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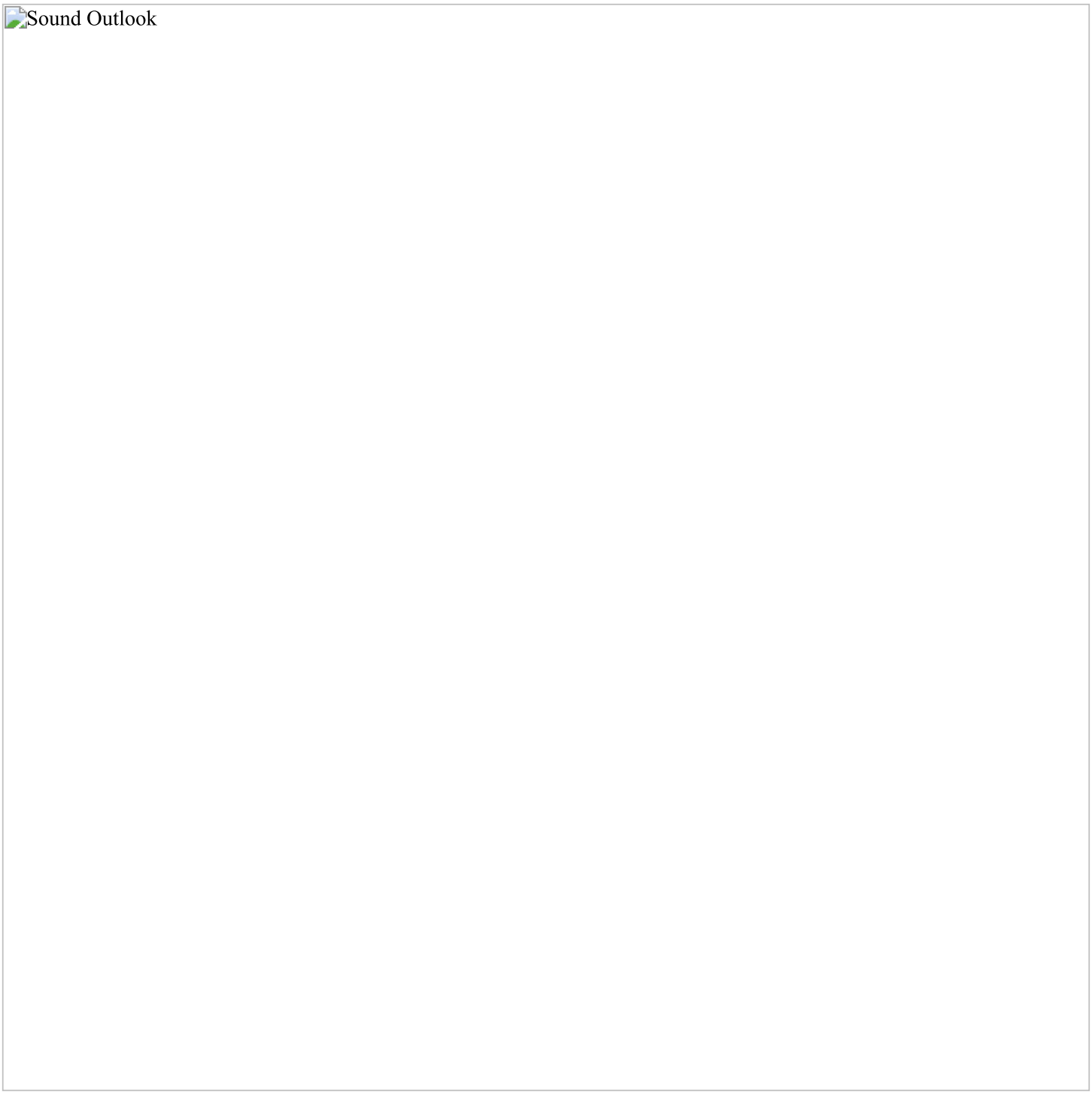

A Newsletter from the Connecticut Department of Energy & Environmental Protection
Exploring Long Island Sound - Issues and Opportunities

Hurricane Sandy: It's D�j� Vu, All Over Again

Baseball legend Yogi Berra once said, "It's d�j� vu, all over again." Reportedly, he was referring to Mickey Mantle and Roger Maris' streak of hitting back-to-back

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Inside

home runs season after season. But he could very well have been talking about the recent spate of intense storms hitting the Connecticut coast year after year. October 2012's Hurricane Sandy brought back painful memories of Tropical Storm Irene that pummeled the coast in late August 2011 (please see the October 2011 issue of Sound Outlook), which itself was followed closely by an October 2011 snowstorm that damaged trees and left most of the state without electricity for a week or more. Hurricane Sandy generated a storm surge of about 6 feet over normal conditions in New London, and about 8 feet above normal conditions in New Haven and Bridgeport. A wind gust of 85 mph was recorded in Madison during the hurricane. Streets and homes remained flooded for several days after the storm subsided.

