



A program of
Connecticut Fund for the Environment

State of the Sound



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LONG ISLAND SOUND IS PART OF OUR LIVES.



We are fortunate that we can still experience some of the wild beauty and abundant animal life that Europeans described when they first reached these shores. But pollution and overdevelopment threaten wildlife and the habitats on which they depend. Pollution of the Sound also threatens us — our health, our beaches and our state and local economies, which receive billions of dollars each year from fishing and tourism.

Introduction

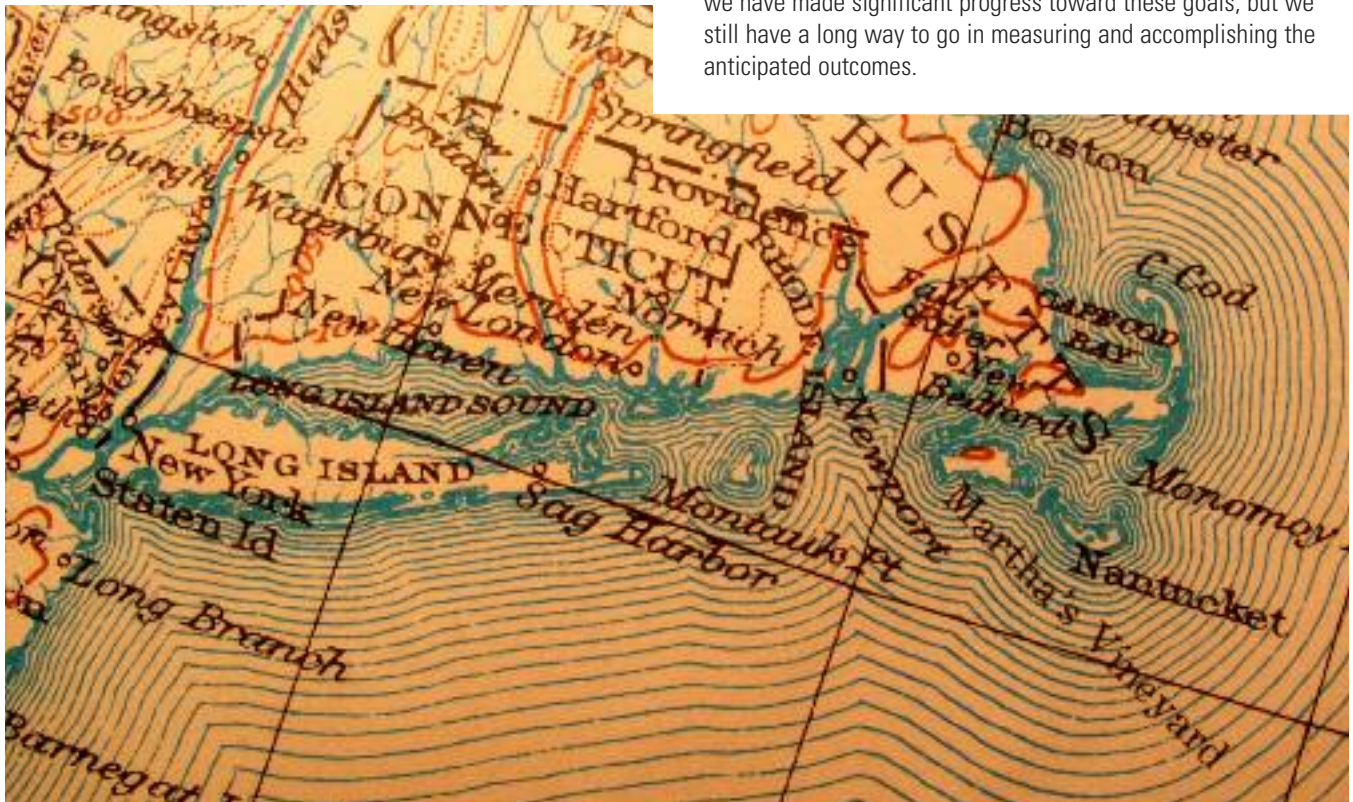
Long Island Sound is an ESTUARY, a body of water along the coast where fresh water from rivers and streams meets and mixes with salt water from the ocean. Because estuaries are protected from the full force of ocean waves, winds, and storms by barrier islands and peninsulas – in the Sound's case, Long Island, New York – many species of fish and wildlife rely on their sheltered waters to spawn, giving rise to the term “nurseries of the sea.”

We live in the Long Island Sound WATERSHED, which means that our rainwater flows directly or indirectly into all the rivers that drain into the Sound. This may seem insignificant, until you step back and notice that these rivers include major and minor waterway inputs in Connecticut, New York, northern New England, and in the case of the Connecticut River, even our neighbor Canada. Thus the Long Island Sound watershed includes 16,000 square miles in Connecticut, the north shore of Long Island, New York City, Westchester County and parts of Massachusetts, Vermont, New Hampshire and Canada. More than 8 million people reside within the watershed and almost 10% of the total U.S. population lives within 50 miles of the Sound's shores. The choices we make as residents and champions affect this fragile body of water, the life that dwells within it and along its shores, and those who depend on it for

recreation or livelihood. We have long depended on the Sound for both its biological abundance and its natural beauty. Unfortunately, as population along its coasts and in its watershed increased, the demands placed on Long Island Sound by the very people relying on its bounty began to take their toll.

The summer of 1987 marked a significant turning point in the Sound's history. Although there have been reported occurrences of hypoxia (low oxygen) in Long Island Sound as early as the early 1900s, the hypoxic event of 1987 was staggering. At least in part, this situation was fed by blooms of algae. When they died, their decay sucked the oxygen from the water, causing a “dead zone” in which no wildlife could survive. Certainly, the Sound had already suffered from a multitude of environmental assaults including loss of coastal and underwater habitat, industrial pollution, and dumping of raw sewage, but the emergence of the dead zone became a call to action.

Under the guidance of the Long Island Sound Study, scientists and citizens from throughout the region came together to create the Comprehensive Conservation and Management Plan (the CCMP; see page 30 for more information). The goals of the CCMP are to improve water quality, protect habitat and living resources, educate and engage the public, and improve our long-term understanding of how to manage the Sound. Two decades later we have made significant progress toward these goals, but we still have a long way to go in measuring and accomplishing the anticipated outcomes.



What sets State of the Sound apart from other environmental reports is that it doesn't just point out the problems. It highlights the positive steps that have been taken and the next steps that ought to be taken to improve the state of the Sound. This is not a catalog of environmental degradation — it is a CALL TO ACTION!

Ever wonder about the state of the Sound's environment?

About the quality of the water and the coastal habitats we share with birds, fish, seals, oysters and other wildlife? Perhaps you are curious about the health of our

beaches and coastal habitat, or maybe you are wondering what efforts are being made to enhance fisheries or manage stormwater pollution. If so, "State of the Sound" is your guide to understanding and protecting this national treasure known as Long Island Sound.

This report is divided into four topics — habitat, water quality, stewardship, and emerging issues — that together address the questions "How is the Sound doing?" and "How can we improve it?" Three of these topics are further broken down into eight indicators, each representing an aspect of the Sound's health that *we can change for the better*. The grades provided for these indicators are, therefore, a true measure of the *efforts* made by New York and Connecticut to conserve and protect Long Island Sound over the last two decades. The milestones against which these efforts are assessed reflect the goals of the Long Island Sound conservation community (as developed in the Comprehensive Conservation and Management Plan and the Long Island Sound Agreements), which will create a healthier balance of human and natural needs. They include restoring 2,000 acres of coastal habitat, opening 100 river miles blocked by dams to fish passage, reducing by 58.5% human nitrogen inputs that contribute to oxygen-reducing algal blooms, and ensuring that the Sound is available to everyone through the development of public access sites, parks and nature reserves.

Many of Long Island Sound's needs are straightforward: no raw sewage, no toxic chemicals and no litter in the water. But we also recognize that this vital ecosystem has always been a human place; after all, it is situated in one of the most populated parts of the country. New threats which impact the health of the Sound, and in many cases human welfare, will continue to arise. The fourth topic — emerging issues — while not graded, covers issues like energy and dredging needs in the section called *Use Conflicts*. In addition to these four broad headings, numerous issue such as climate change, food web interactions, and nutrient bio-extraction — are rising to the surface. These vignettes are covered in various spotlight sections found throughout the report.

The following page summarizes the grades for each indicator and, most importantly, the policy improvements that Connecticut and New York must prioritize in order to raise the grades. Following this "report card" we list steps that *individuals* can take to effectively protect the Sound. It will take the combined efforts of governments and individual citizens to achieve our vision of a clean and healthy Long Island Sound.

[READ MORE ABOUT THE CCMP ON PAGE 30.](#)



What this report is and what it isn't

This report is Save the Sound's take on the CCMP-based Long Island Sound issues that the public inquires about most frequently. It is intended to be a subjective, brief overview based on data collected from regulatory reports and experts up to 2010. This report is not intended, and does not attempt, to cover the entire world of Long Island Sound. Accompanying each identified issue is a grade that assesses the efforts our government has put forth to achieve regionally-agreed-upon CCMP goals.

Foreword

Long Island Sound was in bad shape back in the mid and late 1980s, when I first started paying attention. If you think of the Sound as a big forest, it was as if all the air had been removed from a third of that forest, and all the warblers, thrushes, butterflies, spiders, bats, squirrels, cicadas, katydids and deer suffocated or, if they were lucky, crowded into other areas. That's how bad hypoxia was in the summer. Virtually all forms of marine life were unable to survive in the western third of Long Island Sound.

BUT THAT WAS 20 YEARS AGO. WHAT'S HAPPENED SINCE?

Lobsters have all but vanished. Oysters, carefully restored with infusions of money from taxpayers and the private sector, succumbed to two diseases and are only now starting to revive. Winter flounder disappeared. The water on average has gotten warmer; warm-water species are replacing coldwater species. Salt marshes are dying. And hypoxia returns every summer — sometimes bad, sometimes not so bad, sometimes critically bad.



Several years ago I was on a conference call, planning a public forum with a handful of college professors who teach on the far eastern end of the Sound, and when I used the word "crisis" to describe the late 1980s, one of them interrupted and told me quite peremptorily that there is not now nor has there ever been a crisis in Long Island Sound.

On the contrary. Long Island Sound exists now in a state of permanent crisis. That's my opinion, of course. But what other conclusion are we to draw? Twenty years ago the US government and the states of New York and Connecticut created what has become a permanent — as well as knowledgeable and dedicated — bureaucracy to manage Long Island Sound, and yet there's so much going wrong in the Sound we can hardly keep track.

When I was in elementary school I once tried to cover up a failing grade by dropping a strategically-located blot of blue ink from a cartridge pen onto my report card. Reading this "State of the Sound" report card, I see a lot of places where I'd like to drop blots of blue ink.

