

2007-2008 | Long Island Sound Study | Biennial Report

PROTECTION + PROGRESS



PROTECTION + PROGRESS

In Memoriam: Donald R. Henne

On May 16, 2009, the Avalonia Land Conservancy renamed the 76-acre Shunock River Preserve in North Stonington, CT, the *Donald R. Henne Memorial Shunock River Preserve*, in honor of the dedicated and respected conservationist who died in 2007. Don worked in conservation and natural resource management for the federal government for 32 years, the last nine as project leader at the Southern New England Coastal Program of the U.S. Fish and Wildlife Service (FWS) in Charlestown, Rhode Island. He represented FWS on the Long Island Sound Study management committee, generously contributing his time and expertise. Among many accomplishments was his effort to help initiate the Long Island Sound Futures Fund (Futures Fund) as a funding source for communities to restore and protect the Sound. He was also Chairman of North Stonington's first Conservation Commission, and worked with great patience and dedication to protect the town's wetlands and streams, including the Shunock River. While greatly missed, Don left a legacy in the hearts of those who knew him and in the land and water that he worked passionately to conserve.



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For more Information on LISS, please visit:
www.longislandsoundstudy.net

THE DONALD R. HENNE MEMORIAL TRAIL in North Stonington, CT (*top left*). Don speaking at a Thames River Basin Partnership workshop in 2006 about options for funding sources for an invasive species control project at Poquetanuck Cove.

(*On the cover*) A sanderling at David Weld Sanctuary in Smithtown, NY. The sanderling is on New York State's list of "species in greatest conservation need" and Audubon's watchlist for species in need of immediate conservation help. Photo by George DeCamp.

ABBREVIATION KEY:

CT: Connecticut
CT DEP: Connecticut Department of Environmental Protection
EPA: U.S. Environmental Protection Agency
FWS: U.S. Fish and Wildlife Service
LISS: Long Island Sound Study
FUTURES FUND: Long Island Sound Futures Fund
NFWF: National Fish and Wildlife Foundation
NOAA: U.S. National Oceanic and Atmospheric Administration
NY: New York
NYSDEC: New York State Department of Environmental Conservation
OPRHP: New York State Office of Parks, Recreation and Historic Preservation
UCONN: University of Connecticut

Unsure about a term used in this report? See www.LIShealth.net for a definition.



Working in Partnership

The Long Island Sound Study (LISS), sponsored by the U.S. Environmental Protection Agency (EPA) and the states of Connecticut and New York, is a partnership of federal, state, and local agencies, universities, national and local environmental groups, businesses, and community groups to restore and protect Long Island Sound. An "Estuary of National Significance," the Sound is an ecologically vital coastal waterbody where freshwater draining from the Sound's large watershed mixes with salt-water from the ocean. Through a strategy of adaptable, collaborative, effective, and efficient management, LISS partners work to improve water quality, restore habitats to protect marine life and shore birds, and involve the public in programs to understand and enjoy their unique treasure.

LISS IS PART the EPA's National Estuary Program (NEP). The NEP consists of 28 programs on the coasts of the U.S. and Puerto Rico that use partnerships to secure and leverage funds to restore and maintain the water quality and ecological integrity of estuaries of national significance. The NEP celebrated its 20th year in 2007 with the theme: "adaptable, collaborative, effective, efficient." Log on to www.epa.gov/owow/estuaries for more information.



03

Director's Remarks

I keep one of my favorite quotes posted in plain view from my office chair. Louis Gerstner, speaking of IBM upon becoming CEO, said, "Part of the culture was a tendency to debate and argue and raise every issue to the highest level of abstraction. The process almost became one of the elegance of the definition of the problem rather than the actual execution of an action plan."

Whether the challenge is success in business or in restoring Long Island Sound, the purpose of debate is to lead to informed action, not distraction.

Protection & Progress reports on the execution of the Long Island Sound Study's action plan to reduce pollution, and protect and restore coastal habitat. The activities undertaken in 2007 and 2008 by LISS partners to achieve these goals—upgrading sewage treatment plants, reducing polluted stormwater runoff, fostering watershed management, restoring degraded habitats, preserving open space, conducting monitoring and research programs, and educating and involving the public—are reported here.

The desired outcomes of these efforts are distilled in a vision statement first articulated in 1990.

The vision...for Long Island Sound is of waters that are clean, clear, safe to swim in, and charged with life. It is a vision of waters nourished and protected by extensive coastal wetlands, by publicly accessible, litter-free beaches and preserves, and of undeveloped islands. It is a vision of abundant and diverse wildlife, of flourishing commercial fisheries, of harbors accessible to the boating public, and of a regional consciousness and a way of life that protects and sustains the ecosystem.

For many, this vision came into focus in June 2009 with the arrival in Long Island Sound of a pod of more than 200 bottlenose dolphins. The dolphins came to forage for food, drawn by schools of menhaden and the larger fish trailing them. The dolphins, in numbers not seen for decades, entered Hempstead Harbor and gave witness from shore and by boat to a Long Island Sound compatible to both nature and humankind. Can the harmony glimpsed that day be sustained? Will dolphins once again become a regular sight in Long Island Sound? It's really up to us. We have a plan to execute and there is much work to do.

Mark Tedesco
Director,
U.S. EPA Long Island Sound Office

LIS Futures Fund Grant Program A 'Surround Sound' Partnership

IN 2007 AND 2008 the Long Island Sound Futures Fund provided more than \$1.8 million in grants to groups across the Sound for stewardship, restoration, planning, and education projects. The Futures Fund is funded by EPA, FWS, the National Fish and Wildlife Foundation (NFWF), and Shell Oil's Marine Habitat Program. It is managed by NFWF, which seeks additional funding from corporations and foundations. The New York State Department of Environmental Conservation (NYSDEC) and the Connecticut Department of Environmental Protection (CT DEP) also provide technical support. Since the Futures Fund started in 2005, 114 projects have been funded, including projects that have opened 33 river miles for fish passage, restored or protected 193 acres of habitat, and educated and involved more than 300,000 residents. See www.longislandsoundstudy.net/futuresfund for descriptions of all projects.



Green Roof Project

The New York City Department of Parks and Recreation installed a 12,000 square-foot green roof projected to capture 300,951 gallons of stormwater annually. The green roof will be used as a pilot demonstration area to be reproduced in other parks buildings.



Shellfish Seeding

Nassau County, the towns of Oyster Bay and North Hempstead, and Cornell Cooperative Extension partnered to seed shellfish in areas of Hempstead Harbor targeted for water quality improvements that will allow for harvesting. They worked with The Waterfront Center to seed 1.7 million eastern oysters and hard clams from the historic sloop, *The Christeen*. (Pictured: Nassau County Executive Thomas Suozzi in yellow jacket).

Fishway Design
The Nature Conservancy designed and built fishways for two dams to accomplish a goal of opening up 1.5 miles of habitat for diadromous fish on the Aspetuck and Saugatuck (pictured) rivers.



Water Monitoring

Earthplace Harbor Watch/River Watch and the Town of Westport monitored water quality and identified water quality problems at the Muddy Brook—a stream that empties into the Sherwood Island Mill Pond—with the goals of raising awareness and reducing pollution.



Beach Clean-up

The Coastal Steward of Port Jefferson worked with 370 volunteers to remove 32 tons of trash on almost 15 miles of beach.



Stormwater Reduction and Education

The Group for East End removed and replaced the surface of a public boat ramp with permeable pavement, planted wetland vegetation, and developed public education materials focused on reducing nonpoint source pollution into Mattituck Inlet.



Eelgrass Restoration

Cornell Cooperative Extension of Suffolk County will restore up to 1.25 acres of historic eelgrass beds with the aim of ensuring survival in the face of climate change, sea-level rise and other threats.



Dune Restoration

Mitchell College in New London, working with volunteers, removed invasive plants, reduced erosion from foot traffic, and restored 600 linear feet of dune with American Beachgrass.