Even before Hurricane Sandy hit, d&#65533;j&#65533; vu from Tropical Storm Irene prompted OLISP to pro-actively issue several temporary and emergency authorizations that allowed residents to shore-up existing structures ahead of the storm, and to repair damaged structures immediately after the storm as well as remove the sand that the storm pushed onto streets and into wetlands and drainage areas.

Hurricane Sandy damage in Milford. The elevated home weathered the storm,while the at-grade home sustained significant damage.
Photo Credit: DEEP OLISP

Yogi Berra also said, "You can observe a lot by watching." During Tropical Storm Irene and Hurricane Sandy, OLISP watched very closely and made several keen observations.

We observed that many seawalls and other hard structures that were constructed to protect properties actually failed.

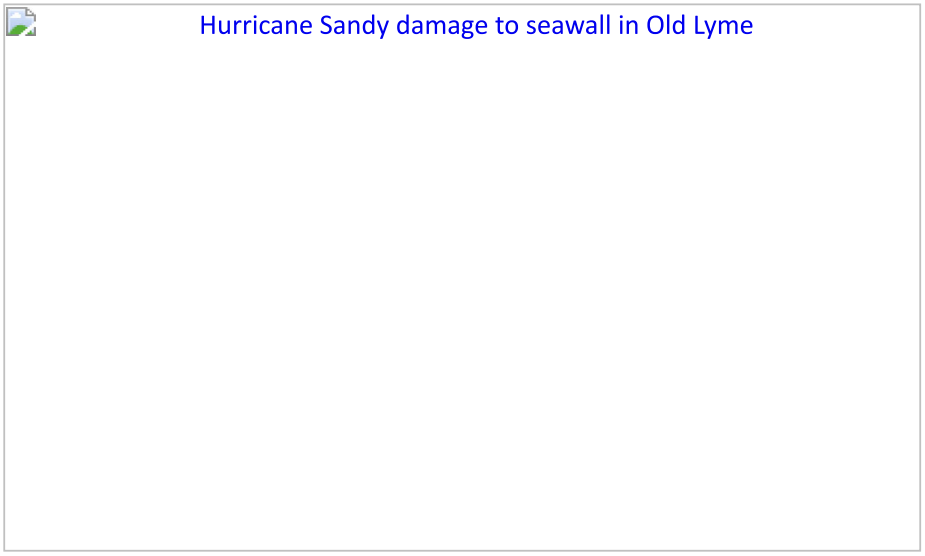
Sound Tips:

Help Mother Nature Help You!
Managing Your Property with Natural Practices Like Dunes,
Living Shorelines, and Rain Gardens Can Save You in a Storm

There's no better way to fight the forces of nature than with natural forces! If you want to protect your property from erosion or flooding, consider using dunes, living shorelines, and rain gardens and other green infrastructure techniques instead of walls or riprap. It's only natural!

Hurricane Sandy caused erosion behind riprap in Milford
Photo Credit: DEEP OLISP

In many instances, the presence of seawalls did little to stop erosion, and might have even worsened it.



Hurricane Sandy damaged a seawall in Old Lyme. Note the significant erosion behind the failed seawall. Photo Credit: DEEP OLISP

We observed that homes set back from the water on properties protected by sand dunes were, in many cases, better protected than those properties that had seawalls.

- Dunes played a vital role during Tropical Storm Irene and Hurricane Sandy in protecting waterfront homes and other shoreline buildings. In doing so, they took quite a beating! For information about beach and dune restoration, please refer to the Long Island Sound Study Habitat Restoration Initiative's Technical Report on Coastal Barriers, Beaches, and Dunes. Additional information can be found in The Dune Book published by the North Carolina Sea Grant program.