After 20 years of anti-pollution efforts, we get a D-plus in raw sewage? Spill an ink blot there. C-minus in low oxygen? Ink blot, please. A C-minus in keeping stormwater that is contaminated with dog crap and motor oil and chemical fertilizers away from our beaches and shellfish beds? A big ink blot there. And we still have substantial work to do for sea level rise adaptation and dealing with conflicts among the people who use the Sound. Blot, and another blot.





LONG ISLAND SOUND EXISTS NOW IN A STATE OF PERMANENT CRISIS.

HAMMONASSETT STATE PARK

BUT WE MUST BE DOING WELL IN SOMETHING, YES?

We get an A- in migratory habitat. Fish ladders open up rivers blocked by dams, letting anadromous fish swim upstream to spawn (although as the biologist in charge of Connecticut's program has said, swimming upstream is one thing; getting back down past the dams and ladders is another).

We get an A in coastal habitat for restoring 834 acres, mainly of coastal marshes.

And we get a B- in beach litter, although not because there's any less of it now. The amount of litter is about the same as it was a decade ago. We earn a B because more people are volunteering to participate in beach cleanups – in other words, more people are picking up other people's trash.

It takes an act of will not to feel pessimistic in the face of all this, and I'd be lying if I said that at times I don't. But those of us who care about Long Island Sound can't afford to be too pessimistic – or rather, we can't afford to let pessimism deter us from doing what needs to be done.

What exactly is that? We need to make sure our elected officials know that Long Island Sound is a priority, and that they continue to provide money for sewage treatment plant upgrades and

stormwater management, and for increasing and improving public access to the Sound. We need to help organizations like Save the Sound continue to promote the notion that what we as individuals do has an effect on what Long Island Sound is.

When anyone – a municipality operating a sewage plant, a boat owner heedless about where he dumps his vessel's head, a multinational corporation that wants to industrialize the Sound, a homeowner with a bad fertilizer habit – damages the Sound, we need to take it personally. We need to remember that Long Island Sound is ours.

And one more thing: although the state of the Sound seems grim, this "State of the Sound" report is excellent – read it, and do what it says.

TOM ANDERSEN

Tom Andersen is the author of
*This Fine Piece of Water:
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INDICATOR	EFFORT
Coastal Habitat	A
Beach Litter	B-
Migratory Habitat	A-
Low Oxygen	C-
Raw Sewage	D+
Stormwater Runoff	C-
Toxic Chemicals	C
Stewardship	C-

STATE OF THE SOUND:

Average grade for Connecticut
and New York efforts

C+

How to Raise the Grade: Policy Priority Areas for New York and Connecticut

- STEP 1. **Fully fund Long Island Sound federal programs** like the Long Island Sound Restoration Act and the Stewardship Initiative to provide New York and Connecticut with strong support for clean water projects and climate change efforts and to save and restore the Sound's last great coastal spaces. SEE PAGE 32.
- STEP 2. **Control stormwater runoff** through riverfront protection legislation, facilitating the creation of regional stormwater associations, promoting low impact development, green infrastructure and best management practices and providing low-interest loans for capital improvements. SEE PAGES 22 AND 26.
- STEP 3. **Leverage federal stewardship funding** by creating a dedicated state Long Island Sound Stewardship Matching Fund that will preserve and restore the region's last great coastal spaces.
- STEP 4. **Address expected impacts of global warming** by incorporating sea level rise adaptation strategies into coastal infrastructure planning and beach protection. SEE PAGE 37.
- STEP 5. **Create options that ensure a conservation sale of Plum Island** to provide wildlife habitat and opportunities for enhanced public access. SEE PAGE 35.

Federal Policy Priorities

Long Island Sound is a regional treasure and has been declared an Estuary of National Significance by Congress. Federal support plays a critical role in the Sound's conservation efforts.



LOOK FOR THIS SYMBOL
THROUGHOUT THIS REPORT.
IT HIGHLIGHTS THE AREAS
OF HIGHEST PRIORITY FOR
INCREASED FEDERAL
INVESTMENT.

- STEP 1. Reauthorize and fully fund Long Island Sound programs under Section 119 of the Clean Water Act — including but not limited to the Long Island Sound Restoration Act — to provide strong support for New York and Connecticut clean water infrastructure projects. SEE PAGE 32.
- STEP 2. Reauthorize and fully fund the Long Island Sound Stewardship Act to protect and restore the Sound and its last great coastal spaces. SEE PAGES 28 AND 35.
- STEP 3. Increase Long Island Sound Study funding to research changes in the Sound's food webs, water quality issues and living marine resources. SEE PAGE 40.
- STEP 4. Fully fund NOAA's Community-Based Restoration Program, Open Rivers Initiative, and Coastal and Estuarine Land Conservation Program, as well as the Land and Water Conservation Fund to ensure the success of habitat restoration and fish ladder projects in the Sound's watershed. SEE PAGE 10.
- STEP 5. Fully fund the US Army Corps of Engineers' Dredged Material Management Plan for Long Island Sound and the Environmental Impact Statement for the Designation of Dredged Material Disposal Sites in the eastern Sound. SEE PAGE 34.

TOP 10 THINGS YOU CAN DO TO PROTECT LONG ISLAND SOUND

1. Call or e-mail your state legislators and congressional representatives and encourage them to act now to raise their State of the Sound grades.
 2. Enjoy the birds when visiting marshes and beaches, but don't disturb them. Also, reconsider bringing your pets.
 3. Volunteer for a beach cleanup or a local river bank restoration. Or help environmental agencies by assisting at the Stewart B. McKinney Wildlife Refuge, or the Connecticut Department of Energy and Environmental Protection (DEEP) and New York Department of Environmental Conservation (DEC) state parks.
 4. Get involved with your local watershed association, land trust or conservation commission.
 5. Storm drains lead to the Sound, so be sure to clean up after your dog and wash your car in the grass or at a carwash that recycles its water.
 6. Test soil to apply the right type and amount of fertilizer, and try to use organic fertilizer, compost, or grass clippings to fertilize your lawn naturally. Reduce or eliminate pesticide use.
 7. Whenever possible, recycle compact florescent light bulbs and electronics. And be sure to dispose of all products containing heavy metals, like mercury thermometers, old thermostats, and lead-acid batteries, at a hazardous waste facility.
 8. Keep cigarettes and other litter off your local beaches and sidewalks.
 9. Maintain your septic tank regularly. Never hook your storm gutters up to sewers, and report illegal storm drain hookups to Connecticut DEEP and New York DEC.
 10. Purchase a Preserve the Sound License Plate in Connecticut or a Marine and Coastal District License Plate in New York. Portions of both fees go to protect our coastal waters!
- ...and remember to always enjoy and celebrate the Sound!
- Want more info on Long Island Sound?
Want to pitch in to protect the Sound?
Turn to the Resources section on page 45.

COASTAL HABITAT: A

- Coastal habitats are critical for wildlife and flood protection.
- Connecticut has restored substantial habitat in recent years but New York's program has not kept pace.
- We can improve by protecting upland areas and monitoring marsh loss. A streamlined permitting process and greater focus on high elevation marshes will also enhance restoration progress in New York.



Coastal habitats are found within the transition zone between land and sea. They include marshes, forests, shellfish reefs, sand dunes and eelgrass beds. Coastal habitats provide food and refuge for birds, fish, crabs and many other animals.¹ Many of these habitats act as buffers, preventing erosion and flooding.

WHERE ARE WE NOW?

Combined, Connecticut and New York have restored or protected over 1000 acres of coastal habitat, composed primarily of coastal marshes, over the last decade.² However, there is a tremendous amount of work to be done. The two states are not yet on track to meet their commitment of restoring 2000 new acres by 2020. At the current rate, the states risk sliding to an F on coastal habitat restoration in the future.

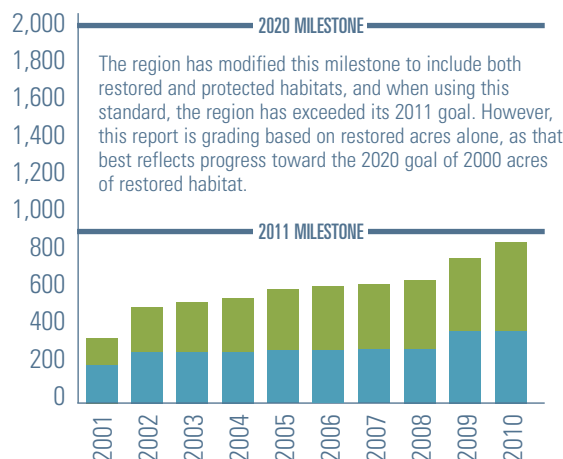
WHAT'S NEXT?

- New York can improve its restoration program by streamlining the permitting process and focusing restoration efforts on high elevation marshes. These marshes are more resilient in the face of sea level rise than low elevation marshes, which have been a focus of restoration efforts in the past.
- Both states should protect upland areas to allow for wetland migration over the coming decades and support comprehensive monitoring and study of marsh changes and losses.

Restored and Protected Coastal Habitat

ACRES

■ CT
■ NY



Marshes Under Threat

Centuries of filling marshland resulted in the loss of a third of Connecticut's³ and possibly as much as half of Long Island's coastal marshes until state and federal protections were enacted in the early 1970s. Today, the remaining marshes are facing new threats.

Sea level rise is drowning the Sound's low elevation marshes. Some high elevation marshes are migrating into formerly dry areas, but those that are blocked by roads or houses may soon disappear. Still other marshes suffer from a mysterious malady called sudden marsh die-back, which may be related to sediment deprivation, over grazing, disease, or a combination of factors.

In the Long Island Sound Agreement of 2003, New York and Connecticut committed to measuring tidal wetland loss in the Sound and researching its causes.⁴ This process has begun, but comprehensive tracking of marsh loss and migration is still needed to determine conservation and restoration priorities.



Diamondback terrapins protect marshes from overgrazing by eating the periwinkle snails which consume marsh grasses. Marsh restoration will help the number of terrapins grow.⁵



Ecosystem-Based Management means making decisions with a holistic understanding of the needs of, and relationships among, all the living and non-living components in an ecosystem. It is difficult to achieve but it is more important now than ever before.

Fisheries managers in Long Island Sound use ecosystem-based management, but are hindered by limitations in our understanding of the food webs in Long Island Sound, as well as the habitat and environmental quality requirements for all of the species they manage.

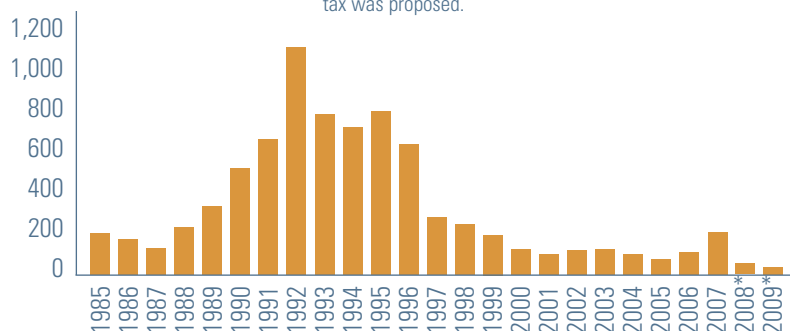
Effective ecosystem-based management is all the more important in the face of climate change. The species composition of the Sound is changing and management decisions that have worked well in the past are losing their effectiveness. We must study the impact of climate change on Long Island Sound's systems and organisms and establish baselines so that we can better monitor and respond to changes as they emerge.