Social Marketing

The Last Green Valley's "Source to Sea" campaign educated adults and children through 90 events, developed a Web site about water quality issues in the Thames River Watershed, and solicited nearly 1,000 pledges by citizens to take specific actions to reduce pollution into waterbodies.



- 2007-2008 Projects
- 2007 Projects
- 2008 Projects

5 2.5 0 5 Miles

Lucy Reading-Ikkanda, FWS Coastal Ecosystems Program, and NFWF

Water Quality

The number of reported oxygen-depleted waters in coastal areas around the world has doubled every decade since the 1960s, according to scientists Robert Diaz and Rutger Rozenberg in a 2008 paper published in the prestigious journal *Science*.

These “dead zones” are as serious a threat to marine life as overfishing and habitat loss, say the authors. They are caused in part in the Sound by an increase in nutrients, such as nitrogen, which triggers growth of microscopic algae in surface waters. The organic matter produced sinks to the seabed, where it is decomposed by bacteria in a process that consumes oxygen.

A primary source of nitrogen is the treated human waste from sewage treatment plants (STPs) and septic systems. Other sources of nitrogen include animal waste and fertilizer, which can be carried into the Sound’s tributaries and storm drains as stormwater runoff from impervious surfaces such as roads, and the burning of fossil fuels by power plants or vehicles, deposited from the atmosphere to the Sound and its watershed.

LISS began studying ways to reduce nitrogen pollution in the early 1990s, and in 1998 approved a plan to reduce nitrogen loadings by 58.5 percent from the CT and NY portions of the watershed. Municipalities must reach their targeted goals by 2014 with the exception of New York City and Westchester County, which received extensions to 2017 because of the complexities in renovating their STPs. Overall, since 1994, when nitrogen discharges peaked, upgrades at 41 of the region’s 106 plants have resulted in a reduction of 12,719 trade equalized pounds of nitrogen per day (see response, p. 7).

Besides STP upgrades, LISS partners also look for innovative ways to reduce pollution carried by runoff (see center article). In 2007, the Town of Mansfield, with support from the University of Connecticut (UConn) and CT DEP, also created the first regulatory plan to limit land coverage of impervious surfaces to 12 percent in the Eagleville Brook watershed, or to use best management techniques to reduce the impact of impervious surfaces to meet the equivalent of this threshold.

- GOAL** Improve water quality by reducing nitrogen pollution
- PROGRESS** Reduced nitrogen by 12,719 trade equalized pounds from sewage treatment plants since 1994
- CHALLENGE** Maintaining adequate funding for plant upgrades



CONTRACTORS INSTALL a “Smart Sponge” filter near the Maritime Aquarium in South Norwalk section of the City (left), and a cartridge type filter at Veteran’s Park in East Norwalk (top right).

HIGHLIGHTS 2007—2008

DUMP SOMETHING on the ground, and it may get carried by rainfall to a storm sewer draining to the Sound. But what if a municipality installed a filter in the storm drain to catch the debris as well as animal waste, fertilizer, motor oil, and pesticides?

That’s what Norwalk did with two pilot projects, one funded in 2006 by the EPA for storm drains installed on South Norwalk streets, and the other

funded in 2007 by the Futures Fund for drains installed at Veterans Park along Norwalk Harbor.

The two stormwater filter projects were shown to be highly effective, said Michael Yeosock, a senior engineer at the Norwalk Department of Public Works. In the South Norwalk project where 275 filters were installed in storm drains, more than 19 tons of trash and debris were collected in the

two-year test period. Lab tests by the company that installed the filters indicated that bacterial removal of E. coli averaged 70 percent, and the oil and grease removal rate was 70.5 percent, equivalent to preventing an oil spill of more than 1,200 gallons.

Yeosock said that as a result of the success of the pilot projects, the filters will become a component in the city’s stormwater management plan to comply with EPA requirements to reduce polluted runoff. The city will continue to maintain and replace the filter systems as needed, and is looking to add an

STRATFORD’S aeration tank, which helps remove nitrogen from sewage, under construction (right). Stratford’s secondary clarifier, which separates solid waste from effluent, under construction (bottom).

additional 50 to 100 filters annually in areas near tributaries that drain into the Sound.

Norwalk estimates that if the 2,500 most critical storm drains in its streets and parks had filters, 172,000 pounds of trash would be collected in one year. But Norwalk is just one of dozens of coastal communities in both states with storm drain systems that discharge into the Sound.

“It really doesn’t dawn on people until you begin to look at this data,” said Yeosock. “And then you look at the whole coastal area of the Sound, and there must be an incredible amount of pollutants that goes into storm drains.”

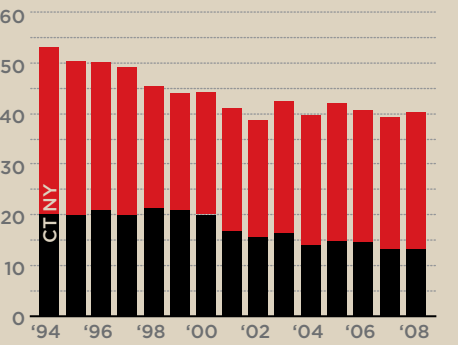
Since the project started, Norwalk has received calls from around the country wanting more information. Locally, other municipalities have also started pilot programs. For example, with a Futures Fund grant, Westchester County installed stormwater filters in 2006 at Rye Playland amusement park, adjacent to the Edith G. Read Natural Park and Wildlife Sanctuary. The filters have been effective in reducing hydrocarbons and heavy metals, said Jason Klein, Westchester County parks curator at the Read sanctuary. On Long Island, Flower Hill and Bayville also have plans to start filter programs.



IN 2008, Stratford, CT began upgrading its sewage treatment plant to reduce nitrogen discharged into Long Island Sound. The short-term interruption of interim nitrogen removal activities at the facility caused by the construction process has increased nitrogen levels at the plant from 335 trade equalized pounds per day in 2006 to 884 pounds in 2008. However, by 2014, after the advanced nutrient removal system is completed, nitrogen discharge will be reduced to 221 pounds per day. In 2006, CT DEP announced that it would provide the town \$29.7 million from the state’s Clean Water Fund to help pay for the \$55 million upgrade, of which \$10.1 million was allocated for nitrogen removal. The fund was created in 1987 to assist in financing sewer system and STP projects. Under the program, about \$480 million in grants and more than \$1.3 billion in loans have been provided to local water pollution control authorities.



LIS Point Source Nitrogen Trade-Equalized Loads (thousands TE pounds per day)



◀ **NITROGEN** has been reduced by 12,719 trade equalized pounds a day since 1994, but there was a slight increase in 2008.

RESPONSE

Reducing Nitrogen

BOTH NY AND CT are implementing innovative programs to reduce nitrogen levels in phases. These programs take into account that some sewage treatment plants can more cost-effectively remove nitrogen because of size and design considerations, or have a greater impact because of proximity to the western Sound where hypoxia is a greater concern. In 2007, CT received EPA’s Blue Ribbon Water Quality Trading Award for its innovative nitrogen credit exchange program. See www.ct.gov/dep/nitrogencontrol for more information

Several treatment plants completed denitrification projects in 2007 and 2008, contributing to improving water quality and fulfilling the reduction targets. In CT, Cheshire, East Hartford, Simsbury (phase 1), Suffield, Winsted, Hartford (interim project), Shelton, and Westport (phase 2) completed projects at a cost of about \$36 million, resulting in a reduction of 639 trade equalized pounds of nitrogen per day from baseline levels. In NY, two plants, Huntington and Port Jefferson, completed advanced nitrogen removal upgrades, costing \$22.5 million, resulting in a reduction of 520 trade equalized pounds of nitrogen per day. In addition to the completed projects, six plants in CT, including Stratford, started construction in 2007 and 2008 for advanced nutrient removal, and New York City has several large ongoing projects under construction. These upgrades required temporary disruptions of nitrogen removal activities, and resulted in an overall increase of nitrogen discharges in 2008 from 2007.