- Living shorelines were identified by the Connecticut State Legislature in the 2012 Coastal Omnibus Bill as feasible, less environmentally damaging alternatives to seawalls and other coastal structures in the fight against coastal flooding and erosion. These techniques use a variety of structural and organic materials and can include tidal wetland plants, submerged aquatic vegetation, coir fiber logs, and sand fill to provide shoreline protection and maintain or restore coastal resources and habitat. For more information on the use of living shorelines, please see the June 2012 issue of *Sound Outlook*, as well as the DEEP's shoreline protection webpage, NOAA's Living Shorelines webpage, and the College of William and Mary's Center for Coastal Resources Management

Homes in Westbrook that are set back from the highest tides and protected by dunes fared well during Hurricane Sandy
Photo Credit: Civil Air Patrol

We also observed that Yogi Berra was a very smart man. To quote him yet again, "The future ain't what it used to be." This is especially true when it comes to future storms. Hurricane Sandy was called a "superstorm" and a "frankenstorm" hybrid by meteorologists, but climate researchers are predicting that extreme weather events like hurricanes, tropical storms, and nor'easters may become the rule rather than the exception in the northeast as our climate changes (please see the 2010 Report by the Adaptation Subcommittee to the Governor's Steering Committee on Climate Change). And all that precipitation associated with more frequent severe storms will likely result in more flooding from both storm surges and stormwater runoff, especially in coastal areas. Add sea level rise to the mix, and it becomes increasingly clear that the approaches we take to addressing a future that "ain't what it used to be" must also be different than what we've tried in the past.

Which brings us to yet another "Yogi-ism": "When you come to a fork in the road...take it." In light of the substantial damage that occurred in Connecticut from Tropical Storm Irene and Hurricane Sandy, we find ourselves at a fork in the road when it comes to coastal management policies affecting coastal flood hazard areas. Some of the recommendations issued by the Governor's Shoreline Preservation Task Force (please see the sidebar article) encourage the use of living shorelines where appropriate instead of relying on seawalls, promote consideration of the impacts of climate change on local land use planning, and support the provision of loans to property owners to improve the resiliency of their homes with techniques like elevating their homes so that flood waters can pass beneath them. These new approaches to dealing with shoreline preservation and protection are a good first step.

But we must also take the fork in the road that leads us to reconsider not only HOW we rebuild structures in hazardous areas to improve resiliency, but IF we should continue to promote rebuilding in hazardous areas. This is especially

living shorelines webpage.

- Even without the threat of sea level rise or flooding from Long Island Sound, increases in precipitation from more frequent severe storms will result in more stormwater runoff. The better way to deal with increased runoff volumes is the use of rain gardens, green roofs, rain barrels, vegetated riparian areas, pervious pavement, and other green infrastructure techniques. And now, there's an App for that! The University of Connecticut's NEMO program has developed a Rain Garden App for iPhones and iPads, and an android version is currently in the works.

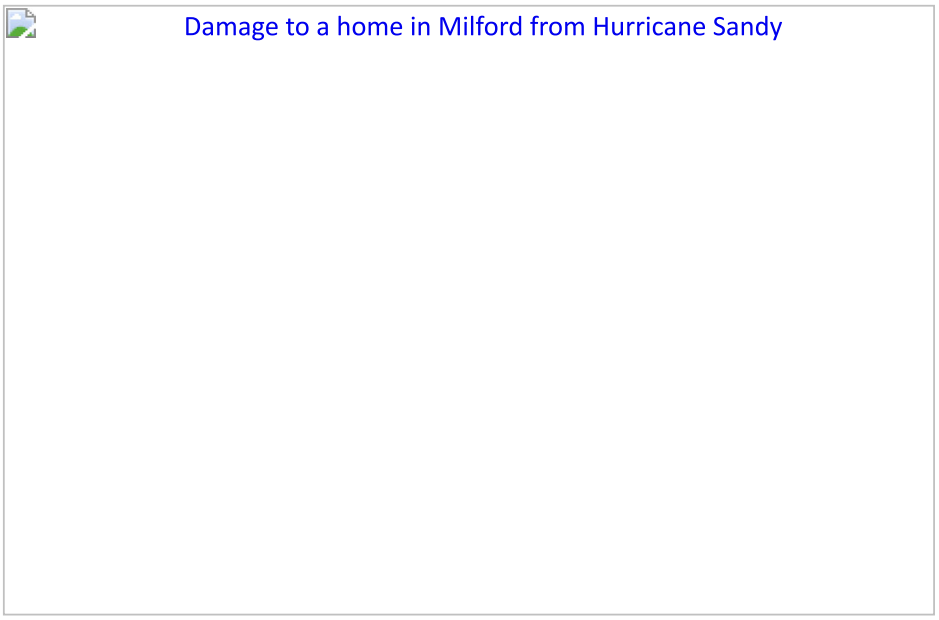
General Assembly Establishes a Shoreline Preservation Task Force

Even before Hurricane Sandy hit Connecticut, a Shoreline Preservation Task Force had been established by the Connecticut General Assembly in February 2012 to research and analyze the impacts of storms like Tropical Storm Irene on Connecticut's shoreline property owners, and to look at the impact of climate change on efforts to protect shoreline areas.