Serious commitments to ecosystem-based fisheries research at the federal and state levels will have far-reaching benefits in the future.

Oysters and their cultivation are a critical part of our heritage and cultural identity. They also provide an environmental benefit; they are natural water filters and nutrient cleansers. Unfortunately the industry hit some tough times in the late 1990s when two diseases decimated the population. Thanks to NOAA scientists, the Connecticut Division of Aquaculture and oystermen, the industry is now poised to undergo a major renaissance. Such an event will depend on undertaking large-scale restoration efforts. In order to accomplish this, the Sound's oyster managers need a direct infusion of capital if the industry is to reclaim its share of the market. Unfortunately, the last major investment in the Long Island Sound oyster industry occurred in the early 1990s. It is time to change that.

Oyster Harvest

BUSHELS (THOUSANDS)

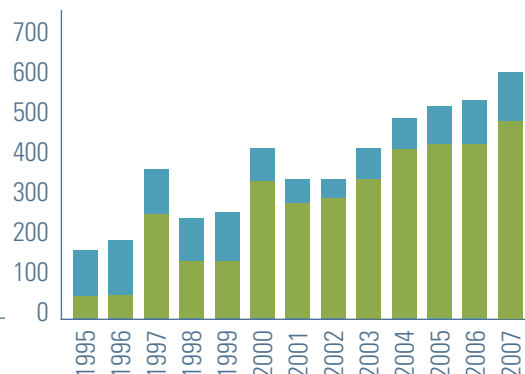


*Unfortunately there is no data for Connecticut in 2008 or 2009. Connecticut shellfishermen stopped reporting their yield when a new, though ultimately defeated, tax was proposed.

Hard Clam Harvest

BUSHELS (THOUSANDS)

CT
NY



BEACH LITTER: B-

- Beach litter threatens the health of both humans and wildlife.
- Connecticut and New York have increased beach cleanup participation but have not made needed progress in preventing litter.
- We can improve litter law enforcement and marine debris education and cleanups.

Beach litter is not just unsightly; it also poses a real danger to human and wildlife health. Children playing in the sand have encountered syringes, broken glass and cigarette butts, all of which endanger their health. It is also often fatal to wildlife that become entangled in it or accidentally ingest it.

REMEMBER: WHAT GOES ON THE GROUND GOES IN THE SOUND!



Discarded fishing gear, fishing line, plastic bags, nurdles (pre-production plastic pellets) and other plastic marine debris kill more than a million seabirds and 100,000 marine mammals and sea turtles worldwide each year.⁷

WHERE ARE WE NOW?

On average, almost 300 pounds of trash per mile of beach are collected annually around Long Island Sound. This is nearly the same as it was a decade ago. It is apparent that our present litter prevention programs, while working, are in need of improvement.

The good news is that people are becoming more aware of the problem. Public participation in beach cleanups has increased significantly over the last decade – last year alone nearly 2,700 people in Connecticut volunteered for coastal cleanups. In addition to removing litter, beach cleanups educate the public and develop community responsibility for beaches and waterways. Data collected during cleanups serves to help the region understand the sources of litter, identify trends and determine what steps can be taken to curb littering behavior. New York and Connecticut have recently passed expanded bottle bills which will help eliminate water bottles and other non-soda beverages from our beaches.

WHAT'S NEXT?

By taking the following steps, New York and Connecticut can reduce litter on land and sea:

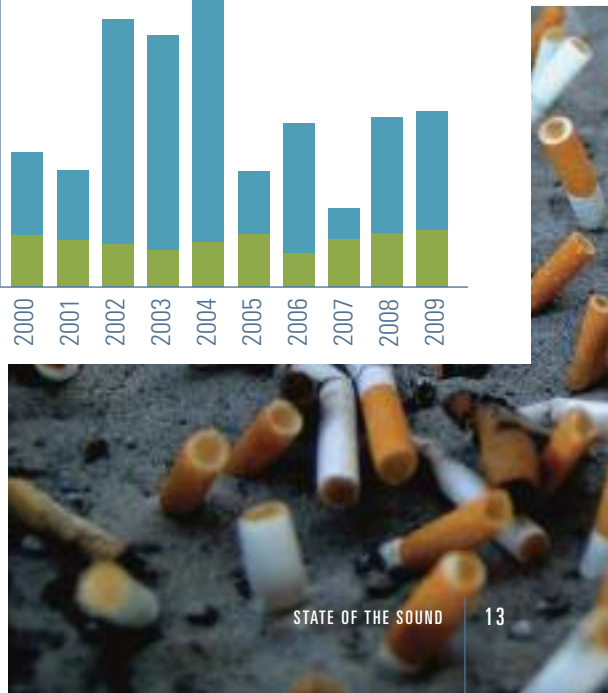
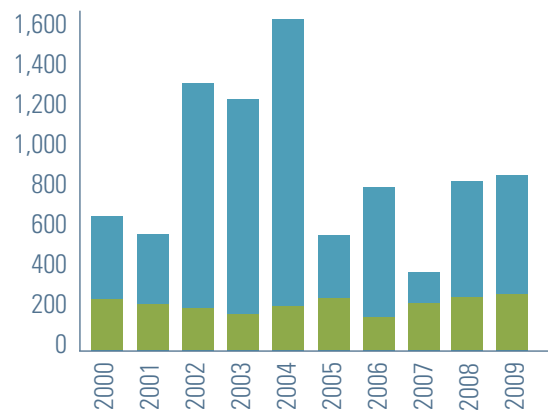
- Create state marine debris acts that provide education and cleanup funding.
- Raise inadequate littering fines and improve enforcement.



Beach Litter

TRASH FOUND PER MILE OF BEACH ON INTERNATIONAL COASTAL CLEANUP DAY (IN POUNDS)⁶

CT
NY



MIGRATORY HABITAT: A-

- Fish ladders are critical for the survival of many migratory fish.
- Connecticut exceeded the 2008 and 2011 milestones
- We can improve with consistent state funding for migratory fish habitat restoration in Connecticut and dedicated fish ladder staff in New York.

Fish ladders are composed of a series of low steps that enable fish to swim over or around a dam and into waters on the other side when it is not possible to remove the dam structure. River herring, American eel, shad, brown trout and Atlantic salmon all live within the waters of Long Island Sound watershed. These fish rely on fish ladders to reach their spawning areas; if their path is blocked by dams, their numbers dwindle. These fish are a major source of food for birds of prey in both New York and Connecticut and they return nutrients that have been washed out to sea to inland habitats that need them. When it isn't possible to restore the natural flow of rivers by removing dams, fish ladders are a good second choice, allowing fish to migrate and reproduce successfully.

WHERE ARE WE NOW?

Connecticut, which has the larger migratory fish habitat, has been making substantial progress in fishway construction. It hit the 2008 milestone earlier than expected and has also surpassed the 2011 milestone. Each project has been a collaborative effort involving government agencies, non-profit organizations and volunteers. The success of the program speaks to the commitment of all involved. At this point, about 47% of the historic migratory fish habitat in Connecticut is open.

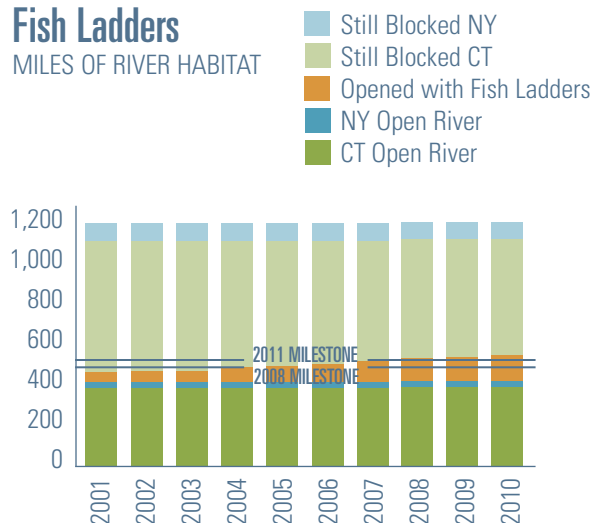
In contrast, New York has not built any fish ladders in the Sound watershed to date and only 13% of the Long Island Sound portion of New York's habitat is open. Despite Connecticut's progress, there remains much that needs to be done in both states.

WHAT'S NEXT?

- Given Connecticut's significant natural habitat for migratory fish, installing fishways on its streams and rivers remains a high priority. A consistent source of matching state funds for building fish ladders and additional staff will enable this successful program to continue to grow.
- New York's program needs improvement. The addition of dam safety staff dedicated to streamlining the fish ladder permitting process and enhancing cooperation between agencies would meet this need.
- The Long Island Sound community should continue to set challenging milestones and work to meet them as about 600 river miles of riverine habitat remain blocked to migratory fish.

Fish Ladders

MILES OF RIVER HABITAT

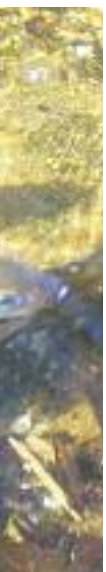


ALEWIVES RUNNING UPSTREAM. (ROBERT JACOBS, CONNECTICUT DEEP)





THE JORDAN MILLPOND FISH LADDER IN WATERFORD, CONNECTICUT



The river herring population has continued to decline over the last two decades and is now at an all-time low. Several possible causes⁹ have been identified: by-catch from the large Atlantic herring fishery may be under-reported; striped bass prey on river herring; and most river habitat is still blocked. It is likely that a combination of these factors and others are responsible for the decline. Research is needed to pinpoint the best management strategies that will bring schools of herring back to our rivers.

Spotlight: Clean Water Infrastructure



CLEAN WATER — HEALTHY SOUND



The dream of a clean and healthy Long Island Sound watershed is a profound one for millions of us who live near its shores and rivers. Perhaps it's the visual delight of these rivers and our coastal waters, with their ever-changing surface reflections. Maybe their ebb and flow naturally connects us to the larger cycles and tides of life.

Perhaps the dream of clean water is profound because water is the single largest chemical component of our beings.

Whatever it is, clean rivers and a clean Sound remain a dream only half realized. The following pages are a snapshot in time. They demonstrate current efforts and progress towards achieving the shared vision of clean water in a healthy Sound. They provide overviews of three interconnected problems impacting water quality: low dissolved oxygen, raw sewage and stormwater runoff. Improperly managed stormwater flushes sewage from old sewer systems and chemicals from lawns and roadways into the Sound. Meanwhile, nitrogen and other nutrients from raw sewage overflow, sewage treatment plant discharges and stormwater runoff spur an overgrowth of algae, which consumes oxygen and can help lead to hypoxic conditions as it decomposes.

