject to severe flooding during storm events.

In the time between major storm events, it's easy to become complacent about planning for disasters and forget the lessons learned during the last big storm. And it's easy to regard state agency recommendations as an unnecessary impediment to coastal development. But we must not be lulled into complacency once the relative calm is restored to Long Island Sound. The catastrophic damage that occurred on Connecticut's coast on August 28, 2011 resulted from a tropical storm--imagine the devastation if Irene had retained her "hurricane" status.



Structure removed from pilings at Cosey Beach, East Haven
View Larger Image

In the coming months, officials and residents in coastal municipalities will grapple with many serious issues as owners of storm-damaged property consider how (or whether) to rebuild. The state's coastal management and flood management programs will play a key role in assisting them to comprehensively identify those coastal areas that are most vulnerable to flooding and erosion hazards in order to properly site future development and prevent future catastrophic damage during the next storm.

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Best Wishes to Former *Sound Outlook* Editor Tom Ouellette on His Retirement from State Service

With the October 2011 issue of *Sound Outlook* we say farewell to Editor Tom Ouellette, who retired from the Connecticut Department of Energy and Environmental Protection on August 31, 2011 after more than 29 years of state

[Preparedness Guidance](#)

[Federal Emergency Management Agency \(FEMA\) Emergency Preparedness](#)

[FEMA Emergency Preparedness for Businesses](#)

[FEMA Residential Coastal Construction Information](#)

After a storm, a primary concern of home- and business-owners is to assess and tend to the safety of family and property. The Connecticut Departments of [Public Health](#), [Insurance](#), and [Transportation](#), and [Connecticut Light and Power](#) (CL&P) have the following resources available:

Public Health - [Drinking Water](#), [Beaches](#), [Food and Water Safety](#), [Flood and Storm Water Advisory for Public Water Systems](#)

Transportation - [State Road Incidents and Closures Listing and Map](#)

Insurance - [Homeowners Insurance](#), [Flood Insurance](#)

[CL&P Storm Center](#)

The American Red Cross also provides this [checklist](#) to help guide you to a safe and speedy recovery.

Additionally, [DisasterAssistance.gov](#) provides numerous online resources designed to provide information on how you might be able to get help from the U.S. Government before, during, and after a disaster.

Coastal

service.



Tom Ouellette

Tom took-up the editor's pen with the October 2001 issue of *Sound Outlook*, and guided the publication through 10 years and 29 issues. He also contributed many of the original illustrations that will continue to grace the pages of *Sound Outlook*.

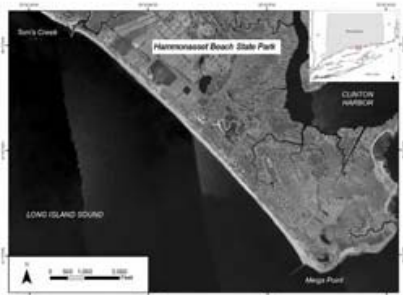
Tom's humor, insight, and unique perspective will be sorely missed. Those of us left behind are daunted by the high bar he set as editor, and we are grateful for his steadfast commitment to excellence and for his ability to see the good in all. We wish Tom great success in whatever his future holds.

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SPOTLIGHTED COASTAL ACCESS: Tropical Storm Irene Visits Hammonasset Beach State Park

Ah, a day at the beach. To many, the idea of a summer visit to the Connecticut beach conjures images of sunshine and gentle breezes blowing across the calm waters of Long Island Sound, and the soft sound of water washing up a gently sloping beach. This was not the scene on the morning of Sunday, August 28, 2011 when the eastern edge of Hurricane Irene roared across Long Island on its way to landfall on the Connecticut coast. Although down-graded to a tropical storm by the time she arrived in Connecticut, Irene's diminished fury would still leave an indelible mark along the 2.1 miles of sandy beach at Hammonasset Beach State Park in Madison, Connecticut's longest and most popular public beach.

Between 8 a.m. and noon, Tropical Storm Irene's sustained winds blew out of the south-southeast at between 30-40 miles per hour, sending waves crashing along the central Connecticut coastline. The waves rode atop a 3 to 4 foot storm-surge of coastal waters caused by wind and rising water levels. Strong winds also toppled trees rooted in already-saturated soil from the summer's abnormally high rainfall. In addition, Irene appeared to have the makings of a "perfect storm," as she struck during a spring high tide, a twice-a-month astronomical event producing the highest tides of the month.



[View Larger Image](#)

Because of the orientation of the shoreline at Hammonasset (see map), the beaches were spared from worse damage than if the storm center had tracked further to the east, or the winds had been out of the southwest. Nevertheless, the park's West and Camper's (Dowd) beaches were significantly eroded, as were parts of East Beach. A dune located immediately waterward of the East Beach bath house was entirely washed-away (see images below). The

dune did the job nature intended, absorbing much of the storm's wave energy, thereby minimizing damage to the bath house.