The Task Force's final report issued in January 2013 contains recommendations on topics including coastal structures, municipal land use, sea level rise, insurance and real estate, and education.

critical as coastal hazard areas become even more hazardous with more frequent extreme weather events, and they expand and encroach even further inland with rising sea levels. Further, according to the Governor's office, the 3 major storms that hit the state within that 14-month period between August 2011 and October 2012 resulted in approximately $1 billion worth of damage in Connecticut alone. As of January 2013, over $40 million in federal aid had been approved to help Connecticut residents recover from Sandy. The continued expenditure of such significant sums of public funds for post-storm repair and reconstruction raises several important questions about the efficacy of development in coastal hazard areas.

DEEP Commissioner Dan Esty has suggested that the State investigate additional strategies, including a "buy out" fund for coastal property owners who experienced significant storm damage and do not wish to rebuild, if an appropriate funding mechanism can be found (please see the link to the Commissioner's Testimony Before the General Assembly's Shoreline Preservation Task Force in the sidebar article). "It ain't over 'til it's over," as Yogi Berra so perceptively pointed out, and we can all rest assured that the debate about the future of shoreline development is far from over.



Damage to a home in Milford from Hurricane Sandy
Photo Credit: DEEP OLISP

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Some of the recommendations for addressing future storm impacts include

- pursuing regional opportunities for living shorelines and other low impact techniques for shoreline protection;
- developing education programs to further promote the use of rain gardens and other similar green infrastructure practices; and
- exploring the creation of a fund to compensate and assist property owners who voluntarily decide to relocate away from coastal hazard areas.

DEEP Commissioner Dan Esty provided testimony to the Shoreline Preservation Task Force to address many of the recommendations contained in the Task force report and to discuss some of the challenges facing Long Island Sound. Please refer to the Commissioner's testimony and supporting documents and materials for more information.

View past issues of *Sound Outlook*

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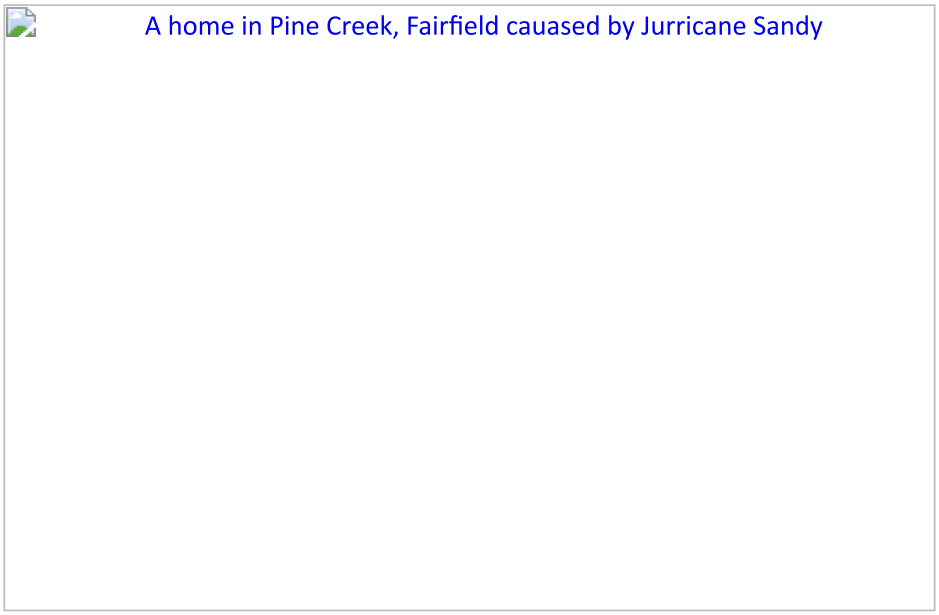
Look Out For Upcoming Events!

Long Island Sound Study (LISS) Committee Meetings

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

Bald Eagle Viewing: Shepaug Dam

CT River Museum Eaglewatch Boat Tours



Hurricane Sandy pushed this home into Pine Creek, Fairfield
Photo Credit: DEEP OLISP

Naturalist Jack Hanna
Thursday March 14, 4 & 8 p.m.
Maritime Aquarium, Norwalk

Green Infrastructure Protects Long Island Sound

The second decade of the 21st Century has ushered in a new era of extreme weather events that has made us all rethink the way we handle rain water and the polluted contaminants it carries off our streets, buildings, and other impervious surfaces. Here in Connecticut, increased rains and flooding events such as the March rains of 2011, Tropical Storm Irene, and "Superstorm" Sandy have brought to the forefront the realization that we need to restore nature's flood-buffering and water-retaining properties that have been lost due to the hardening of our landscape.