We often hear from citizens concerned about how water quality will affect their use of the Sound. Key questions we are frequently asked include:

IS THE SOUND SAFE TO SWIM IN? WHAT ABOUT HARVESTING SHELLFISH?

The Sound must be nearly free of sewage and harmful bacteria to be safe for continuous swimming and harvesting of oysters and clams. We have made substantial progress, especially in Connecticut, in reducing raw sewage discharges from combined sewer overflows. However, progress is still spotty, and in recent years we have seen an unacceptable number of shellfish bed and beach closings and advisories. This is caused by two major factors: ongoing sewage overflow problems from urban areas like New York City and Bridgeport and stormwater runoff contaminated with pesticides, petroleum products and other chemicals picked up by rainwater as it flows over our streets, parking lots and lawns on its journey to the storm drain. Continued collective investments in fixing these problems are essential if we are to enjoy a sewage-free Sound.

IS POLLUTION IMPACTING THE ECOLOGICAL HEALTH OF THE SOUND?

Without a doubt, the Sound's ecology is being impacted by pollution. For a portion of every summer, oxygen levels in the western Sound drop low enough to have a negative impact on animals living in that region. This low oxygen problem, known as "hypoxia," is one of the Sound's biggest ecological threats and is caused by many factors — some, like sewage-related nitrogen, are under our direct control and others, like warming water temperatures, are not. Connecticut and New York municipalities have made major investments in sewage treatment plant upgrades over the past fifteen years. We are now removing more than 28% of the nitrogen pollution produced by sewage treatment plants in the two states. We are nearing the halfway point in our effort to comply with legal requirements to remove 58.5% nitrogen pollution by the year 2014. Additional state and local funding is essential if we are to meet this important goal.

The federal government, New York and Connecticut united to protect Long Island Sound in 1994 when they developed the CCMP, and joined forces once more in 2000 when together they designed the action plan for nitrogen reduction, known as the nitrogen total maximum daily load (TMDL). While all parties involved continue marching toward the 2014 TMDL goal, increased investments and implementation of innovative policies are necessary. Now is the time to muster resources and mobilize allies to support nitrogen reduction and increased research into other potential factors that may be contributing to hypoxia in Long Island Sound. After all, in this day and age, clean water should not be a dream half-realized. It shouldn't be a dream at all.

LOW OXYGEN: C-

- Sewage treatment plant discharges are a major source of the nutrients that contribute to the low-oxygen, hypoxic “dead zone” in the western Sound.
- Connecticut has renewed its commitment to clean water and New York has taken steps forward in the critical New York City and Westchester plants.
- While substantial investment in sewage treatment plant upgrades has been made in the last two decades, significant work remains. However, state funding for this work is intermittent at best, non-existent at worst. It is critical that both states re-commit to sustained and reliable funding allocations.



Low dissolved oxygen, known as hypoxia, is the most serious water quality problem in Long Island Sound.¹⁰ During hypoxic events, oxygen levels in the western Sound drop so far that living creatures who are able to leave the area, must. Those that cannot, often perish. A major cause of this “dead zone” is nitrogen; one main source of this nitrogen is sewage treatment plant discharges. Other sources of nitrogen to Long Island Sound include groundwater and surface runoff contaminated with lawn fertilizer, agricultural waste and failing septic tanks, and even the organic-rich sediments of western Long Island Sound.

The addition of extraneous nitrogen acts to fertilize the Sound, resulting in an overgrowth of algae. When the algae die, they begin to decompose as they fall through the water column. Their decomposition uses up the oxygen in the water, contributing to the hypoxia problem.

WHERE ARE WE NOW?

A significant part of the cure for the hypoxia in the Sound is to ensure that all sewage treatment plants within the Sound's watershed are upgraded to include nitrogen removal as part of their treatment. In 2001, New York, Connecticut and the federal government agreed to reduce nitrogen inputs by 58.5% by 2014. Connecticut and New York have made significant progress, toward this goal. Advanced nitrogen removal has been introduced at 43% of the 105 sewage treatment plants around Long Island Sound.¹¹ For the last several years, however, a lack of funding has stalled clean water projects, putting the attainment of that milestone at risk.

In Connecticut, the state Clean Water Fund was well funded for fifteen years. But in 2002 funding stopped, causing a substantial backlog in sewage treatment plant upgrades. In 2008, thanks to the state's leadership, Connecticut recommitted to a reinvestment starting that will result in major progress over the next few years.

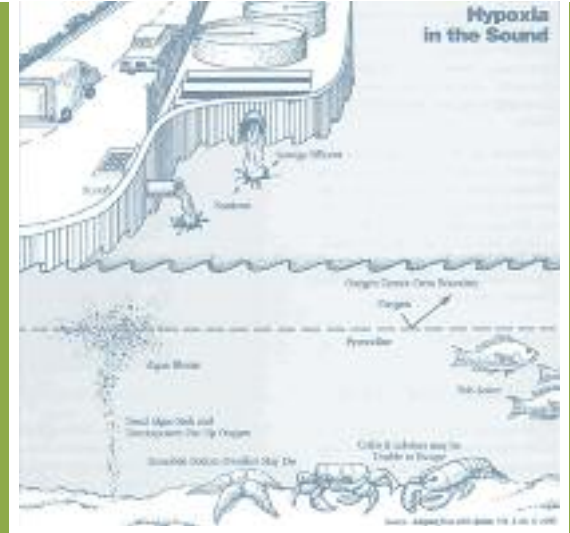
In New York, clean water funding has run out and has not been renewed despite the urgent need to upgrade the large sewage treatment plants in New York City and Westchester County. New York City has initiated construction but will be two years behind the 2014 schedule. Westchester has entered into a Consent Order with the Department of Environmental Conservation that delays significant reduction in nitrogen levels until 2017. The good news, however, is that Westchester is obligated to take significant steps over the next eight years toward reducing nitrogen discharges.

As we study Long Island Sound, new issues continue to surface. For example, in addition to nitrogen from sewage treatment plants, we now know that organic carbon is stored in the sediment beds where it can become oxidized. This process consumes oxygen and re-releases the bound nitrogen back into the water column, where it can serve as a nutrient for a next generation of algae. In addition, rising temperatures and wind patterns may result in enhanced stratification, impeding resupply of oxygen to the deeper part of the Sound.

WHAT'S NEXT?

While the Total Maximum Daily Load is currently under review and re-evaluation, reaching the current milestone will require New York to renew clean water funding and Connecticut to maintain consistent funding in the future.

While the summer of 2008 marked a five-year high in hypoxia square mileage, the extent and duration of hypoxia has not decreased over the last decade despite lower nitrogen inputs. Scientists believe that organic matter from past decades is stored in the sea floor sediment and can release nitrogen back into the water as it decomposes.¹⁴ This results in a delay between decrease in nitrogen release and reduction of hypoxia and its ill effects. In addition, warming temperatures and wind shifts resulting from climate change may be slowing the Sound's response process.

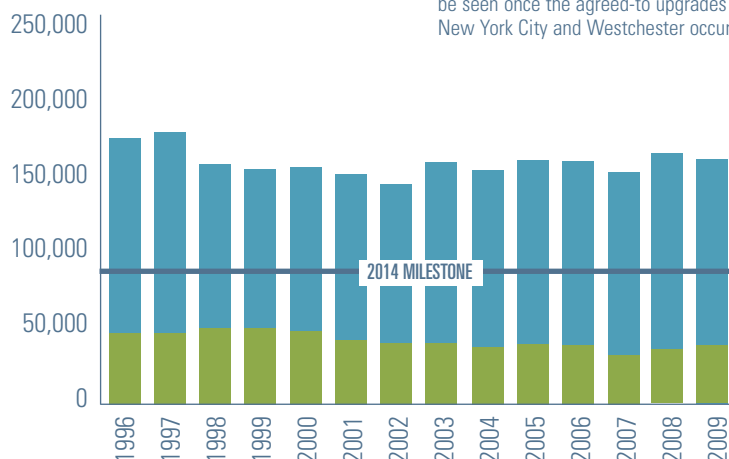


Nitrogen Output from Sewage Treatment

POUNDS PER DAY

CT
NY

Between 1994 and 2002, nitrogen output from sewage treatment was reduced by 28%¹², but since then progress has stagnated due to lack of funding. Significant movement should be seen once the agreed-to upgrades at New York City and Westchester occur.



Pump It Out.

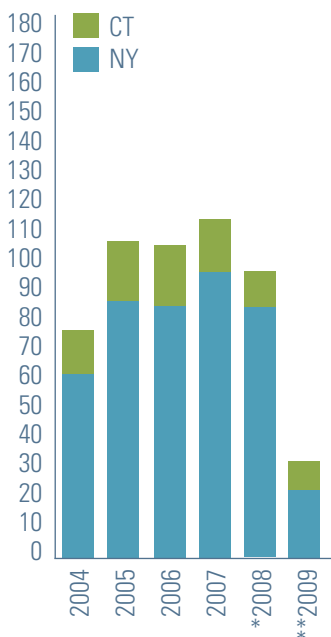
In 2007, Connecticut declared all of its waters a no-discharge zone for boats with onboard toilets in an effort to eliminate sources of sewage, and New York followed suit in 2011. In order for no-discharge zones to be successful, it will be essential to maintain the pump-out stations and make them easily accessible.

RAW SEWAGE: D+

- Raw sewage is a danger to public health and limits use of beaches and shellfish beds.
- New York City and several Connecticut cities are working to correct combined sewer overflows (CSOs).
- Bridgeport needs to prioritize implementation of its CSO control plan. Renewed clean water funding in New York would mean faster progress in New York City and stable funding in Connecticut would move projects forward statewide.

Sewage Discharged into Sound

GALLONS/INCH OF RAIN (MILLIONS)



* CSO information was not provided for Hartford in 2008 and 2009.

** Both New York and Connecticut reported a large number of "unknown" volumes in 2009. The low numbers for that year are therefore indicative of a lack of data, not of improvement.

No one knows how much raw sewage flows out of unmonitored storm pipes, but these graphs track our CSO correction progress by measuring the volume of minimally treated sewage per inch of flowing rain water discharged into the Sound²⁴ – the taller the column, the worse the situation. When sewage and stormwater overwhelm a treatment plant's capacity to fully treat sewage, it signals that the related combined sewer outfall pipes along the way are overflowing into the Sound as well. In New York's Long Island Sound watershed, New York City is the major CSO concern; its bypasses have increased in recent years. In Connecticut bypasses have decreased overall, although in some cities like Bridgeport bypasses have increased in recent years.

DURING DRY WEATHER
Mixed sewage flow is contained within the system and flows to the Wastewater Treatment Plant.



DURING STORMY WEATHER
The combination of stormwater and sewage can exceed normal capacity and overflow into area waterways.