Watershed Management

What gets built on the ground, or what we apply or throw on the ground, can have consequences for waterbodies. For example, applying too much fertilizer on a lawn may result in nutrients washing into a storm drain, which can lead to algal blooms in nearby streams and ponds, or downstream in the Sound.

Recognizing the impact of land use activities on waterbodies, LISS in 2003 adopted a policy objective to improve management of the watershed—the area of land where all of the water that drains off the landscape ends up in the Sound. The goal is to have 50 percent of the Sound’s watershed in both CT and NY developing or implementing watershed restoration strategies. To determine if the goal is being met, LISS in 2007 surveyed the Sound’s local watersheds (see response, p. 9).

To help achieve the goal, the Futures Fund awarded more than 20 grants to local communities and watershed associations for developing and implementing watershed plans. LISS also has funded UConn’s Center for Land use Education and Research (CLEAR) to develop information products for communities involved in watershed planning. For example, in 2008, CLEAR completed a report to help communities assess the effectiveness of regulations to protect vegetated buffers around waterways.

LISS, through the New England Interstate Water Pollution Control Commission (NEIWPCC), also works with three upper New England states and CT to address nitrogen contribution issues involving the CT River, which begins along the Canadian border and supplies more than 70 percent of the fresh water that enters the Sound. In 2008, the U.S. Geological Survey with NEIWPCC published a study determining the rate of nitrogen loss in the upper CT River in the journal *Biogeochemistry*. The study determined that no or only small rates of in-stream nitrogen loss occurred during the spring and summer of 2005.

GOAL Reduce polluted runoff and nonpoint source pollution
PROGRESS Supported 14 watershed protection projects in 2007-2008
CHALLENGE Fostering development in a sustainable manner



WATERSHED RESIDENTS take part in a guided nature walk along the Nissequogue River, learning about its history, ecology, and recreational opportunities (left). Healthy native marsh (top) will help to serve as a seed source to restore native plants in areas impacted by reduced tidal flow. *Phragmites australis*, an invasive species also known as common reed, has been growing in Sunken Meadow Creek as a result of reduced tidal flow from the Sound (right).



Creek is one of the largest tributaries of the Nissequogue River. Once a healthy tidally dominated river system, the area was diked in the 1940s. Since that time, the changed hydrology of limited tidal flows from the Sound has been a bottleneck to fish and resulted in growth of noxious invasive plants of limited use to wildlife. The ultimate goal of the project is to reintroduce tidal flow across the current dike to provide access for fish. Restoration of tidal flow would reconnect approxi-

mately 73 acres of vegetated wetland and 38 acres of underwater wetlands to daily tidal flushing. This will help improve water quality in the Sound.

Other recommendations in the Stewardship Action Plan include enhancing the Town of Smithtown’s managed growth, developing a transfer of development rights program, restoring native vegetation throughout the watershed, and conducting water quality monitoring through local high schools.

▼ **LARISSA GRAHAM**, LISS’s New York public outreach coordinator, describes her catch to a reporter during an event in November 2008 announcing the Nissequogue Action Plan.



HIGHLIGHTS 2007–2008

THE NISSEQUOGUE RIVER on Long Island flows nearly nine miles from its source—the freshwater Hauppauge Springs—to its mouth on Long Island Sound. Along this route are many ecological treasures, including freshwater wetlands, coastal forests, and a rare red maple black gum swamp. It is the only major tidal river draining into Long Island Sound in New York where the coastal portion remains in relatively undisturbed condition, and it has one of the largest coastal wetlands on Long Island’s north shore.

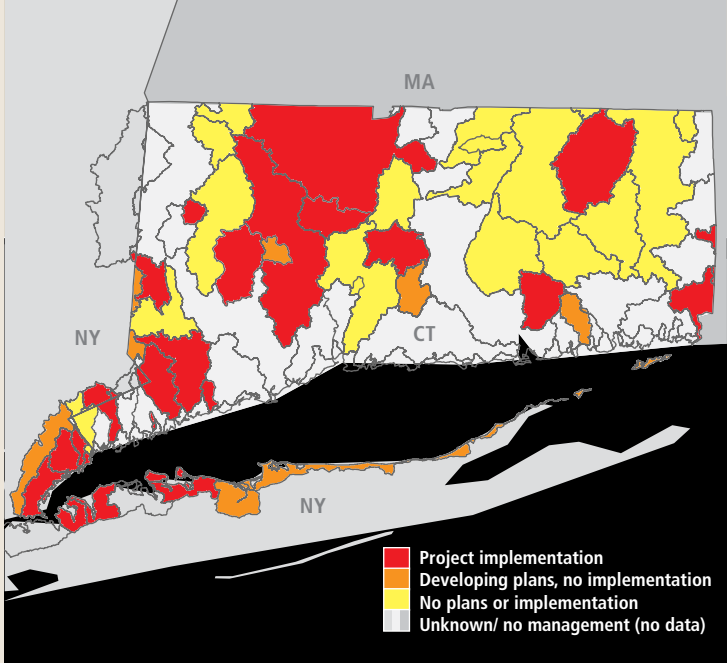
But while parts of the Nissequogue River may look pristine, the river lies in a 40-square mile watershed with suburban densities of around 2,000 people per square mile. Certain habitats such as wetlands are protected, but groundwater and runoff pollution from surrounding developed areas can threaten these wetlands and local water quality.

To address these threats, as well as to enhance those areas already protected, LISS funded the Regional Plan Association (RPA) to develop a watershed action plan for the Nissequogue River.

After two years of planning involving a broad coalition of government, civic, business, and environmental groups, RPA published the *2008 Nissequogue River Stewardship Action Plan* (available at www.rpa.org/nissequogue). With 110 recommendations for action, implementation of the plan will help to ensure the protection of habitat and water quality for the Nissequogue River, one of the 33 Stewardship Areas identified by the Long Island Sound Stewardship Initiative (see p. 12).

The Action Plan’s recommendation

to implement a marsh restoration project within Sunken Meadow State Park is beginning to take place with help from a \$30,000 grant from the Futures Fund. In this project, the New York State Office of Parks, Recreation and Historic Preservation (OPRHP) and its partners are creating a model of tidal flow aimed at identifying the best alternative to restore salt marsh and underwater habitat for anadromous and resident fish in Sunken Meadow Creek at the mouth of the Nissequogue River. Sunken Meadow



RESPONSE

Protection Strategies

ACCORDING TO A 2007 survey of the Long Island Sound watershed in CT and NY, 56 conservation groups are considering or developing watershed management strategies in a total area covering more than 4,000 square miles. The survey found that 24 of these watershed groups have developed and are actively implementing plans.

These watershed strategies include controlling harmful bacteria from agricultural sources, acquiring land to protect natural resources, developing best management practices to control stormwater runoff, removing dams to allow for fish to migrate between freshwater and saltwater sources, developing public education campaigns about proper lawn care practices, and restoring and preserving habitats.

In 2007 and 2008, the Futures Fund awarded grants for watershed management to:

- **The Eastern Connecticut Resource Conservation and Development Area** to conduct a workshop for 35 municipal land use leaders concerning natural resources watershed protection in the Quinnipiac River Watershed;
- **The Nature Conservancy** to review land-use policies for four towns along the Salmon River, creating maps to show the impact of projected development on natural resources, and host public meetings to increase information about conservation; and
- **The Friends of the Bay** to develop a Harbor Watershed Action Plan for the Oyster Bay/Cold Spring Harbor complex.

Habitat Restoration

LISS established a Habitat Restoration Initiative in 1996 to restore and protect 12 priority Long Island Sound habitat types that have been degraded, or are under threat, from development and pollution. These habitat types include some of the most valuable natural resources on the Sound: cliffs and bluffs, intertidal flats, coastal barriers, beaches, and dunes, riverine migratory corridors (opening rivers for fish passage), coastal grasslands, rocky intertidal zones, coastal and island forests, molluscan (shellfish) reefs, estuarine embayments, submerged aquatic vegetation, freshwater wetlands, and tidal wetlands.