Hazards Information (CHAMP)

Events like Tropical Storm Irene can help remind us that the impacts of coastal hazards are a major issue in Connecticut due, in part, to high population density and development along the coast.

Looking forward, changes in sea level and storm patterns may increase the frequency and severity of existing hazard events, or potentially create new ones.

To help better understand and manage these threats, the **Coastal Hazards Analysis and Management Project (CHAMP)**, a two-year partnership between the Connecticut Department of Energy and Environmental Protection, the University of Connecticut Marine Sciences Program, and the NOAA Coastal Services Center Coastal Management Fellowship Program, has developed a [coastal hazards section](#) on the DEEP website that provides useful information such as:

Coastal Hazard Primers

Learn about common coastal hazards like storms, flooding, erosion, and the effects climate change may have on these.

Coastal Hazards Management

Find out what you can do to help manage risk for your community or on your property in the short- and long-term.

Coastal Hazards Mapping

Use an interactive mapping tool



Damage to Dune at Hammonasset Beach State Park after Tropical Storm Irene
[View Larger Images](#)



Damage to Dune at Hammonasset Beach State Park after Tropical Storm Irene
[View Larger Images](#)

Other damage at the state park from Tropical Storm Irene included the destruction of approximately half of the park's 2,800 feet of boardwalk, some sections of which were deposited nearly one-half mile away in adjacent tidal marshes. There was also minor structural damage to a short section of the popular Moraine Trail at Meig's Point, over 20 large trees were downed, and nearly 100 yards of frontal dune at Dowd's beach were completely lost. Salt spray from the storm affected hundreds of other mature trees, but the extent of tree mortality will not be known until next spring.

Connecticut's shoreline is no stranger to tropical storms, Nor'easters and hurricanes, and the devastation these storms bring. Luckily, the State Parks Division at DEEP has not forgotten the lessons learned from past storms at Hammonasset Beach State Park. A consultant will soon be selected to design, rebuild, and relocate park infrastructure (e.g., roads, bath houses and the food concession) at West Beach to less vulnerable locations outside of the high hazard velocity flood zone, thereby balancing the needs of the public to enjoy the park's shoreline while minimizing future risk from storm damage.

To plan a visit to Hammonasset Beach State Park, see the [Connecticut Coastal Access Guide](#) which describes this and approximately 300 other places open to the public on Connecticut's coastal waters.

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to get a glimpse of what coastal hazards (e.g., changes in sea level, storm surge, erosion, etc.) may mean to your community.

Coastal Hazards Resources

See a categorized list of useful websites, documents, tools, and sources of data for both individuals and municipal officials.

For more information, contact [Kevin O'Brien](#) at 860-424-3432.

[View past issues of Sound Outlook](#)

[Subscribe to Sound Outlook or any other DEEP newsletter](#)

Look Out For Upcoming Events!

[21st Annual Long Island Sound Citizens Summit](#)
 Friday, October 28, 2011
 8:30 a.m. to 3:00 p.m.
 Housatonic Community College
 900 Lafayette Boulevard
 Bridgeport, CT 06604

Long Island Sound Study (LISS) [Committee Meetings](#)

Please be sure to check the [Calendar of Events](#) on DEEP's website

SPOTLIGHTED COASTAL RESOURCE--

WATER QUALITY: Irene Mixes It Up

Water conditions in Long Island Sound can change drastically in the aftermath of major storms such Tropical Storm Irene. In the case of summer and fall storms, the waters of Long Island Sound undergo a dramatic top-to-bottom flip-flop that drives warmer, fresher surface waters to the bottom. This phenomenon can have both positive and negative effects on organisms living in Long Island Sound.

On the positive side, the oxygen-rich surface waters re-oxygenate the oxygen-starved bottom waters that traditionally take hold during the late summer (see Figure 1). Low dissolved oxygen in bottom waters can stress, and even kill,

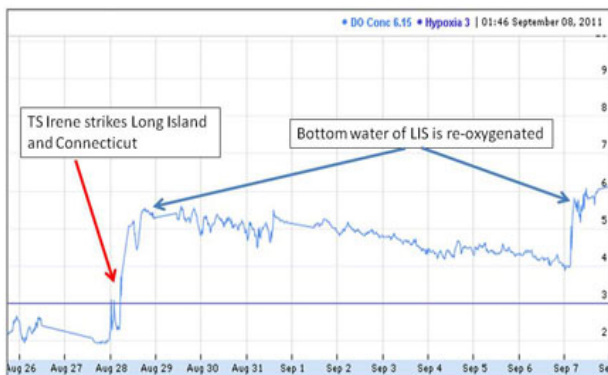


Figure 1: The increase in dissolved oxygen readings in western Long Island Sound when tropical Storm Irene hit
View Larger Graph

bottom-dwelling creatures. When strong winds and wave action associated with hurricanes and tropical storms hit, a sudden surface-to-bottom mixing of water occurs in Long Island Sound. These conditions increase dissolved oxygen levels, which is good for bottom-dwelling marine organisms.