What is a Combined Sewer Overflow?

Found in our older cities that were originally built with a combined sewer system, CSOs are a slurry of residential sewage, industrial wastewater and stormwater that discharges, untreated, into nearby water-bodies like Long Island Sound.

City of Wilmington, Delaware, CSO program (www.wilmingtoncso.com)

WHERE ARE WE NOW?

In Connecticut, a handful of cities still have combined sewers. These cities are in various phases of separation, but the worst overflows are in Bridgeport, New Haven, Norwich and the Hartford metropolitan area. While progress has been made, much more needs to be done; continued commitment by these cities, even in tough economic times, is required. The \$875 million in state bonding from 2008 to 2011 and the \$48 million from the American Recovery and Reinvestment Act will be helpful but the state must fully finance the Clean Water Fund for years to come if we are finally going to stop the flow of raw sewage into the Sound.

New York City will invest billions of dollars in the first stage of a plan to control their CSOs. But because state funding is extremely limited, it will take decades to complete. In other areas, like Port Chester, testing of stormwater pipes has revealed significant bacterial contamination likely attributable to leaking sanitary sewer pipes, though the exact cause has not yet been identified.

WHAT'S NEXT?

While CSOs separation has been achieved in both states, public health is still at risk and the Sound's waters, critical to supporting wildlife, are still far from clean. Connecticut must ensure the remaining CSOs are separated in a timely manner by providing resources through the Clean Water Fund. New York should renew clean water funding to make faster progress in New York City. The Village of Port Chester must dedicate the necessary resources to identify illicit discharges or other sources of the contamination and take appropriate corrective steps.

BEACH CLOSURE AND ADVISORY DAYS

CONNECTICUT

	2005	2006	2007	2008	2009
Fairfield	148	176	87	79	87
Middlesex	41	6	4	40	15
New Haven	11	32	17	16	6
New London	0	2	0	0	0
TOTAL	200	224*	108	135	108

NEW YORK

	2005	2006	2007	2008	2009
Bronx	69	181	216	225	299
Nassau	54	126	152	147	196
Queens	23	26	63	63	66
Suffolk	65	307	334	321	226
Westchester	53	42	77	105	230
Total	264	688	842	861	1017

* While New London County continually self reports zero beach closings and/or advisories, federally required testing at several key beaches tell a different story. For example, 50% of the water quality samples from Waterford, CT's Kiddie Beach exceeded state standards.³⁶

Red tides, or algal blooms, are events in which microscopic plant-like organisms multiply rapidly, sometimes forming dense, colored patches near the water's surface. Some algae species contain neurotoxins that accumulate in filter-feeder organisms like oysters, mussels and clams. Eating shellfish contaminated with these toxic organisms can cause symptoms including respiratory paralysis in humans; the toxins may also harm birds, fish, marine mammals and humans. Upper New England's shellfish beds are frequently closed in summer to prevent this poisoning. While very unusual in the Sound, in 2008 a couple bays were closed due to Alexandrium-produced saxitoxin. In the summer of 2010 cells were detected in Northport and Huntington, NY, and one site in Long Island Sound.

Increased shellfish bed closures reflect worsening raw sewage and stormwater problems in parts of Connecticut.

Shellfish harvesting has played a central role in the Long Island Sound economy for centuries. After decades of careful management to expand shellfish beds, the number of open shellfish beds in Connecticut has begun to shrink due to contamination from combined sewage overflows and coastal overdevelopment. New York is fortunate that no combined sewers exist in Long Island and shellfish bed acreage there has remained constant, but sewage overflow from New York City severely limits shellfishing in the surrounding area. In Connecticut, temporary shellfish bed closures during CSO events have been getting worse. Combined sewer overflows in Bridgeport closed shellfishing in Fairfield for 166 days in 2007.²² Coastal overdevelopment is spreading in the eastern Sound and could pose a future threat to shellfishing beds unless careful land-use planning, like innovative use of low impact development and green infrastructure, are employed to reduce potential stormwater impacts.

Beach closures reflect continuing raw sewage and stormwater problems in many parts of the Sound.

Beaches are the ultimate symbol of summertime and the primary way that residents of the surrounding areas interact directly with Long Island Sound. Unfortunately, in many parts of the Sound, beaches must be closed for days, and in some cases weeks, because bacteria from combined sewer overflows and stormwater runoff make it dangerous to swim.²³

STORMWATER RUNOFF: C-

- Stormwater runoff pollutes waterways and causes flooding.
- New York and Connecticut have mandated stormwater plans and stormwater associations are being developed to help implement those plans.
- Stormwater funding and enforcement programs are in need of expansion and legislation is needed to protect riverfronts.

Stormwater runoff affects everyone; it is one of the most serious water quality problems facing the United States today. Every time it rains, water runs off hard surfaces such as roofs, driveways, roads and parking lots, collecting pollutants along the way. This runoff flows into streams and ultimately drains into Long Island Sound.

Stormwater runoff is the source of many problems: flooded streets and basements, streams that are inhospitable to fish, closed beaches and shellfish beds, and an unhealthy Long Island Sound. But with appropriate management, runoff doesn't have to be so destructive.



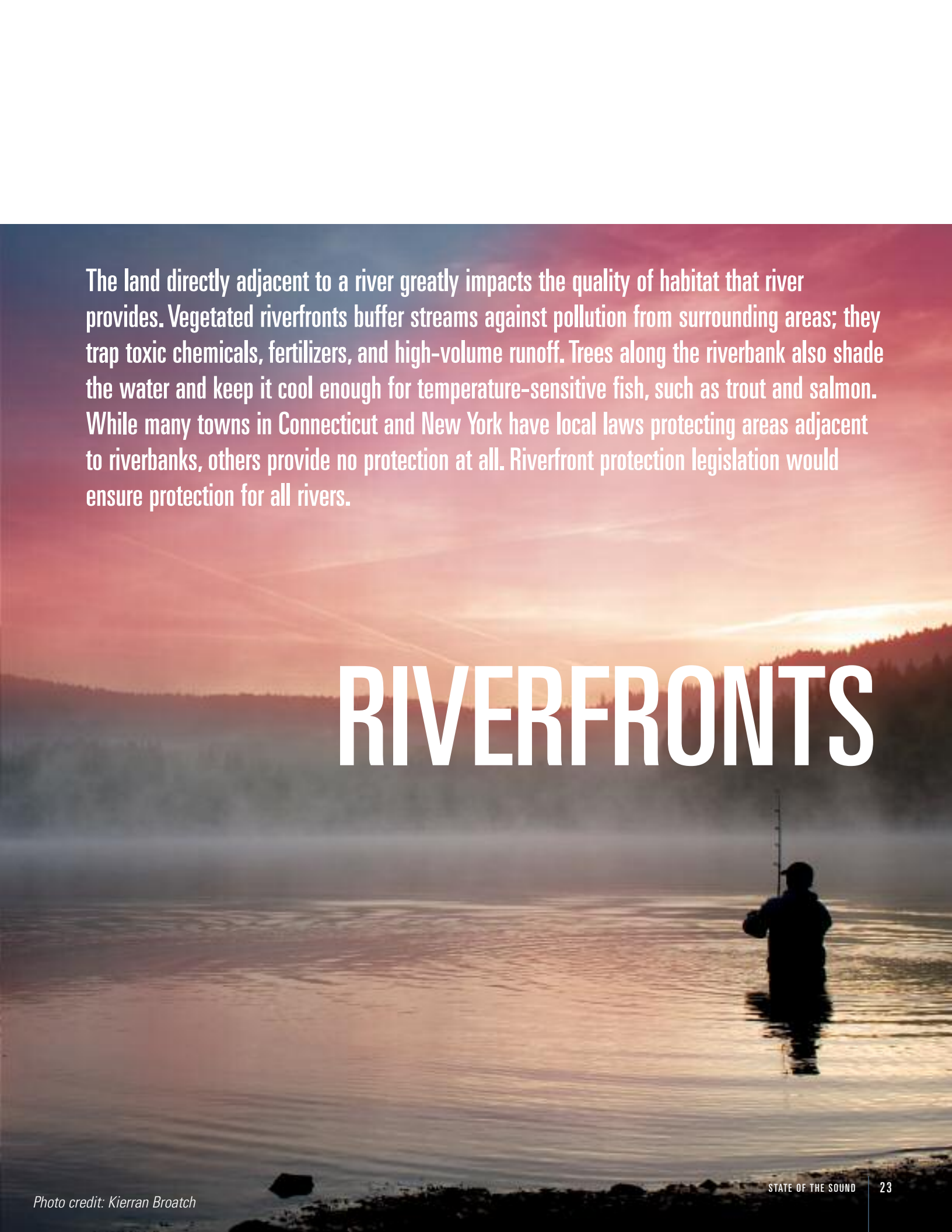
WHERE ARE WE NOW?

To protect Long Island Sound, both New York and Connecticut require municipalities to put stormwater management plans in place; however, enforcing those plans has become a major challenge. The good news is that the two states are actively funding and implementing protective measures, like storm drain filters and municipal stormwater associations, which could significantly reduce pollution and control localized flooding. Connecticut recently allocated a million dollars for planning of local stormwater authorities in several coastal cities¹⁹ and Mamaroneck, NY, is leading a coalition of twelve towns from its county to plan a stormwater utility district.²⁰

WHAT'S NEXT?

New York and Connecticut have only begun to address the problems of stormwater runoff. The two states should:

- Create small stormwater assistance funds to help municipalities start stormwater authorities and install stormwater filters in catch basins.
- Work with municipalities to find and address illicit discharges and to encourage intermunicipal cooperation.
- Create incentives for cities and towns to incorporate green infrastructure techniques (see spotlight page 26) for new construction and redevelopment.²¹
- Explore incentive programs for residential stormwater control.

A person is silhouetted while fishing in a river. The sun is low on the horizon, creating a warm, orange glow that reflects on the water. The background shows a forested hillside under a hazy sky.

The land directly adjacent to a river greatly impacts the quality of habitat that river provides. Vegetated riverfronts buffer streams against pollution from surrounding areas; they trap toxic chemicals, fertilizers, and high-volume runoff. Trees along the riverbank also shade the water and keep it cool enough for temperature-sensitive fish, such as trout and salmon. While many towns in Connecticut and New York have local laws protecting areas adjacent to riverbanks, others provide no protection at all. Riverfront protection legislation would ensure protection for all rivers.

RIVERFRONTS

TOXIC CHEMICALS: C

- Toxic chemicals in our waterways endanger wildlife and public health.
- Legal action stopped major toxic violators in Connecticut. In New York, the number of violations has decreased but still remains dangerously high.
- Enforcement resources are needed to address violations, particularly in Suffolk County, NY.