To achieve the goal of restoration—reestablishing ecological conditions before human disturbance—the Initiative identified hundreds of potential priority sites to be restored, and established acreage and river mile restoration targets (see response, p 11). In recent years, the pace of restoration has slowed, in part because many of the largest, least expensive sites were restored first. To help municipalities and environmental groups restore the remaining sites, LISS-funded habitat restoration coordinators have been providing communities with technical assistance and advice on where and how to apply for grants. In part because of their efforts, the Futures Fund is beginning to see an increase in habitat restoration proposals.

Recognizing that habitat restoration projects can be expensive, the Futures Fund also increased the potential grant awards for these projects to \$150,000 from \$75,000. In 2007, New York City was the first municipality to receive the larger award level to restore 23.5 acres at the headwaters of a creek in Alley Pond Park by removing exotic plants and replacing it with native riparian forest.

The Habitat Restoration Initiative is also working to integrate the possible effects of climate change in restoration planning. For example, the Initiative issued grant guidance in 2007 that recommends that tidal wetland restoration applications document how the projects will be sustainable in the face of sea-level rise, including allowing for adequate upland for future salt marsh migration.

GOAL Restore shoreline habitats and river corridors
PROGRESS Restored 23 acres and 40 miles of river passage in 2007-2008
CHALLENGE Accomplishing more costly and complicated restorations



◀ **THE BRONX RIVER**
Alliance Conservation Crew and volunteers lay coconut fiber mats with marsh cordgrass (*Spartina alterniflora*) plugs along the banks of the Bronx River at the site of a former concrete mixing plant, August 2007.

and tires. Project partners include New York City Parks and Recreation's Natural Resources Group, the Bronx River Alliance, New York State OPRHP, and U.S. Rep. Jose Serrano, who helped bring federal funds to the project.

RAYMOND BROOK
Removing a small four-foot high dam on the Raymond Brook in Hebron, CT has opened up 16 miles of passage upstream for Atlantic salmon and American eel to find freshwater habitat, and helped clean up a silty environment.

About 50 years ago, a dam was built on the Raymond Brook by a private prop-

erty owner for the purpose of creating a recreational pond. But by 2007 the dam was in disrepair to the point of being partially breached with water seeping through during low flows. The half-acre pond also was filled with sediment. The current property owner agreed to remove the dam by working with a group led by the Connecticut River Watershed Council, and including the CT DEP, American Rivers, The Nature Conservancy, and the U.S. National Oceanic and Atmospheric Administration (NOAA).

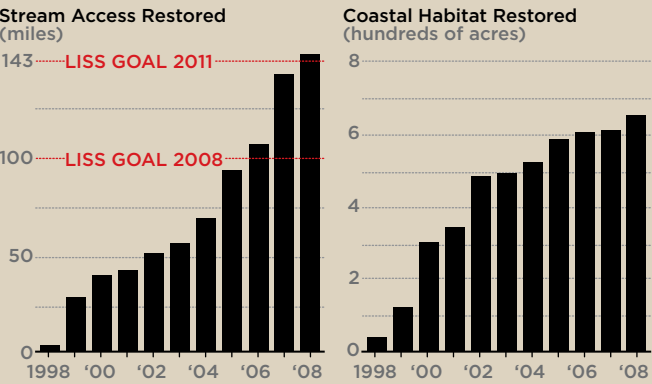
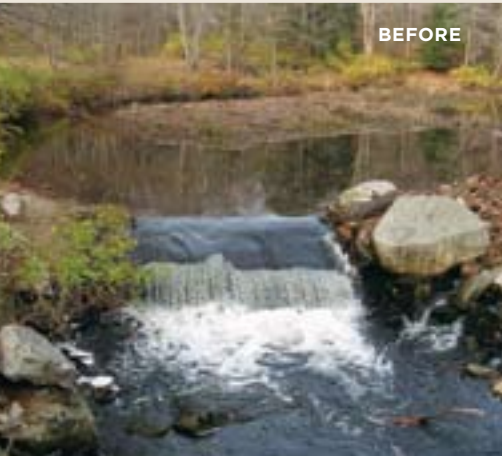
Removal started July 23, 2007, and was completed August 10, 2007. Excess sediment was removed from the chan-

◀ **BEFORE:** Denuded and debris-covered bank of the Bronx River, and site of a former concrete mixing plant, prior to restoration.
AFTER: Restored Bronx River bank after two growing seasons.

nel and was moved to an upland area on the dam owner's property, east of the brook. The channel was re-shaped, two pools were created, and the channel was lined with large cobble substrate. A downed tree trunk was strategically anchored with a boulder along the bank just upstream of the former dam to add habitat value.

Visit the habitat restoration section of www.longislandsoundstudy.net to find information about other projects.

▼ **THE DAM AT Raymond Brook** was removed to allow for fish migration.



▲ **BY THE END OF 2008**, 146 river miles have been reopened to fish passage and over 650 acres of coastal habitat have been restored.

RESPONSE

Restoring Habitats

BY THE END OF 2006, LISS met a goal to reopen 100 miles of river for fish that migrate between rivers, the Sound and the ocean—two years ahead of schedule. The success can be attributed to implementing fish passage projects developed with the cooperation of CT DEP and federal, municipal, and non-profit partners. Owing to this progress, LISS in 2006 added a new goal of adding an additional 43 miles by 2011. This goal has almost been met by 2008. Dams, largely built in the nineteenth and twentieth centuries, have prevented many migratory fish from finding suitable freshwater spawning habitat. In addition to removing dams, opening river miles can involve creating fishways to allow fish to pass over or around a dam.

LISS and its partners did not meet a goal launched in 1998 to restore 2,000 acres of coastal habitat in 10 years. After initial success restoring larger, relatively less expensive sites, LISS partners have more recently encountered smaller sites on sensitive lands that are expensive and difficult to restore. As a result, LISS has extended the 2,000 acre goal to the year 2020. In 2007 and 2008 LISS's partners completed 12 tidal wetland and freshwater wetland projects, each less than 2.5 acres. One project greater than 10 acres, the 11.7-acre tidal wetland restoration of Old Field Creek in West Haven, CT was completed in 2008.

Stewardship Management

According to EPA's National Coastal Condition Report, the coastal counties surrounding the Long Island Sound estuary have a population density of 2,170 persons per square mile, the second highest of any coastal system in the country. This level of residential and commercial development comes at a cost to the natural resources of the Sound and its watershed.

Recognizing that continued growth will put further pressure on the Sound's remaining natural areas, LISS established the Long Island Sound Stewardship Initiative to protect the diverse plants and animals that make their home in or near the estuary. The Stewardship Initiative also seeks to ensure that the Sound's citizens will continue to have access to the natural seascapes that make the area an enjoyable place to live. As a culmination of over three years of effort, the Stewardship Initiative work group identified 33 inaugural areas around the Sound with significant recreational and ecological values (see www.longislandsoundstudy.net/stewardship for details).

To help the Initiative to succeed, LISS supports local partnerships of environmental and community groups and landowners, working with state and federal officials, to develop management strategies to fulfill Stewardship goals of conservation and public enjoyment of natural open space. To help pilot this concept, the Futures Fund provided a grant for "Model Conservation Programs for Stewardship," in 2005 and again in 2007 to Audubon New York and Audubon Connecticut to work with local stakeholder groups to identify priority actions that further conservation at four Audubon-selected Important Bird Areas. One of these efforts in Rye has helped to promote a unique proposal in Rye's Marshlands-Edith G. Read Stewardship area (see center article). In addition to the stakeholder groups, the Futures Fund in 2007 and 2008 invested in developing a conservation strategy for the Great Meadows Stewardship Area, and also in implementing several projects in stewardship areas (see response, p. 13).

GOAL Improve management of natural areas with high recreational and ecological value
PROGRESS Convened stakeholders in comprehensive stewardship planning
CHALLENGE Managing competing uses



1942



2009

◀ **HENRY BIRD**, entomologist, stands in front of the Bird House circa 1942. The house was built in 1835 in the the Greek Revival style. It has been in the Bouton-Bird-Erikson family since 1852 and retains an unusually high degree of authenticity.