For many years, state agencies and municipalities used what we call "gray infrastructure" to collect, divert, and discharge stormwater to local streams and rivers. Examples of gray infrastructure include paved streets with curbs/gutters and catch basins, storm drains, expansive underground pipe systems, and stormwater discharge pipes. These techniques were developed primarily as a way of removing as quickly as possible the precipitation that fell on our roads, roofs, driveways, sidewalks, and parking lots to prevent standing water and flooding, and to discharge that precipitation to the nearest wetland or waterbody.

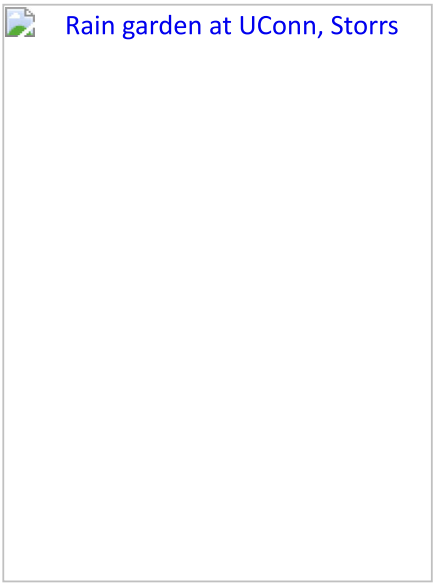
Flooding in Fairfield remained
for days after Hurricane Sandy
Photo Credit: DEEP OLISP

However, we've come to realize that there are many problems associated with these gray infrastructure techniques. We now know that there are contaminants including oil and grease, and bacteria, metals, pesticides and many other pollutants unseen to the naked eye that the rainwater collects as it runs over our landscape. And since the primary goal of gray infrastructure is to remove the rain water as quickly as possible, this pollutant-laced cocktail is discharged untreated almost immediately into Connecticut's rivers, streams, wetlands, and, ultimately, into Long Island Sound. In fact, Larry Levine, Senior Attorney with the Natural Resources Defense Council's water program, has identified stormwater runoff as one of the largest water pollution issues facing the U.S. today.

Some cities have "combined sewers" that allow rainwater to flow to their sewage treatment plants, so during periods of light rain, stormwater is treated before it is discharged. However, during heavy rain events, and the amount of impervious surface increases, the volume of stormwater entering

the sewage plants is more than the plants can handle. When the plant's operating capacity is over-topped, both the stormwater AND the sewage became a "combined sewer overflow" and the polluted mix is discharged without treatment. This overflow containing raw sewage can also flood local roads and back-up into people's homes!

In an effort to reduce stormwater volumes, public works managers, land use planners, and environmental engineers are now realizing the value of using natural vegetated surfaces because of their ability to absorb, retain, and infiltrate stormwater. The vegetated areas help prevent flooding by slowing the release of stormwater to low-lying areas and waterbodies, and their plant roots and soil bacteria treat the stormwater by digesting, breaking down, and removing many pollutants.



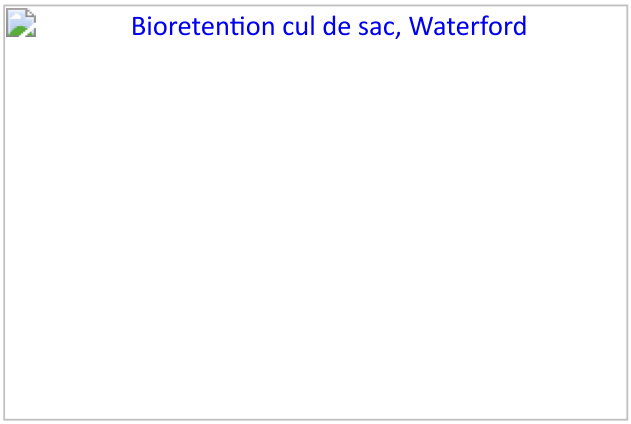
Rain garden at the
University of Connecticut in Storrs
Photo Credit: UConn CLEAR

These vegetated stormwater collection and treatment techniques are called "Green infrastructure" (GI) and "Low Impact Development" (LID) and they mimic how nature handles rainwater through the use of porous surfaces (or pervious cover) rather than impervious surfaces like roadways. And these techniques are mostly "decentralized," which means that when a big storm hits, the stormwater can be treated by a spread-out series of strategically placed practices such as green roofs, rain barrels, rain gardens, roadside swales and plantings, tree box filters, and grassy bioretention areas instead of being piped to one large (yet under-sized) facility or being retained in an underground storage tank system to be released untreated once the storm is over.