Toxic Chemicals entering our waterways can cause problems ranging from reduced growth and fertility to cancer and death in both people and wildlife. Humans, birds of prey and other animals high on the food chain are most at risk of certain bio-accumulating toxins such as heavy metals, while other toxics can wipe out the tiny organisms that form the base of the food chain. These chemicals can re-enter the water when they are disturbed by storms or activities that shift the sediments. Once in the water, they are bioavailable and may be assimilated into the Sound's living organisms. Although toxic releases have been greatly reduced in recent decades, egregious violations of government safety standards still exist.

WHERE ARE WE NOW?

Five Connecticut companies violated standards for heavy metals, cyanide and other highly toxic chemicals for years. After being threatened with lawsuits, four of the companies, Electric Boat (Groton), Whyco Finishing Technologies (Thomaston), and Allegheny Ludlum and Cytec Industries, both in Wallingford, agreed to end their discharges and pay fines directed towards water improvements. The fifth company, Atlantic Wire (Branford), closed its doors and admitted criminal liability.

New York records show that the number of toxic chemical discharge violations has decreased significantly over the past four years. However, a handful of companies are responsible for hundreds of violations every year. These include violations related to mercury, lead and arsenic that are tens-to-hundreds of times their legal limit.¹⁵

WHAT'S NEXT?

New York and Connecticut can reduce violations of toxic chemical limits by devoting more resources to enforcement of discharge permits. Such action will address the current toxic releases in Suffolk County and will prevent future problems in Connecticut.

Fish Pharm

A myriad of pharmaceuticals, including birth control pills, antidepressants and anti-seizure medications, are flushed down the drain and into our waterways daily. Connecticut does not allow sewage discharges to drinking water sources, but New York does, and everyone in our region should be concerned about the impact of these chemicals on Long Island Sound.

We know very little about the environmental effects of the majority of these pharmaceutical chemicals, but growing evidence suggests cause for concern. Studies show that estrogen-like chemicals in sewage have skewed the sex ratio in some fish so much that there are nine female fish for every male.¹⁶ Other studies have demonstrated that synthetic estrogen from birth control pills can decimate the fish of an entire lake by impairing sperm and egg development in the fish population.¹⁷

The good news is that advanced (tertiary) sewage treatment removes 75-98% of synthetic estrogen.¹⁸ The bad news is that we have a long way to go until all of our sewage receives advanced treatment. We need to commit resources to research in this area and to responding to any threats this research reveals.



Safe Fish Consumption for Long Island Sound

Most fish caught in Long Island Sound and adjoining waters may be eaten in moderation.

Women of childbearing age and children are considered high risk. They may eat bluefish under 13" at will, but should limit bluefish 13-25" to once a week or less, and should avoid bluefish over 25". The high risk group should limit striped bass to less than once a month, and consume no more than one meal a month of American eel and of weakfish under 25", and no weakfish over 25".

Adult men and women over childbearing age are considered low risk. Once a month they may eat striped bass and weakfish over 25", and once a week, smaller weakfish or American eel. Small bluefish may be eaten once a week, bluefish over 25" once a month.

Everyone should avoid eating the hepatopancreas of lobsters and crabs (the greenish matter in the body section, also called tomalley or liver), as it accumulates high levels of PCBs, cadmium, and dioxins.

For freshwater fish, check your local advisories.

OSPREYS ARE HIGHLY SENSITIVE TO THE PRESENCE OF TOXIC CHEMICALS IN THE ENVIRONMENT.

Spotlight: Green Infrastructure

CONNECTICUT GREEN INFRASTRUCTURE: CLEAN WATER, SITE BY SITE by Mary Rickel Pelletier*

Most transportation and utility infrastructure projects depend upon years – even decades – of planning and billions of dollars in implementation costs. Across Connecticut, however, green infrastructure projects are being accomplished site by site as affordable property-improvement projects. By reducing the volume of rainwater that is shunted into the sewer system, green infrastructure reduces the need for expensive expansions of centralized wastewater treatment.



Simply explained, hard surfaces (rooftops, roadways and parking lots) ought to first drain into vegetated catchment areas before overflowing into the sewer

system. The challenge is to design the catchment so that its soil and vegetation can absorb standing water within 36 hours. While centralized wastewater treatment cannot be eliminated, green infrastructure can reduce costs dramatically – for grassroots gain. Green infrastructure is a decentralized method that intercepts and absorbs rain naturally – such as water for trees and shrubs or ground water recharge. Utilizing strategies outlined by low impact development (LID) research, the term “green infrastructure” emphasizes the value of living systems, especially plants, as an economic infrastructure asset.

On-site stormwater management strategies contribute to regional watershed-based planning goals. While watershed-based planning can maximize regional and municipal cost benefits, any property owner can learn to manage rainwater on-site with green infrastructure. Homeowners can divert rooftop downspouts into rain gardens or rain barrels. Corporate and institutional property managers can create scenic landscape features and install permeable pavement in parking areas to capture stormwater runoff. Municipal planners can protect and restore stream buffers that soak up rainwater and mitigate downstream flooding. Green infrastructure refines the functional relationships between building and nature at any scale of development and in any setting, urban or rural.

An impressive range of projects from across the country were presented during the July 2009 US Environmental Protection Agency (EPA) workshop “Managing Wet Weather with Green Infrastructure” in Hartford. The affordable benefits of green

infrastructure were presented through real world case studies built by large property owners as well as municipal and state government agencies.

Presentations included landscape design drawings, photographs of the construction process, and testing data from three different types of retrofit projects in Portland, OR. One – a \$17,000 green street designed to handle 80% of 25-year-storm rainfall over a catchment of 10,000 square feet – also serves as a traffic calming feature and has been outlined in a “green streets and parking lots” guidebook to show other municipalities how to save money, manage stormwater, and benefit city planning. Other projects combine tree planting for co-benefits like control of flooding and runoff pollution, urban greening, carbon sequestration and to cool urban heat islands.

Local examples from New York and Connecticut were highlighted at the 20th annual Long Island Sound Citizen's Summit, Green Cities/Blue Waters, held in Bridgeport, CT, during the spring of 2010. Across both states, green infrastructure projects are being accomplished site by site as affordable property improvements. In new development areas, field visits to a local Connecticut LID project reveals how the ground plane can be designed to mitigate stormwater runoff. Paving surface slope, pavement materials, threshold design, area and depth of catchment, soil composition, and vegetation are fundamental design decisions made with respect to site conditions. Success requires accurate calculations of surrounding hard surfaces and knowledge of average rainfall rates, as well as practical considerations like the capacity to amend soil and select plants that can thrive in both saturated and drought conditions.

Planning successful green infrastructure demands coordination among a range of experts. New professional partnerships are needed in the green design process to choose attractive, low maintenance vegetation that absorbs rainwater effectively. Specialists qualified to verify soil amendment and planting plans can work with town planners and engineers who may be concerned that vegetated swales will not be as fail-safe as conventional curbs and drains. Collaborative efforts of professionals, non-profits, scientists and community members are needed to assess complex urban environmental conditions and cultural interests that influence realistic opportunities. From this cooperation, lasting and productive partnerships can grow.

Whether projects originate through the watershed planning process, or from the grassroots good will of volunteers, collaboration between municipal planning departments and regional water authorities can result in beautiful and cost-effective quality-of-life gains, along with significant benefits to our local natural environments.

HOLE-IN-THE-WALL BEACH

The parking lot at Hole-in-the-Wall Beach in East Lyme, CT, serves as a “low impact development” (LID) demonstration project for various on-site stormwater management technologies.

Stormwater overflow from the lot, which is paved with eleven different pervious products, drains into two infiltration detention basins specially planted with suitable vegetation. In addition, there are two structural stormwater treatment products: a Filterra bioretention system, which captures stormwater from Baptist Lane, and a ConTech CDS (deflective separation/swirl technology) unit that separates floating pollutants and road runoff sediments from 22 acres of downtown Niantic, north of the lot. The unit’s swirl technology can be observed through a viewing grate.

Completed in the fall of 2008, the 100-car lot and detention basins cost \$240,000. Improvements to the Hole-in-the-Wall Beach were informed by the Niantic River Watershed Management Planning process, funded by the Connecticut Department of Energy and Environmental Protection (DEEP).



VEGETATED CATCHMENT, SISKIYOU STREET
IN PORTLAND, OREGON

Watershed Management, Low Impact Development and the DEEP

Watershed Based Planning protects and improves the quality of a watershed’s natural resources by implementing land and water use practices comprehensively. The Connecticut DEEP’s Watershed Management Program addresses water resource issues from an integrated watershed perspective by dividing the state into five major basins along natural watershed boundaries, within which DEEP Watershed Managers assist communities in forming partnerships, drafting watershed based plans, and implementing environmental projects to restore and protect Connecticut’s water quality.

Developing a watershed based management plan is key to the restoration of an impaired waterbody. The DEEP’s Impaired Waters List identifies specific nonpoint source impairments; the plan focuses on reducing or removing the impairment so the waterbody can meet water quality standards. To qualify for Section 319 Clean Water Act funding to implement low impact development (LID) and green infrastructure projects to mitigate the impairment, plans must address nine elements specified by the US EPA. Developing a watershed based plan can also help find and leverage other funding for implementation projects like the improvements to East Lyme’s Hole-in-the-Wall Beach.

Recently the Connecticut DEEP added an LID Coordinator to assist municipal, state and federal partners with information, outreach materials, and technical coordination. The program is building relationships with land use agencies and stakeholders across the state to identify and remove barriers to LID and implement projects.

FURTHER READING:

A summary of the Niantic River Watershed Protection Plan, Connecticut’s first EPA-approved watershed management plan, is available online: http://www.ct.gov/dep/lib/dep/water/watershed_management/wm_plans/niantic_management__plan_summary.pdf

A partial listing of Connecticut “low impact development” projects are listed on the NEMO website: http://nemo.uconn.edu/successes/case_studies.htm. NEMO (Non-point Education for Municipal Officials) is a program of the University of Connecticut’s Center for Land-use Education and Research (CLEAR).

For the US EPA study, “Protecting Water Resources with Higher Density Development” see http://www.epa.gov/smartgrowth/pdf/protect_water_higher_density.pdf

Powerpoint presentations on retrofits, system operation and maintenance, the EPA Water Quality Scorecard, and New England cold-climate projects, as well as a planning guidelines with detailed diagrams for green streets and parking lots, are posted on the US EPA green infrastructure website: <http://cfpub.epa.gov/npdes/greeninfrastructure/gitrainings.cfm>

*Mary Rickel Pelletier has provided independent design, research, and advocacy on a range of innovative green projects for over a decade. She is currently Director of the Park River Watershed Revitalization Initiative, a project of the Farmington River Watershed Association. Her essay “Green Infrastructure for Blue Urban Watersheds” was included in *Green Communities*, a joint publication of the American Planning Association (APA) Planners Press and the National Building Museum.