HIGHLIGHTS 2007—2008

IT IS ONLY ONE ACRE. But protecting the Bird property along the tidal portion of Blind Brook in Rye will help to ensure the protection of one of Long Island Sound's inaugural Stewardship areas, the Edith Read-Marshlands Stewardship Area in Rye. Protection of the Bird property was one of the priorities highlighted by a LISS-funded stewardship stakeholder group, coordinated by Audubon New

York, for the Stewardship Area.

In its support and advocacy of the environmental qualities of the project, the stakeholder group noted that the site's location along the Blind Brook provides protection downstream to the tidal wetlands at Milton Harbor and the Marshlands Conservancy, the largest salt marsh preserve in Westchester. The brook's vegetated buffer filters

polluted runoff and collects storm-water to reduce flooding on Milton Road. In addition, at low tide, herons from as far away as Captains Island in Greenwich take advantage of the Bird property's mudflats and salt marsh to feed on fish, worms, insects, and other animals.

Jeff Main, a senior curator at Westchester County Parks, Recreation, and Conservation, and a member of the stakeholder group, said that the acquisition also will provide unique opportunities for appreciation of the steward-



INCOMING TIDE in the Blind Brook estuary with salt-marsh grasses on the edge of the Bird property on the right (*left*). Unpaved driveway into the Bird property (*below, left*). The Committee to Save the Bird Homestead plans to maintain the parcel as a demonstration site for environmentally sensitive treatment of coastal properties.



have an intimate experience with the Sound they will be more apt to want to protect it," said Main. "What better way than to get into a kayak and get onto the Sound. I don't think you can get any closer to the environment than to get into the water and really get a feel for it."

The property has been in the Bouton-Bird-Erikson family since 1852. Several scientists lived in the house, including Roland Bird, a pioneering paleontologist with the American Museum of Natural History. Part of the Committee to Save the Bird Homestead's preservation plan is to restore the farmhouse and natural meadow as an education center with interpretive exhibits on how the setting inspired the family's devotion to scientific exploration.

The property, which is adjacent to

ship site. For instance, Westchester County proposes to provide an access point for kayaks and canoes, which will be part of the Westchester County blueway trail to link with other destinations along Long Island Sound and its tributaries.

"My personal feeling about the Stewardship Initiative is if people

city-owned, waterfront open space at the Rye Meeting House, is being acquired by the City of Rye, in partnership with the non-profit Committee to Save the Bird Homestead, Inc., to be set aside as a natural area, and as a center for science, historic preservation, and ecology. Partners and allies in the project include the City of Rye, the Committee to Save the Bird Homestead, the Westchester Land Trust, the New York Landmarks Conservancy, NYSDEC, New York State OPRHP, Westchester County, Audubon New York, and the stewardship stakeholder group. LISS is contributing \$200,000, through a partnership with NYSDEC, to the pending \$1.25 million acquisition.

RESPONSE

Stewardship Projects

ON OCT. 4, 2008, Audubon Connecticut, the state organization of the National Audubon Society, recognized the Stratford Great Meadows Marsh and Long Beach West/Pleasure Beach barrier beach complex as an Important Bird Area (IBA). Audubon also announced that it will develop a conservation plan with community support from Stratford and Bridgeport residents and with financial help from the Futures Fund and other contributors. Audubon is using methods from its "Toolkit for Bird Conservation" as well as from a Futures Fund project, "Model Conservation Programs for Stewardship," to work with partners to develop and implement strategies for habitat management and restoration projects, open space acquisition, and public education and outreach.

The Stratford Great Meadows Marsh and Long Beach/Pleasure Beach barrier beach complex is recognized as an IBA because the marsh, dune, and barrier beach habitats provide wintering habitat for waterfowl, raptors, and songbirds, stopover habitat for thousands of migratory shorebirds, and is likely an important area for nesting Piping Plovers and Least Terns during the breeding season. The Great Meadows Marsh, a unit of the Stewart B. McKinney National Wildlife Refuge, contains the largest block of un-ditched salt marsh (about 225 acres) left in CT. Long Beach West and Pleasure Beach are part of a two-mile coastal barrier beach system that contains sand dunes, tidal wetlands, and sand flats.

In 2007 and 2008, the Futures Fund also provided several implementation grants for stewardship areas, including a \$75,000 grant to the Town of Stratford to help remove exotic plants and restore 6.37 acres of tidal wetlands within the Great Meadows Marsh complex, and \$27,000 to CT DEP to design, develop and install educational exhibits and materials for a new nature center at Sherwood Island State Park.

A STROLL on Long Beach West, Stratford, CT



▲ **A BUCKEYE**, an uncommon species of butterfly in CT, sighted on Pleasure Beach in Bridgeport.



Stewardship Acquisitions

Many stewardship areas are threatened by development that can impact native plant and animal communities, habitats, and scenic vistas. Increasing the total land area under conservation can help protect these natural features. As a result, the Stewardship Initiative supports state and local government efforts to acquire, or protect through easements, privately owned natural areas that act as buffers to enhance and protect stewardship areas.

The first steps toward acquisition are identifying land parcels that are still available in areas that are largely developed, assessing their real estate values, and determining whether the property has ecological values that will add to the Sound's protected open space network. LISS, through the Stewardship Initiative, has supported the efforts of CT and NY to document these properties. For example, in 2008 Yuri Gorokhovich, a scientist at Lehman College of the City University of New York, completed a Geographic Information System (GIS) analysis that identified 700 coastal land parcels available for conservation in the New York area within the Long Island Sound watershed.

Even with an economic downturn that has led to lower real estate prices, properties along the Sound are still expensive. Partnerships between the federal, private, and non-profit sectors have proved essential in helping cash-strapped governments pool their financial resources to acquire open space parcels. For example, in 2008 LISS was able to leverage federal funding through the Long Island Sound Restoration Act and the Futures Fund to partner in a project to add land to the Barn Island Wildlife Management Area, CT's single largest coastal property managed for wildlife conservation (see center article).

GOAL Protect open spaces and natural areas

PROGRESS Protected 450 coastal acres in 2007-2008

CHALLENGE Protecting sensitive lands threatened by development



THE BOUNDARY of the Crowley property outlined in red (*far left*). Cattail tidal marsh in the Crowley property, with common reed in the background (*left*). Birding in the Barn Island Wildlife Management Area (*below*).

desire to sell the property to the state rather than to a developer. Following appraisals, TNC-CT played a critical role by agreeing to purchase and hold the property in the interim while CT DEP sought funding to make the final acquisition. In early 2009, CT DEP received the Stewardship Initiative funds (allocated in LISS's 2008 budget) and used an additional \$270,000 of its Recreation and Natural Heritage Trust Program funds to purchase the parcel.

The Crowley property, which includes 38 acres of forest and 10 acres of inland and tidal wetland, will provide a protective buffer within the Barn Island habitat complex for 25 plant and animal species included on State endangered, threatened, or special concern species lists, including the least tern and saltmarsh sharp-tailed sparrows. The Barn Island habitat complex is also

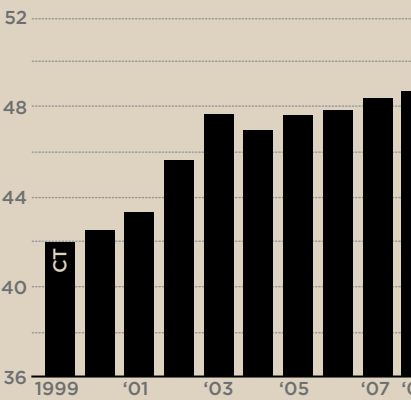
considered a critical stopover area for fall and spring bird migrations, and is a nationally-recognized scientific research site, supporting over 34 academic research studies.

Barn Island is surrounded by some of the fastest growing communities along CT's shore. By acquiring the site, CT DEP, with assistance from LISS, EPA, TNC-CT, and other local partners, is protecting one

of the last remaining near pristine coastal areas on the Sound, which, if developed, could have generated polluted runoff and impaired coastal water quality. In addition to acting as a buffer for protecting valuable tidal wetlands, the Crowley property will protect areas capable of supporting the upland migration of tidal wetlands expected to occur as sea level rises as a result of climate change.