Tree box filter in East Lyme
Photo Credit: DEEP

For several years now, DEEP has promoted the use of GI and LID techniques to better manage stormwater runoff and has fostered partnerships with municipalities and the regulated community to embrace GI and LID practices. In an effort to further encourage GI and LID practices and identify any remaining obstacles that may be preventing more widespread adoption of such practices, DEEP is partnering with the EPA Long Island Sound Study and the University of Connecticut's Center for Land Use Education and Research (CLEAR) to host a Green Infrastructure Symposium in the spring of 2013.

The symposium will assist municipalities in the Connecticut portion of the Long Island Sound watershed identify the most appropriate GI and LID practices for their community. In preparation of the symposium, DEEP is conducting a survey of Connecticut municipal land use and public works professionals to determine the current level of use of GI/LID practices in their towns and to identify obstacles to more widespread use. Once the date and location of the symposium are determined, they will be announced on the DEEP, Long Island Sound Study, and CLEAR web sites.



Bioretention Cul de Sac in Waterford
Photo Credit: UConn CLEAR

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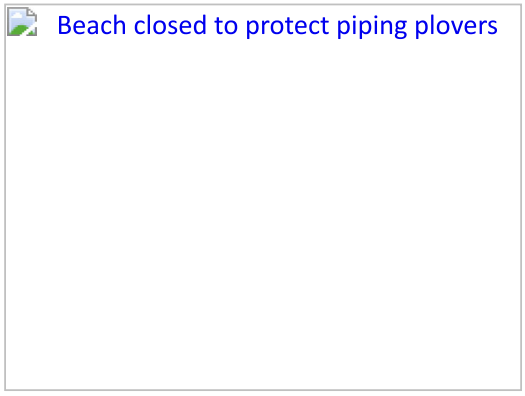
SPOTLIGHTED COASTAL RESOURCE:
Beaches and Dunes: Self-sacrificing Sand That Will Save You in a Storm

Most of us know the value of the beach when it comes to summer vacation. For many of us, it isn't a successful vacation unless we've spent time at the beach, frolicking in the surf or sitting in a chair digging our feet deep into the cool sand. And even though we curse that residual sand between our toes (and in our cars) at the end of the day, we know we'll return to the beach as soon as we can and enjoy the experience over and over again.

We also recognize the value of the beach as a critical habitat for animals such as sea turtles and a variety of shorebirds. We're even willing to temporarily avoid important nesting and mating areas to give piping plovers and horseshoe crabs a fighting chance at survival.

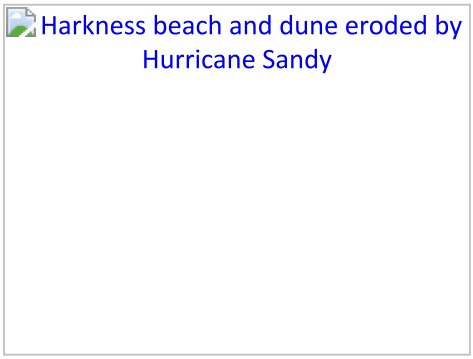


Temporary beach closure and signage to protect piping plover nesting area
Photo Credit: DEEP Parks

However, many of us are not aware of the value of the beach when it comes to protecting us during a storm. These sandy playscapes that allow us to enjoy our day off also work overtime as the first line of natural defense against the forces of nature, buffering the upland against coastal flooding and erosion and helping to lessen the energy of pounding waves during a storm.

By natural design, coastal beaches are ever-changing environments of sand, cobble, or gravel, and their shape and form at any given moment depends on the wind, the waves, the tides, and the season. Waves associated with intense storms can erode the face of a sandy beach, as it temporarily sacrifices some of its sand to be washed offshore. Those sacrificed sand bars then cause the waves to expend their greatest intensity offshore, which eventually lessens the wave energy hitting the upland. Once the storm is over, the more gentle waves return much of the sacrificed sand from the offshore bars back to the upland beach. As a result, the beach face looks steeper and narrower during the stormier winter months and then seems to magically return to its gently sloping, wider face during the calmer summer months.

In addition, the dunes that can form behind the beach as a result of wind-driven sand getting caught in beach grass can further protect whatever is located on their landward side. Whether it's a house or a tidal wetland, the dunes act as a shield against direct wave action, sacrificing their own sand to supply the beach itself. They can also provide long-term protection against potential rises in sea level.