Stewardship: Our Special Coastal Places

STEWARDSHIP: C-

- The stewardship program aims to preserve and manage the last great coastal spaces and to reconnect people with the Sound.
- \$25 million was authorized for the Long Island Sound Stewardship Act, and while no money has been directly appropriated exclusively for the act, other limited federal funding has provided acquisition opportunities.
- Greater federal appropriation and matching state funds are needed to protect stewardship sites, while inventorying and evaluating public and private access points will improve people's ability to experience the Sound.



Stewardship is about building connections. It means protecting and managing spaces where humans can connect with nature. The sum of these individual connections creates a regional consciousness of the natural context in which we live. To promote this ethic, the bi-state Stewardship Initiative has identified 33 inaugural stewardship areas throughout the Sound as places with significant ecological or recreational value. These sites are priority areas for restoration, protection and management.

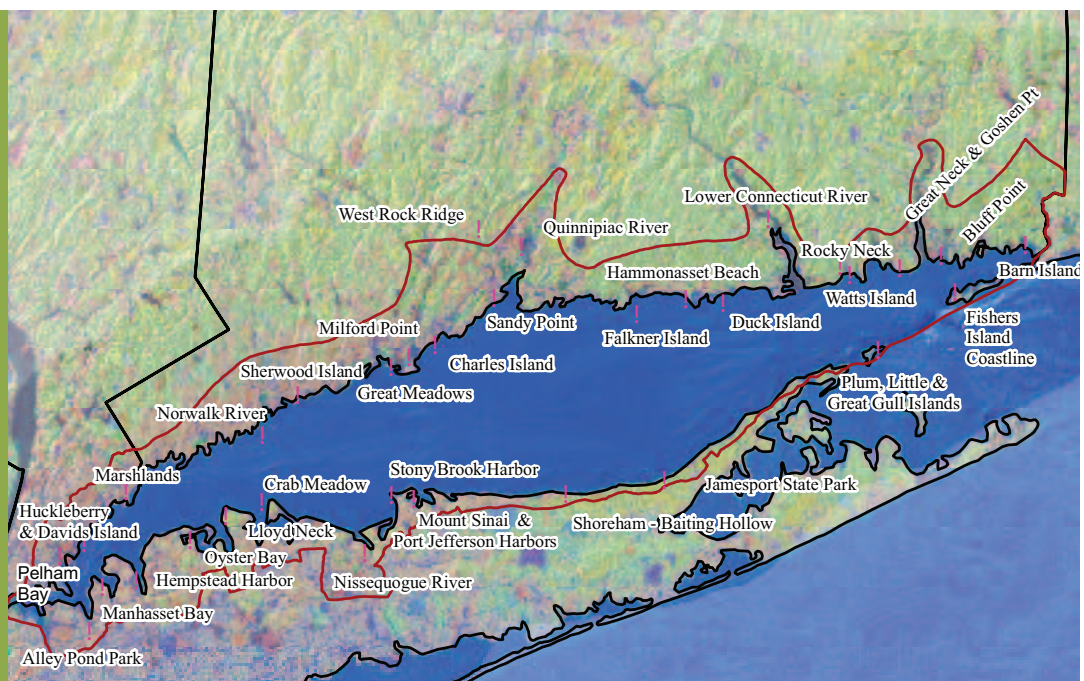
WHERE ARE WE NOW?

The federal Long Island Sound Stewardship Act (LISSA) was designed to fund land acquisition, restoration projects and other stewardship activities. While this is a great start, the related federal funding is far less than what is needed to make timely and significant progress in the protection and enhancement of these stewardship sites. In both New York and Connecticut, LISSA partners are proactively working to create state matching funds. Meanwhile the two states continue to conduct needs assessments at existing stewardship sites and to review additional sites for potential stewardship designation.

The public's ability to connect with the Sound is often limited by the quantity and quality of public access points. Existing access points are often restricted to town residents, ill-maintained and ill-marked by private developers who provide public access as part of a permit, plagued by inadequate parking and bathroom facilities, or located adjacent to private homes, resulting in a public that has few opportunities to access the very areas it is being asked to steward.

Long Island Sound Stewardship Initiative

Thirty-three priority areas have been identified around the Sound as being especially valuable to human enjoyment and wildlife habitat.²⁸



WHAT'S NEXT?

Greater federal appropriation and matching state funds are urgently needed to protect stewardship sites and to manage them for both wildlife conservation and human enjoyment.

Both public and private access points should be inventoried and evaluated for true accessibility. Aspects to be evaluated should include adequate signage, parking, facilities, setbacks from private development, and overall upkeep and management.

As part of the Long Island Sound Stewardship Initiative (LISSI), The Long Island Sound Study, The Nature Conservancy, Stonington Land Trust, and Connecticut DEP partnered to purchase a 48-acre parcel at Barn Island (Stonington, CT) known as the Crowley property in February 2009. This purchase expanded the Barn Island Wildlife Management Area to more

than 1,060 contiguous acres of coastal forest, tidal marsh and grassland habitats. In addition to being one of the initial 33 stewardship sites, Barn Island has hosted more than 30 different research projects over the last six decades. This latest purchase will ensure that the last remaining unprotected salt marsh within the Island's tidal wetland system is protected for years to come.

The Nissequogue River Watershed covers 40 square miles (mostly in Smithtown, Long Island), and is a unique case study that demonstrates the great potential of the Long Island Sound Stewardship Initiative. Using the principals of the LISSI, a Stewardship Action Plan has been developed by a coalition of stakeholders representing diverse interests. Their goal is to protect and enhance this local landscape comprised of a wide array of species, varied ecosystems and an assortment of recreational opportunities.

TWO PRIORITY STEWARDSHIP SITES

BARN ISLAND, CT
(BELOW) AND
NISSEQUOGUE RIVER
STATE PARK, NY (LEFT).



Photo credit: Robert Freudenberg

What Exactly is the “CCMP”?

In 1985 Congress directed the US Environmental Protection Agency to sponsor the Long Island Sound Study, a management conference that involves federal and state governments, interstate and local agencies, industry, universities and environmental groups. **The Comprehensive Conservation and Management Plan (CCMP) developed by this group 17 years ago identifies six priority areas for the Sound.** The blueprint sets goals, milestones and action steps that can help turn things around, providing information and estimates on the “how” and “how much” along the way.

Hypoxia describes a level of dissolved oxygen so low it negatively affects bottom water habitats and animals. Excess nitrogen is believed to be the one of the of hypoxia (it helps algae grow, but when the algae die and settle to the bottom of the Sound, they use up the available oxygen in their decay); reducing the amount of nitrogen is expected to assist in reducing hypoxia. In 1994 it was estimated that 93,600 tons of nitrogen per year enter the Sound, of which 53,700 tons are human contributions that can be managed and curbed. The goal was to reduce the most severe instances of hypoxia by freezing inputs at 1990 levels and then methodically eliminating 24,000 tons of nitrogen inputs by 2014, as outlined in the follow-up 2000 Nitrogen Total Maximum Daily Load (TMDL).

Toxic Substances are both natural and man-made substances that can negatively impact the environment or human health. Goals included enhanced pollution prevention programs that target toxic inputs, additional sediment evaluation and monitoring for toxins, and greater communication with the public.

Pathogen Contamination, which comes primarily from combined sewer overflows, nonpoint source runoff, sewage plant malfunctions and vessel discharges, can close beaches and shellfish beds and cause illness in bathers and those who eat undercooked contaminated shellfish. Reducing instances of contamination depends on fully funding nonpoint source pollution control programs, infrastructure improvements to correct CSOs and sewage malfunctions, and enforcement of regulations on sewage discharges and hookups.

Floatable Debris is trash that floats in waterbodies or washes up on shore. It is a major cause of mortality for wildlife, a hazard to boaters and swimmers, and an aesthetic and economic burden to municipalities. Most floatable debris in the Sound is litter from beachgoers or boaters and waste carried downstream by rivers or stormwater systems. This must be dealt with both at the end point and at the source. Every year, volunteers pick up thousands of pounds of trash from beaches; the CCMP recommends doubling the cleanups and investment in enforcement and education programs in order to reduce the amount of litter. The other component is preventing debris from reaching the Sound in the first place through stormwater abatement.

Living Marine Resources and Their Habitats include the finfish, shellfish, birds, mammals and other animals that spend part or all of their lives in the Sound or its watershed, as well as the plant life and ecosystems that support them. The major causes of harm to the Sound’s living resources are water pollution, destruction of habitat and overharvesting. The CCMP urges state and federal agencies to meet existing habitat management goals and enhance ongoing programs in tidal wetlands restoration and management of threatened harvestable species.

Land Use and Development of the Sound’s 16,000-square-mile watershed has a significant impact on the estuary’s water quality. The CCMP stresses five critical areas for improvement: reduce nonpoint source pollution from developed areas; minimize damages from new development; make information, training, financing and technical assistance more available to municipalities, trade organizations and the public; conserve open space through watershed-based planning; and improve public access to the Sound.

Learn more about the CCMP and the Long Island Sound Study: www.longislandsoundstudy.net



Invasive Species in Long Island Sound

An invasive species is a non-native plant or animal that aggressively establishes itself in a new territory to the detriment of native species.

Around Long Island Sound, the common reed (*Phragmites*) out-competes native marsh grasses to form dense monocultures. These are less robust than diverse coastal marshlands and provide inadequate bird and animal habitat. Many other invasive species presently occupy the waters of Long Island Sound and there are continuously arriving via ship ballast water and as “hitchhikers” on boats and boat lines. Warmer waters associated with global warming have extended the ranges of many species — making the Sound’s waters suitable environments for organisms like the lionfish, a poisonous tropical species. This fish can now be found in the eastern Sound during the summer. Invasive species may foul boats and pipes, and can also have major economic impacts. For example, predation by the invasive green crab has contributed to the decline of the softshell clam industry in the Northeast.

The New York DEC and Connecticut DEEP maintain information on problem species and containment protocols. For further reading on invasive species of Long Island Sound: <http://www.seagrant.uconn.edu/whatwedo/ais/listour.php>

6 priority areas of the Sound

Hypoxia

Toxic Substances

Pathogen Contamination

Floatable Debris

Living Marine Resources and
Their Habitats

Land Use and Development

Long Island Sound Restoration Act



The fact that Plum Island – a federally recognized stewardship site – is up for sale to the highest bidder is a clear symbol that intense development pressures continue to put pressure on Long Island Sound. The Sound, surrounded by some of the densest population in the United States and with a watershed that reaches all the way to Canada, has unique challenges that require federal and inter-state cooperation to manage. One of the most important tools for protecting and restoring the region has been the Long Island Sound Restoration Act (LISRA).