Open Space Preserved in the LIS Watershed (thousand acres in CT)



◀IN 1998, CT passed legislation to preserve 21% of the state's land, or 673,210 acres, as open space by 2023. By 2008, 486,504 acres have been preserved by the state, land trusts, municipalities, and water companies, which is more than 70% of the ultimate goal.

RESPONSE

Open Space Protection

ACQUISITIONS AND CONSERVATION agreements are key tools in protecting environmentally sensitive areas from development. Both CT and NY work in partnership with the federal government, local governments, and non-profit conservation groups to protect these lands – through acquisitions or easements.

In 1998, CT passed legislation to preserve 21 percent of its land as open space by 2020. By 2008, the state or land trusts, municipalities, and water companies have preserved 486,504 acres as open space, or 15 percent of Connecticut's land area. In 2007 and 2008, the state provided grants to municipalities and land trusts to help them acquire or receive easements for 66 parcels, including seven coastal properties totaling 228 acres.

NY also has an open space plan that includes protecting undeveloped parcels in the Long Island Sound watershed. In 2007 and 2008, a total of 10 properties were preserved in the watershed, totaling 175.7 acres. One of these areas is the 57-acre Bittner property in Southold, which will provide important public waterfront access to Long Island Sound, including 1,400 feet along the shore. The \$13 million purchase was funded through the Suffolk County Environmental Legacy Fund, the Southold Community Preservation Fund, and a grant from NOAA.



HIGHLIGHTS 2007—2008

A \$650,000 LISS GRANT made possible through the Long Island Sound Stewardship Initiative is helping CT add valuable coastal forest and tidal wetlands to one of the largest undeveloped areas along the coast. CT DEP is using the funds to acquire 48 acres of land that will expand its Barn Island Wildlife Management Area near the Rhode

Island border to 1,018 acres.

The property in Stonington, owned by the Crowley family, was nominated to be one of the first acquisition projects funded through the LISS Stewardship Initiative in part because of the significance of Barn Island's rare species habitats and the exemplary salt and brackish marsh communities that contribute to

the region's high quality coastal waters.

A highly cooperative and willing seller, and a partnership between the state, The Nature Conservancy of Connecticut (TNC-CT), NFWF, and the Stewardship Initiative were essential elements to CT DEP completing the acquisition. In 2007, the Crowley family, consisting of nine siblings and three trustees, expressed a

Monitoring

Since 1987, LISS has sponsored a comprehensive water quality monitoring program for the Sound. The program, managed by CT DEP since 1991, provides information for resource managers to help evaluate the effectiveness of water quality programs, including efforts to reduce hypoxia (low dissolved oxygen) in the Sound. Scientists also use the data to support basic research on the causes of hypoxia and other water quality issues.

CT DEP staff gathers the information at monitoring stations throughout the Sound aboard the research vessel *John Dempsey* using instruments that profile the water column to collect data for depth, temperature, salinity, dissolved oxygen, and water clarity. Grab samples are also collected at surface and bottom depths for laboratory analyses of nitrogen, phosphorus, carbon, suspended solids, and chlorophyll-a. CT DEP has significantly expanded the monitoring program since 2001 to include zooplankton and phytoplankton sampling, and phytopigment analysis of plankton at selected stations. The agency also works cooperatively with the Interstate Environmental Commission and the New York City Department of Environmental Protection in monitoring the Sound. Log on to www.longislandsoundstudy.net/monitoring.htm for information about all the programs.

Through the Futures Fund, LISS also supports volunteer monitoring groups that monitor local embayments, harbors, and rivers for dissolved oxygen and pathogens. In 2007 and 2008, projects were funded in Hempstead Harbor, Huntington-Northport Harbor, Oyster Bay, and the Bronx River in NY and Sherwood Island Mill Pond in Westport, CT.

Other programs monitor the Sound's living resources. For example, LISS funds FWS to monitor the extent of eelgrass in embayments and open areas. Eelgrass provides important habitat for small fish, scallops, and waterbirds. Among animal species, the Futures Fund has provided grants for Project *Limulus*, a program developed by Sacred Heart University scientists to monitor the abundance of horseshoe crabs. CT DEP also monitors the abundance of fish species in the Sound in trawl surveys, and CT DEP and NYSDEC monitor the abundance of fish in embayments and tributaries on both sides of the Sound.

GOAL Track the ecological health of Long Island Sound
PROGRESS Expanded habitat and water quality monitoring
CHALLENGE Synthesizing and interpreting data to identify trends



► CT DEP STAFF deploy a rosette, a water sampling device, aboard the research vessel *John Dempsey*.

HIGHLIGHTS 2007—2008

WILL REDUCING human-caused sources of nitrogen pollution be enough to end Long Island Sound's problem with oxygen-depleted waters?

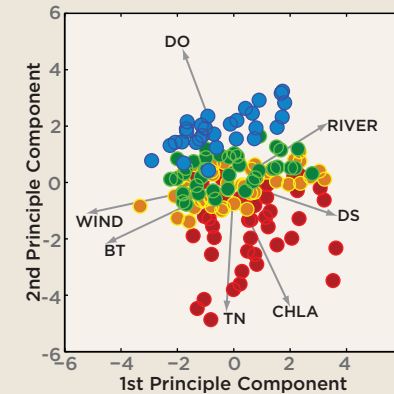
That's what Kamazima Lwiza, PhD, a marine physicist at Stony Brook University's School of Marine and Atmospheric Sciences, wanted to find out with the help of 14 years of water quality monitoring data collected by CT DEP's water quality monitoring program.

Excess nitrogen in coastal waters is linked to hypoxia, a condition where low levels of dissolved oxygen in the bottom waters cause some animals to die or flee. But hypoxic conditions have persisted in the Narrows and western Sound despite efforts since the early 1990s to remove nitrogen from treated sewage through sewage treatment upgrades. Lwiza wanted to determine if other variables, such as the rate bacteria consume oxygen, or physical vari-

ables such as temperature, wind, and stratified waters were the main drivers controlling hypoxia.

Lwiza used CT DEP's water quality monitoring data with computing methods called principal component analysis and self organizing maps, and determined that each of the Sound's basins is affected to a different degree by several variables, and each basin has its own controlling factor. In the western-most and shallow areas of the Sound,

stratification (i.e., the separation of lighter surface waters from heavier, less oxygenated, bottom waters) is the controlling factor that leads to low oxygenated bottom waters. But strong winds from the east can also weaken the stratification, resulting in



mixing of the two layers, and allowing oxygenated water to reach the bottom. Overall, the volume of hypoxic waters was related to summer wind speed, spring total nitrogen, spring chlorophyll a, and maximum river discharge.

Lwiza's research also showed the role of temperature in affecting water quality conditions. Colder winters appeared to lead to larger spring algal blooms—possibly, says Lwiza, because cold winter days correspond to more sunlit days than warm winters. Higher light levels stimulate algae growth—and the increased plant mass leads to an increase in hypoxia in the summer.

A BI-PLOT of principal components (left) used to show the relationship between some of the variables such as dissolved oxygen (DO), Total Nitrogen (TN), and wind that impact the Sound. Kamazima Lwiza (below left) with Younjoo J. Lee, a graduate student who worked with Lwiza on the research.

But the data also shows that higher temperatures in the summer lead to enhanced bacterial activity and more oxygen taken out of the Sound.

"The research puts the issue of hypoxia in a climate perspective," said Lwiza. "As our climate changes the hypoxic events, patterns, frequency, and strength might also change regardless of what we are doing to try to improve conditions. This implies that we should increase our efforts for nitrogen removal to offset the effects of climate change."