However, the mixing of the water column in the Sound, in concert with the increase in freshwater contributed from rain-swollen rivers, decreases the salinity and increases the temperature of bottom waters in Long Island Sound, which can also be a lethal combination for bottom-dwelling creatures such as lobsters.

The heavy rains associated with Tropical Storm Irene also contributed more than just freshwater to Long Island Sound. As Irene moved into the upper Long Island Sound and Connecticut River watersheds in northern New England, an abnormally high level of stormwater runoff caused significant flooding and erosion of roads and streambanks. Eroded sediment and suspended solids were then carried into the waters of the Connecticut River and its tributaries, ultimately washing into Long Island Sound (see Figure 2).



Figure 2: A westward plume of suspended solids and sediments spewing into Long Island Sound several days after Tropical Storm Irene's flooding of Vermont and other Connecticut River communities
View Larger Image

The result was a plume of sediment creating an aquatic version of a 1930's Dust Bowl storm in the Sound, smothering everything in its path. Bottom-dwelling creatures can experience a type of "dust pneumonia" as their gills become clogged with excessive silt and particles. Imagine being a lobster or a crab living on the bottom of Long Island Sound near the mouth of the Connecticut River and trying to breathe as a massive sediment storm descended upon you!

Fortunately, Irene's water quality effects will be short-lived, and water quality conditions in Long Island Sound will improve as the tides change, currents in the Sound continue to flow, sediment settles out of the water column, and water temperatures return to normal (see Figure 3). However, as climate change continues to have

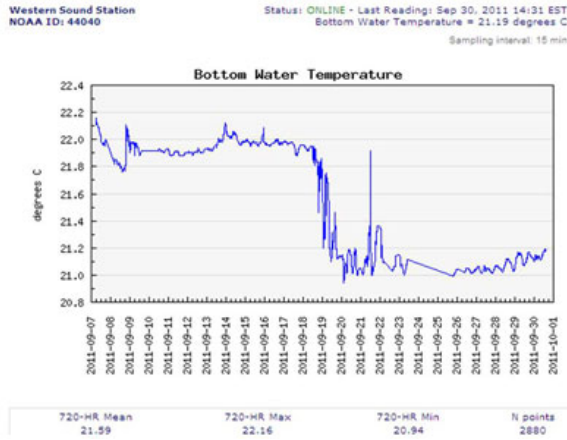


Figure 3. Water temperature returning to cooler conditions later in September
View Larger Graph

an impact on weather patterns around the world, Long Island Sound may experience the severe conditions of intense storm events more frequently, impacting the Sound in ways we do not yet fully understand.

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Irene Impacts Infrastructure

Many sewage treatment plants (STPs) are built on waterfront sites for the obvious reason that they need to be near a receiving waterbody in order to discharge treated sewage effluent. However, a disadvantage of such a location, especially when adjacent to Long Island Sound, is that it makes the facilities vulnerable to the effects of heavy rains, high winds, and tidal flooding from severe storms like Tropical Storm Irene.

When Irene made landfall in Connecticut on August 28, 2011, she arrived at the same time as a lunar high tide on a track that brought strong easterly winds into Long Island Sound. The winds drove high waves into the narrow western end of the Sound and piled the water high onto the shore and into harbors and embayments, precisely where several coastal STPs are located. Fortunately, coastal facilities such as those in New Haven, Bridgeport, Norwalk, and Stratford are surrounded by constructed earthen berms (or dikes) that protect them from coastal flooding.

Irene's high winds also caused many trees to fall on power lines across the state, cutting power to many customers including STPs. One of the biggest challenges facing these facilities was the extended duration of power outage, which required a switch to emergency power generation to allow the STPs to continue to treat and pump waste water. Of the 87 STPs affected in the state, 32 were on emergency power the day after the storm, and three were still relying on emergency power five days later. Most STPs have enough fuel on-hand to operate emergency generators for 48 hours. Those facilities using emergency power for an extended period had to arrange for supplemental fuel deliveries, which in some cases were hampered due to flooding of local roads.