Hurricane Sandy damage to the beach and dune at Harkness Memorial State Park in Waterford
Photo Credit: DEEP OLISP

It is this continuous cycle of sand give-and-take as they bear the brunt of pounding waves and rising flood waters that makes beach environments such hazardous locations for homes and other structures. As evidenced by Tropical Storm Irene in August 2011 and Hurricane Sandy in October 2012, homes built on the beach too close to the reach of the highest tides were subjected to both flooding from storm surges AND high intensity wave action during the height of those coastal storms.

That's why the Connecticut Coastal Management Act (CCMA) contains policies that strongly encourage coastal property owners to protect beaches and dunes so those resources can, in turn, protect coastal property owners! We know that beaches and dunes will be eroded during coastal storm events, so development in beach areas should not interfere with the natural functions of the beach to protect against coastal flooding and erosion. Homes should be set back as far as possible from the reach of the tides. Structures should be elevated to ensure that flood waters and pounding waves can pass beneath them. Dunes should be restored--or even created--to provide a natural wall of defense against storm surges, and they should also be protected from foot-traffic that can trample dune grass and undercut the roots which can cause erosion.

As an added bonus, taking these protective measures will allow beaches and dunes to continue to provide opportunities for another day at the beach for people and plovers alike.

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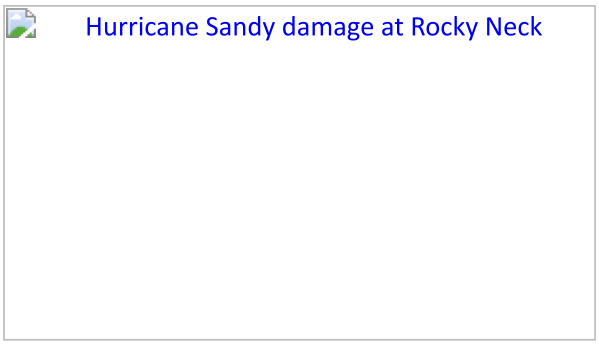
SPOTLIGHTED COASTAL ACCESS:
Rocky Neck State Park Provides a Variety of Coastal Resource-Based Outdoor Recreation Opportunities

The rocky escarpment at Rocky Neck
Photo Credit: DEEP OLISP

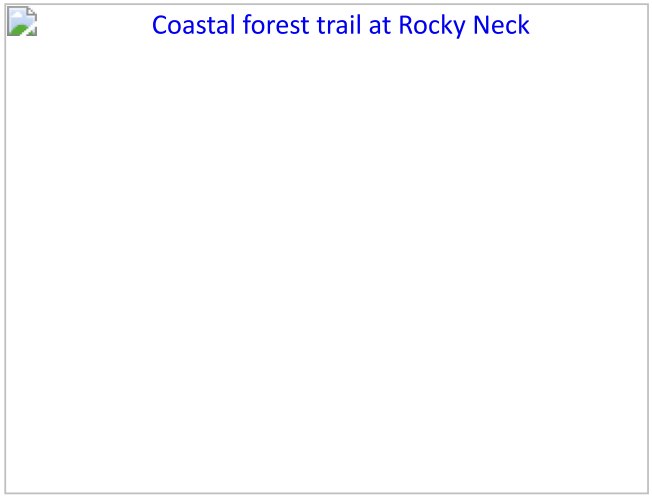
Although named for the glacial deposits and exposed bedrock dominating its western shoreline, Rocky Neck State Park offers a variety of landscapes to explore in the winter beyond its impressive rocky intertidal areas. Coastal resources to enjoy within the park include a gently sloping coastal escarpment that rewards climbing visitors with outstanding views of Long Island Sound. Atop this escarpment also stands the architecturally significant Ellie Mitchell Pavilion, a Works Progress Administration-era structure built with stone and timber from Connecticut State parks and forests. The pavilion sustained wind damage to its slate roof during Hurricane Sandy and will require costly repairs before this park icon can be re-opened to host public events.

A large salt marsh with tidal creeks graces the center of the park which can be viewed via a series of trails (see trail map), platforms, and elevated walkways. Of course, no visit to the park is complete without visiting its beach. Like several of Connecticut's beaches, the beach at Rocky Neck was eroded by Storm Sandy and its dunes were damaged. Storm Sandy also damaged approximately 900 feet of boardwalk fronting the dunes at Rocky Neck, a fate similar to that encountered at the state's other coastal parks. Although hurricane season has ended, Connecticut beaches remain vulnerable to storms throughout the winter when more common and equally damaging nor'easters are known to visit Connecticut's shoreline.