RESPONSE

Sentinel Monitoring

SCIENTISTS HAVE made predictions of some of the possible effects of climate change on our coasts, but not enough is known about what would happen in Long Island Sound. To fill this gap in knowledge, LISS is developing a "sentinel" monitoring program to examine the effect of climate change in different areas of the Sound. The program's purpose is to collect information to understand and to adapt to climate change by adjusting the way Long Island Sound is managed.

LISS is preparing a monitoring strategy that will be drafted by 2010. In CT and NY, work groups of researchers and resource managers are developing priorities for understanding climate change impacts on Long Island Sound that will be incorporated into the overall strategy. Pilot demonstration projects in each state will then be implemented for select habitats.

Since there are many different habitat types in the Sound, monitoring one or two would yield only a portion of the insight to the ecological responses to climate change. The long-term goal is to have multiple monitoring sites in both states all around the Sound to yield more comprehensive information regarding climate change. It is expected that the strategy and the demonstration projects will increase the likelihood of funding from a variety of sources so that the monitoring program can continue and expand.

STAFF FROM NYSDEC and The Nature Conservancy installing a Surface Elevation Table (SET) at East Creek in Sands Point, NY (top), and after the SET installation (right). A SET is used to monitor the elevation of coastal marshes and to see if they keep pace with local sea level rise.



Research

Since 2000, LISS has awarded research grants through the Long Island Sound Research Grant Program. The objectives are to investigate the complex ecological issues facing the Sound and to apply this research to help improve conditions in the Sound.

In 2008, the Research Grant Program was administered by New York Sea Grant and Connecticut Sea Grant. Proposals were requested in the areas of hypoxia, invasive species, and climate change. Of the 52 proposals submitted, five received funding with grants totaling \$820,000 (see list, p. 19). This is the fourth grant cycle for the program, which has awarded a total of 26 grants to scientists since its inception. Descriptions of all projects are available at: www.longislandsoundstudy.net/research.htm.

LISS also funds the Long Island Sound Fellows Program to provide partial fellowships to two graduate students in NY and CT that are conducting research on the Sound. The Fellows work with the LISS Science and Technical Advisory Committee in developing research papers on science and management topics. In 2007 and 2008, the Fellows' research topics included invasive species and sea level rise.

In 2007-2008, NFWF also administered the Dissolved Oxygen Environmental Benefit Fund (DO EBF) for western Long Island Sound and Jamaica Bay, NY. More than \$3 million in grants were awarded to research projects, including more than \$2.4 million for the Sound. The DO EBF was created as part of a settlement associated with discharges from New York City sewage treatment plants.

GOAL Apply research to improve management of the Sound
PROGRESS Initiated five new research projects
CHALLENGE Integrating research from different scientific fields



◀ **CHARLES YARISH** of UConn/Stamford holding up *Ascophyllum nodosum* (rockweed) at Cove Island Park, Stamford. Rockweed is used as packing material for baitworms in upper New England states, but it is also found along the Sound's coast.

HIGHLIGHTS 2007—2008

RECREATIONAL FISHERS be warned. Don't throw seaweed used as the packing material for live bait overboard! The seaweed used to pack both sand and blood worms in bait boxes may contain invasive marine algae (both seaweeds and potentially harmful phytoplankton) and animals, which in turn may cause harm to Long Island Sound's water quality and marine life.

That conclusion was reached by a team of CT and NY scientists analyzing samples of worms purchased at local bait and tackle shops in both states in 2007 and 2008. "People might think, 'I have seen this seaweed in Long Island Sound before so there won't be a problem'," said Charles Yarish, PhD, professor of Ecology and Evolutionary Biology and

Marine Science at UConn/Stamford, and one of the principal investigators for the project. "But it could be a problem for the health of the Sound and the economy." Yarish conceived this research project a few years ago when he was fishing on his boat, the *Sound Dancer*, off Norwalk Harbor. He was taking the last worm out of his bait box when he wondered if the seaweed used as packing material might be harboring invasive microorganisms, since the bait he purchased at a local bait and

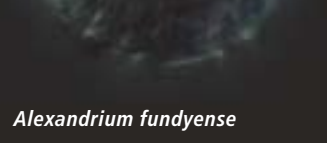
tackle shop was packaged elsewhere. Could seaweed be another transport delivery system, like the ballast water from boats, that could bring potentially harmful nuisance species to the Sound?

The research team's findings validated Yarish's concerns. Many of the rockweed samples contained cells of a microalga, *Alexandrium fundyense*, known to produce a neurotoxin that causes paralytic shellfish poisoning (PSP). In extreme cases, PSP can be fatal to humans who consume shellfish contaminated with the toxin. Intense blooms of this microalga, also known as the red tide, closed shellfish beds in all of Northport Bay, Duck Island Harbor, and Centerport Harbor in Huntington, Long Island in spring and summer 2008. The research team also detected two other microalgae linked

to harmful algae blooms and not known to exist in the Sound: *Pfiesteria shumwayae*, which may play a role in large fish kills, and *Pseudo-nitschia*, which produces a neurotoxin that when concentrated by filtering shellfish can cause amnesic shellfish poisoning in humans who consume the shellfish.

Besides Yarish, the team included professors Senjie Lin, PhD, and Robert Whitlatch, PhD, both from the Marine Sciences Department at UConn/Avery Point, Christina Haska, a graduate student at UConn/Avery Point, and George Kraemer, PhD, a professor of Environmental Studies and Biology at Purchase College in Purchase, New York.

The project was funded with a Long Island Sound research grant. The grant included funding for the scientists to lead workshops in NY and CT to edu-



cate boaters, fishers, bait and tackle shop owners, and owners of recreational fishing excursion boats about the potential dangers of dumping the seaweed packing material. They have also been working with CT Sea Grant, which has received its own funding from NOAA to launch a "Don't Dump Bait Campaign" in harbors throughout the northeast. The scientists' findings could have national implications, since the bait purchased at stores in the Sound was packaged in Maine, the center of the bait industry, and shipped throughout North America.

◀ **TO VIEW** a fact sheet with more information on the UConn and Purchase College invasive species research, and the CT Sea Grant "Don't Dump Bait" campaign, visit: <http://bit.ly/3Rz89Y>



RESPONSE

2008 Long Island Sound Research Grants

Geochemical Budgeting of Dissolved Gases for Understanding Long Island Sound Hypoxia

Mark A. Altabet, University of Massachusetts, Dartmouth, will investigate some of the factors implicated in triggering summertime hypoxia events in the Sound. The research team will examine the physical and biological processes that play a role in oxygen dynamics in the Sound.

The Distribution, Causes, and Impacts of *Alexandrium fundyense* Blooms in Coves, Near Shore, and Open Water Regions of Long Island Sound

Christopher J. Gobler, Stony Brook University (SBU), will provide insights into the development and dynamics of red tides, a serious, emerging human health threat in the Sound.

Impacts of Climate Change on the Export of the Spring Bloom in Long Island Sound

Darcy J. Lonsdale, SBU, and Christopher J. Gobler, SBU, will examine the relationship between winter temperature and the abundance and composition of phytoplankton in the spring and explore potential impacts of changing winter water temperatures on local food webs.

Summer Synoptic Weather Variability as the Control of the Seasonal Evolution of Hypoxia

Robert E. Wilson, SBU, Brian A. Colle, SBU, and Daniel L. Codiga, University of Rhode Island, will study the effect of weather patterns on hypoxia in the Sound, specifically to assess the effects of changes in frequency and track position of extratropical summertime storms on both inter-annual and long term variations in the severity of hypoxia.

Interaction of Biological and Physical Factors Controlling Bottom Dissolved Oxygen

Kamazima M. Lwiza, SBU, and Gordon T. Taylor, SBU, will identify drivers of hypoxia and elucidate relationships among them. Chemical and biological data will be collected from pre-existing sampling stations, including samplers placed on the Bridgeport to Port Jefferson ferry boats and buoys outfitted with sampling devices.