Stratford, Connecticut STP near Long Island Sound
View Larger Image

Power availability is important because there is a particular need to continue operation of STPs during severe storm events. Many of the larger cities in Connecticut have "combined" sewer systems that receive both sewage and stormwater runoff that is routed to the STP for treatment. Under dry weather conditions, this mix of

sewage and stormwater is fully treated for nutrient and pathogen removal at the STP before the effluent is discharged to receiving waters. However, during major storm events with heavy rains, a greater-than-normal volume of stormwater runoff rushes into STP systems. Due to the increased volume of waste water arriving at the STP, facility operators must quickly discharge effluent to balance the flow into the plant and prevent overflow of tank systems and flooding within the facility compound. This sometimes results in discharging waste water from the STP that is only partially treated

(called "primary" treatment), often resulting in increased nutrients and pathogen contamination flowing to rivers and Long Island Sound.

Luckily, only a limited number of Connecticut facilities reported actual loss of treatment during Tropical Storm Irene and in the days that followed: by the day after the storm, nine STPs were treating at the primary level or less; within five days after the storm, only one facility was treating at the primary level and the remaining eight STPs were restored to full treatment.

With good site planning and facility preparedness, STPs can continue to operate and manage flooding impacts during major storm events like Irene. Improved efforts to manage stormwater by reducing the volume of runoff flowing to combined sewer systems will also help STPs weather the storm.

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OLISP Response to Tropical Storm Irene

In dealing with the aftermath of Tropical Storm Irene, many clean-up and damage-repair activities occurred seaward of the high tide line, which normally would have required prior authorization from the Office of Long Island Sound Programs (OLISP). To help Connecticut's coastal residents quickly deal with Irene-related storm damage and alleviate the need to initially acquire permits for the work, OLISP issued several blanket authorizations that immediately covered specific temporary or emergency activities. In issuing the temporary authorizations, OLISP helped avoid catastrophic damage to human health and the environment by allowing temporary measures to immediately prevent imminent failure from damaged structures. To be eligible, temporary activities had to be necessary to prevent hazards to life, health, or welfare or significant loss of property, and had to be followed-up with more detailed applications within 30 days.

Now that the immediate post-storm need has passed, some of the blanket authorizations have expired. For additional information on OLISP temporary and emergency authorizations, please see the [Post-Irene Coastal Permitting Fact Sheet](#) on the DEEP website, or contact the OLISP Permit Section at 860-424-3034.

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Purchase of a LIS License Plate
Supports the LIS Fund



As of August 31, 2011:
Plate Sold: 147,582
Funds Raised: More than \$5.1 million
Projects Funded: 331 (including Ecosystem Management projects)

The LIS Fund supports projects in the areas of education, public access to the shoreline, habitat restoration, and research.

For information on ordering a Long Island Sound License Plate, call 1-800-CT-SOUND.

Climate Change Update: Coastal Resiliency and Climate Resources

Many towns along Connecticut's coast are experiencing impacts from climate change that are already translating to real economic and environmental costs. Even before the damage caused by Tropical Storm Irene preoccupied municipal officials, several major impact areas were identified in a 2011 survey conducted by DEEP and [Clean Air-Cool Planet](#). These include:

- public infrastructure problems due to storms;
- natural resources and ecosystem changes; and
- public and private infrastructure damage from accelerated sea-level rise.

OLISP (alone and in various partnerships) has developed multiple resources to help towns and groups address these and other issues. For example, multiple websites are being finalized that have information on storm and coastal hazards, inundation models for all coastal communities, and how to prepare infrastructure and property (see [Coastal Hazards Information/CHAMP](#)). In addition, the Sentinel Monitoring for Climate Change "Strategies Report" has been published on the Long Island Sound Study [sentinel monitoring](#) website. Pilot monitoring funding and a Sound-wide data clearinghouse will be available soon. DEEP has also conducted [coastal adaptation workshops in Groton](#) and is currently partnering with UConn's CLEAR Program and SeaGrant to conduct additional free workshops for interested communities to plan for climate change. Additional resources include:

- [StormSmart Coasts](#) and its [StormSmart Connect](#) feature are easy to join and use to access the latest free resources including webinars and available funding. Federal funding has been made available to New England towns for coastal resilience and adaptation projects through a [request for proposals](#) posted on the StormSmart Coasts website. The deadline for proposals is 5:00 p.m. on November 10, 2011.
- The Connecticut Municipal Climate Network was formed and periodically meets so all attendees can share lessons learned and hear what state and federal resources are available. There is also a Climate Education Committee organized by DEEP whose statewide members have relevant educational and outreach resources for communities and schools;
- An Adaptation Resource Toolkit for Connecticut is being finalized this year for one-stop shopping for funding, legal, and planning processes and other tools for the whole state; and
- Speakers and other resources are available! Let us help you spread the word.

For more information, contact [Jennifer Pagach](#) at 860-424-3295, and visit the [State of Connecticut's official climate change website](#).

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

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