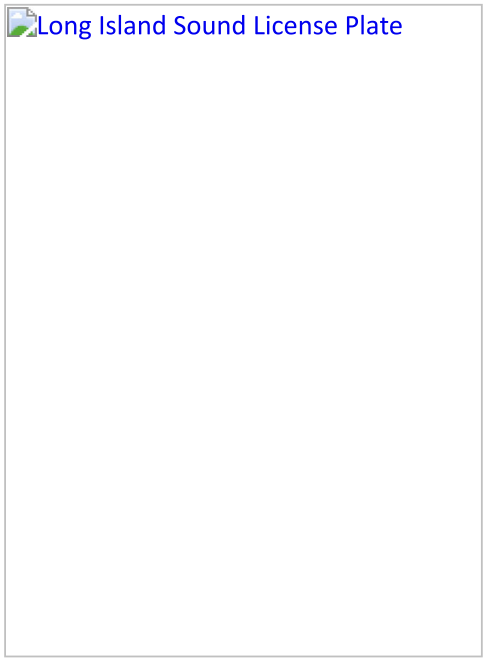
Damage at Rocky Neck from Hurricane Sandy
Photo Credit: DEEP OLISP

The largest and perhaps most ecologically significant coastal resource at Rock Neck is coastal forest. Coastal forest covers approximately 50% of Rocky Neck's 710 acres and includes old field habitat in the northwest corner of the park (shown as 'Shipyard Field' on the trail map). The oak-dominated forest including dense thickets of mountain laurel offers winter visitors a different kind of coastal experience than they may be familiar with when visiting the park's beach in the summer.



Coastal forest trail at Rocky Neck
Photo Credit: DEEP Parks

Approximately 4.5 miles of trails wind through the forest that park staff recently cleared of trees felled by Storm Sandy. While exploring the forest trails, be sure to hike the "yellow trail" to the rock outcrop known as "Tony's Nose" which offers unmatched vistas to the west including the scenic Four Mile River and marsh. Children will especially enjoy finding another local landmark hidden in the forest called Baker Cave, a small "cave" that can be accessed via a short path off the service road to the Mitchell Pavilion (look for the trail entrance on the right side of the service road at an opening in a stone wall with stone steps, an approximately .3-mile walk up the service road). The service road begins near the northwest corner of the large parking lot on the right side of the terminus of the park's main entrance road.



If you're looking for a Connecticut State Park along Connecticut's 333 miles of coastline with the greatest variety of recreational activity and terrain, Rocky Neck State Park is well worth a visit. To help plan your visit to Rocky Neck 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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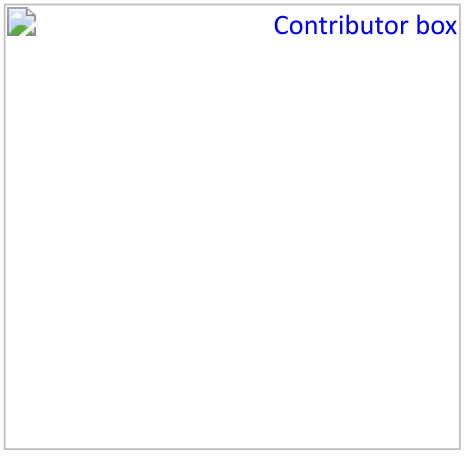
Climate Change Update: Sentinel Monitoring of Impacts on Long Island Sound

As detailed in previous issues of *Sound Outlook* (October 2010, June 2012), the Long Island Sound Study's Sentinel Monitoring for Climate Change in the Long Island Sound Ecosystem Program is a multidisciplinary scientific approach for providing early warning of climate change impacts to Long Island Sound ecosystems, species, and processes. The goal is to inform real-time adaptation in Long Island Sound so disruption of the estuary is minimized. Working with historic monitoring data, climate models, and many scientific partners, the Sentinel Monitoring for Climate Change Workgroup, which includes CT DEEP, NOAA , EPA, and NY DEC staff, has continued to make progress that will help facilitate appropriate and timely decisions for the Sound.

The Sentinel Monitoring workgroup recently funded a project proposed by the University of Connecticut titled "Sentinels of Climate Change: Coastal Indicators of Wildlife and Ecosystem Change in Long Island Sound." The project will be conducted by a multi-investigator team that has developed a northeastern United States coastal marsh bird monitoring program and will monitor three priority sentinels: 1) distribution, abundance, and species composition of marsh birds, colonial nesting birds, shorebirds, waterfowl; 2) species composition within coastal forests, shrublands, and grasslands; and 3) the areal extent, diversity, composition, and marine transgression of salt marshes. This project will provide much-needed insight of the continued impacts from climate change in Long Island Sound, as the ability of salt marshes, which provide critical habitat for so many species, to migrate landward as sea level rises is a critical concern.



For more information on climate change planning activities and opportunities in Connecticut, contact Jennifer Pagach at 860-424-3295.

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