Public Outreach

In 2007, LISS released the results of its survey on the public's perception of Long Island Sound. The survey of 1,220 residents living within 15 miles of the shoreline was conducted by the Center for Survey Research at Stony Brook University in spring 2006. The results show that residents are highly concerned about the environment. For many, those concerns are not linked to accurate knowledge, nor do they translate into environmentally responsible behaviors. But the survey did reveal that people with more knowledge about the environment were more likely to engage in positive environmental behaviors, such as using fertilizer sparingly.

In response to the findings, the LISS Communications Team in 2008 brought in an expert to teach social marketing concepts to local environmental organizations and government agencies. In social marketing, research identifies the barriers preventing citizens from engaging in good environmental practices, and then a campaign is developed to try to overcome these barriers. To encourage campaigns in the Sound's region, LISS also added social marketing as a priority topic for Futures Fund proposals.

In 2008, LISS published the fourth edition of *Sound Health*, an environmental indicators report on the status of the health of the Sound. The report reached more than 450,000 households as a newspaper insert, and was also distributed to local schools to support science education.

In 2007 and 2008, LISS also continued to support CT Sea Grant's Mentor Teachers Program. Since 2002, the program has held 14 workshops, in which mentor teachers shared their successful strategies for incorporating Long Island Sound education into the classroom with 160 teachers representing 45 school districts and more than 12,000 students.

Also in 2007-2008 LISS's Citizens Advisory Committee, representing environmental organizations and trade groups in NY and CT, continued its prominent role in advocating for Sound-related issues important to citizens and to local, state, and federal officials.

GOAL Promote watershed and environmental stewardship
PROGRESS Educated more than 30,000 residents from 2007-2008 LISFF projects
CHALLENGE Empowering change in people and communities



ROCKING THE BOAT
students testing for nitrates
(left). Bird watching on the
Bronx River (top).

Assurance Project Plan, the students performed weekly water quality tests for nitrates, dissolved oxygen, turbidity, salinity, pH, and temperature at two sites. The information gathered was used in programs to educate youth and the public about the health of the River, and was also given to Rocking the Boat's environmental science

partner, the Bronx River Alliance, for analysis and posting. The data collection is helping to create a standardized baseline of water quality where none had previously existed.

This is the second grant Rocking the Boat has received from the Futures Fund. In 2006, it received \$35,000 to support an array of six environmental projects, including initiatives to create and maintain artificial oyster habitats and to build and monitor ecologically engineered stormwater capture systems.

Rocking the Boat is a unique program. High school students build traditional wooden boats, which are used to implement environmental projects on the Bronx River. Rocking the Boat's environmental educational program

promotes stewardship, teaches restoration and monitoring skills, and enhances general public appreciation of the Bronx River. With real restoration and monitoring work as the educational medium, a secondary result of the program is environmental revitalization of a local natural resource.

THROUGHOUT THE YEAR, LISS outreach coordinators in NY and CT visit classrooms and attend public events to teach about the Sound and how to protect it.

For example, in 2008, LISS teamed up with Brookhaven National Laboratory's Open Space Stewardship Program (OSSP), New York State OPRHP, and NYSDEC to encourage students to become environmental stewards of areas within the Sound's watershed. One of the areas was along Sunken Meadow Creek where Larissa Graham, a NY Sea Grant employee and LISS's NY public outreach coordinator, assisted OSSP with teaching Hauppauge High School students to collect water quality data and examine plants, macroinvertebrates, and fish communities. At other Long Island sites, students studied tidal wetlands, and invasive animal and plant species that are outcompeting native species.

◀ **PICTURED LEFT**, Heidi O'Riordan of NYSDEC teaches students how to identify local fish at Sunken Meadow Creek.



HIGHLIGHTS 2007—2008

IN 2007 AND 2008, the Futures Fund awarded seven large grants of up to \$35,000 and 20 small grants of up to \$6,000 for public outreach programs in communities throughout the Sound. The projects ranged from a video to teach residents and construction contractors about reducing nutrient and pathogen stormwater pollution to conducting a hands-on education program about

Long Island Sound to low income children in 10 classrooms in New Haven. The Futures Fund supports projects that combine public outreach with one of the topics of the LISS Comprehensive Conservation and Management Plan: hypoxia (water quality), toxic substances, pathogens, floatable debris, living resources and habitat management, and land use and development.

One such example is Rocking the Boat's project to educate Bronx students by involving them in monitoring the water quality of the Bronx River. In 2008, the Futures Fund renewed its support of Rocking the Boat with a \$35,000 grant. Rocking the Boat recruited and trained 20 high school students to collect and record data in the Hunts Point section of the Bronx, an area where, for the most part, residents are not aware of either the River's wonderful resources or of its challenges. Under an EPA-approved Quality

▶ **BEACH CLEANUP**
at Long Wharf Beach
in New Haven, CT.

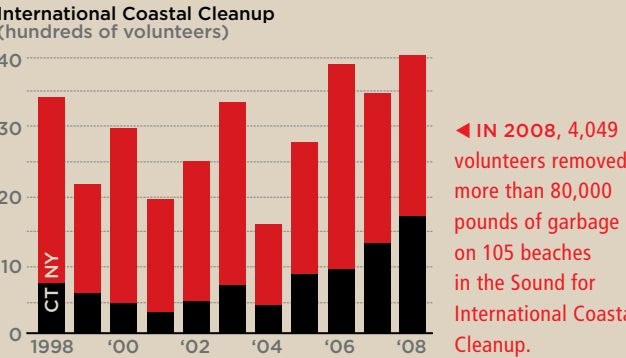


RESPONSE

Beach Cleanup Volunteers

TRASH FLOATING in coastal waters and bays or washed up on the beach reduces the enjoyment of the Sound, can be a nuisance or hazard for boaters, and can harm wildlife. Litter is carried to the Sound primarily by stormwater discharges, combined sewer overflows, shoreline visitors, and boaters. Ultimately, the main sources of floatable debris are people who litter and improperly dispose of their waste.

Since the founding of International Coastal Cleanup in the mid-1980s, volunteers have been participating in Long Island Sound beach cleanups in September. The cleanups raise awareness of the impact litter has on the beaches, and are also an effective means of removing trash. In 2008, for example, 4,049 volunteers removed 83,387 pounds of garbage on 161 miles of shoreline at 105 cleanups. Some of the most commonly retrieved items were cigarette butts, food wrappers, and bottle caps and lids. In New York, the American Littoral Society received Futures Fund small grants in 2007 and 2008 to help coordinate beach cleanups along the Sound.



Budget

Section 119 of the federal Clean Water Act authorizes Congress to provide up to \$40 million a year to the Long Island Sound Study to implement the Comprehensive Conservation and Management Plan (CCMP).

Each year, the Long Island Sound Study develops a work plan to implement projects based on appropriations approved by Congress. This page lists these appropriations for the fiscal years 2006-2008 for projects that took place in fiscal years 2007-2009.

Long Island Sound Study partners who receive grants under these appropriations must meet matching fund requirements—50 per-cent for implementation projects and five percent for education and outreach projects. Not shown in the budget below are the additional funds provided by New York and Connecticut for projects to implement the CCMP.

Electronic versions of annual CCMP Implementation Tracking and Monitoring reports, which provide a comprehensive list of projects undertaken by the Long Island Sound Study and its partners, are available at www.longislandsoundstudy.net under *implementation*.

LISS BUDGET	FY 2007 (Oct '06– Sept '07)	FY 2008 (Oct '07–Sept '08)	FY 2009 (Oct '08–Sept '09)
Coordination/Reporting	\$366,462	\$74,100	\$366,950
Public Information/Education	\$719,487	\$216,691	\$547,907
Monitoring, Modeling & Research	\$320,000	\$789,251	\$1,719,440
Implementation Support and Technical Assistance*	\$867,589	\$379,669	\$2,352,855
Habitat and Water Quality Improvements**	\$450,000	\$300,000	\$450,000
TOTAL	\$2,723,538	\$1,759,711	\$5,437,152

* includes habitat restoration and watershed management planning, and Stewardship Initiative.
** includes EPA grants to the Sound Futures Fund grant program.

LISS Biennial Report 2007-2008

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Designer: LUCY READING-IKKANDA

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