For over two decades, this type of legislation has provided the Long Island Sound Study with funding to implement clean water improvements, habitat restoration projects, scientific research and educational programs around Long Island Sound. The distressed communities program has funded municipal sewer upgrades to stem the tide of raw sewage that raises the Sound's nitrogen level and leads to the low oxygen area that is harmful to marine life. Stormwater initiatives and pharmaceutical take-back programs

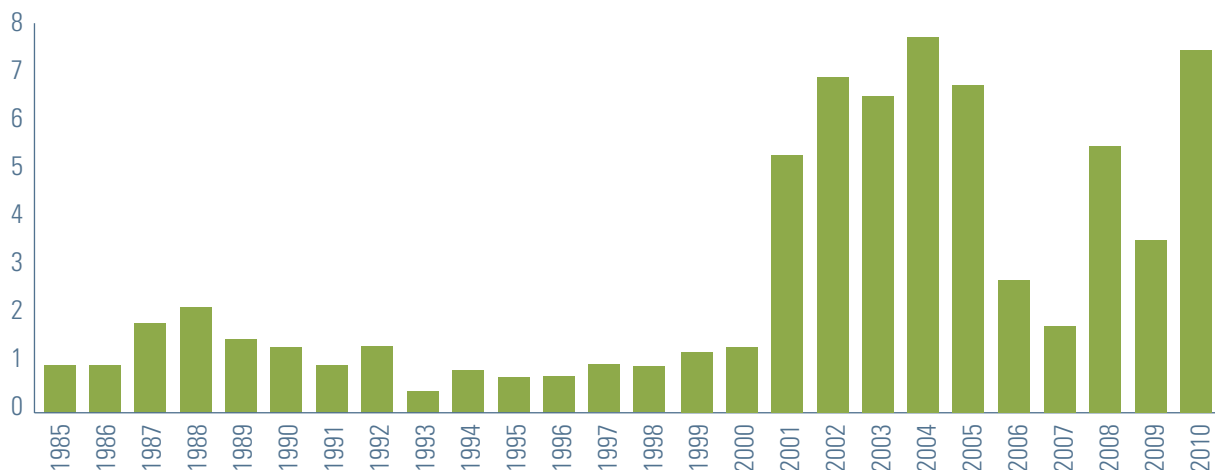
have reduced the amount of chemicals and pollutants the region dumps into the Sound. Habitat restoration projects have re-opened rivers to fish migration and spawning, planted sea grass, rebuilt marsh and dune ecosystems, and protected coastal lands from unfettered development. Research funded by LISRA guides these and other ongoing initiatives, while education and outreach activities provide the information necessary for individuals to take action in their own lives.

LISRA expired in 2010, and its sister bill, the Long Island Sound Stewardship Act (LISSA), expires this year. It is vital that they be reauthorized to ensure continued progress. The states and federal entities like NOAA rely on this critical funding to leverage their investments in Long Island Sound programs. It is crucial that Congress reauthorize LISRA and LISSA this year and appropriate increased funding to ensure we continue on the path toward a healthy and vibrant Long Island Sound.

An investment in Long Island Sound is an investment in the entire region. Not only does the Sound return \$9.4 billion a year to the regional economy in marine trades, fishing, tourism and other industries, but there are less quantifiable benefits as well. The 20 million people who live within 50 miles of the Sound enjoy sailing, kayaking, fishing and walking along the beaches and coastal trails that ring the water. It's a major stop-over point on the migration routes of many bird species, and small, relatively undeveloped islands provide safe resting spots on the journey.

Long Island Sound Study National Estuary Program and LISRA Funding History

MILLIONS OF DOLLARS



Restoring Long Island Sound's Future: Revisiting and Refreshing Our Vision for the Sound

Nearly two decades ago, a plan to restore an ailing estuary began to take shape. A unique partnership that included government, non-profits, universities, private industry and the public uncovered a common hope for our regional treasure:

"The vision...for the 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."

(Listen to the Sound: A Citizens' Agenda. National Audubon Society. 1990.)

From that excitement emerged the Comprehensive Conservation and Management Plan, which identified six key drivers on the road to Long Island Sound's recovery. Thanks to significant federal, state, municipal and private efforts and investments, there have been numerous successes since the CCMP's adoption in 1994, including the development of new plans like the Stewardship and Habitat Restoration Initiatives. However, much has changed since that first plan. The Sound is facing threats not imagined twenty years ago – once-thriving fisheries are collapsing, sea levels are beginning to rise and water quality remains an issue. These challenges demand that we reevaluate the goals of the past, develop and integrate plans for the future and reinvigorate the community.

Over the past two years, the Citizens Advisory Committee of the Long Island Sound Study and community stakeholders have rolled up their sleeves and dusted off the CCMP and other plans related to the Sound's health. By paring the plans to their essentials, integrating goals with one another, and estimating investments needed for each component, stakeholders created a picture of the Sound's progress – identifying which benchmarks have been met and which have not, which goals are no longer relevant and which need to be added, which parts of the Sound's environment need extra attention and which are rebounding faster than expected. From there, areas of overlapping need were identified to determine where the most value lies in terms of ecosystem protection, public access, and return on investment for industry and communities. This coordinated effort has helped show us where we have been, where we are going, and what it will take to get there.

The conclusion of this process marked the beginning of a new chapter for advocacy on behalf of Long Island Sound. In summer 2011, the Citizens Advisory Committee approved a ten-year plan called "SoundVision: An Action Plan for Long Island Sound," and a two-year companion piece. The plan identifies four key topic areas around which to focus discussion and action:

- Protecting Clean Water to Achieve a Healthy Sound
- Creating Safe and Thriving Places for All Sound Creatures
- Building Long Island Sound Communities that Work
- Investing in an Economically Vibrant Long Island Sound

The CAC embarked on an eight-stop tour around the Sound, often accompanied by the Schooner SoundWaters, to bring the SoundVision Action Plan to citizens and to encourage residents of Connecticut and New York to feel connected to the Sound. Legislators from New York and Connecticut are joining together to create a bi-state Long Island Sound caucus to address the needs of the Sound and surrounding communities.

The Long Island Sound community has proved it has the patience, openness, and dedication necessary to identify its common goals. Together, we can achieve our shared vision of Long Island Sound as it should be – clean, safe, abounding with life, and a source of both recreational and commercial activities. To find out more and read the SoundVision report, visit www.LISoundVision.org.

USE CONFLICTS

- Without thoughtful planning, conflicts in use can threaten the Sound's environments.
- In denying a coastal permit to Broadwater, New York chose environmental protection over haphazard privatized energy development.
- Connecticut's Millstone power plant must be upgraded to reduce environmental damage.
- New York and Connecticut should continue cooperating in the development of a regional Dredge Material Management Plan to protect the long term health of Long Island Sound.

Use Conflicts occur when there is perceived competition between economic and environmental needs – sometimes the best interests of the environment and the public win out, sometimes special interests prevail, and sometimes common ground and compromise can create a lasting solution.

WHERE ARE WE NOW?

Broadwater is the floating liquefied natural gas industrial complex proposed for the middle of Long Island Sound by Shell Oil and TransCanada. The project would have irrevocably damaged the Sound's wildlife and limited use of the Sound for recreation and fishing despite concrete and viable alternatives.²⁵ After years of debate in the region, New York denied a coastal permit that would have allowed Broadwater to proceed. While this was a victory for the Sound, New York and Connecticut will need to continue to stand strong in the face of appeals and future permit proceedings on other energy-related projects.

The **Millstone** nuclear power plant on the Waterford, CT, shoreline takes in over 3,000 Olympic swimming pools worth of water (two billion gallons) from Long Island Sound each day to cool its nuclear reactors. This suction kills billions of fish larvae and other marine organisms and is believed to have contributed to the severe crash of the Niantic River's winter flounder population.²⁶

A recycling cooling system would reuse the water multiple times, thereby reducing the destruction of fish and marine life by up to 98%. Yet Millstone was allowed to operate on an expired permit for 11 years without being required to upgrade their antiquated cooling system. This is despite the fact that such a system is being installed by Millstone's owners at their other facilities outside Connecticut. Connecticut Fund for the Environment, its program Save the Sound, and Soundkeeper intervened as legal parties in Millstone's most recent permit proceedings. As a result, the permit proceedings were finally completed and a new permit was issued that required that (1) Millstone install variable frequency drive to slow the intake and reduce the short term destruction of marine life, (2) Millstone complete a study identifying specific recycling cooling systems and the feasibility of installing them, and (3) DEEP make a final decision as to what type of cooling system is required at Millstone based upon the study. As of July 2011, the variable frequency drives have been installed and are operating and the report that will allow DEEP to make its final decision will be completed in summer 2012.



Dredging is necessary to ensure that harbors and industrial areas remain functional. Currently, much of the dredged sediment is disposed of in Long Island Sound, and a dredged material management plan for the entire Sound is needed to avoid any long-term environmental damage. Steps are being taken towards the development of such a plan. While an Environmental Impact Statement (EIS) for the western Long Island Sound has been completed, the EIS for the eastern Sound and a full regional Dredge Material Management Plan have not. Federal funding is urgently needed to complete this process. It is also critical that the Marine Protection, Research, and Sanctuaries Act's "Ambro Amendment," which requires stringent testing for sediments disposed of in Long Island Sound, be protected.

WHAT'S NEXT?

New York State's denial of a coastal permit to Broadwater was a huge success. The four-year fight by thousands of citizens to get to this point highlights the need for **a comprehensive plan that addresses how to balance today's usage needs with the long-term legacy of Long Island Sound that we hope to leave to our children.** Until we develop cohesive criteria to manage Long Island Sound's valuable resources – and evaluate projects in a balanced way – we will always face these battles. New York's new Ocean and Great Lakes Ecosystem Conservation Council is one example of an attempt to enact ecosystem-based management of larger waterbodies. Its process and findings could serve as a model for our LIS regional planners (<http://www.nyoglecc.org/>).

BALANCE CAN CREATE LASTING SOLUTIONS.

The 840-acre Plum Island, NY, has long been the home to a federal research facility, but it also has a less notorious secret: its vast undeveloped spaces have become a de facto wildlife sanctuary that provides nesting areas for at-risk birds.



Just ten miles off of Connecticut's shore, Plum Island – along with its neighboring Gull Islands – has been identified by our state and federal governments as part of the Long Island Sound Stewardship System, a network of the region's last great coastal places that exhibit "exemplary" habitat or public access opportunities deserving of special restoration or protection attention. And in that vision, there is incredible potential: miles of trails winding through coastal forests, summer visitors enjoying sandy beaches and the cool surf.

However, the federal government is preparing to sell Plum Island to the highest bidder, putting this rare island at risk of intensive private development that could ruin wildlife habitats, pollute the Sound, and preclude future public access. It doesn't have to be that way. The undeveloped majority of the island could become part of the US Fish and Wildlife Service's refuge systems. The island could be a place to connect with healthy marine ecosystems and the role they play, showing students and citizens the necessity of maintaining marshes and beaches, without development that impedes natural cycles.

Plum Island is a bellwether for the fate of the Sound – and we must act to protect this jewel. Extensive private development is the wrong answer and an uninspiring response to this kind of potential. In preserving this landscape now we are also preserving our options for the future. This tiny island is, if we care to look, nothing short of amazing.

PLUM ISLAND, NY



Emerging Threats

GLOBAL CLIMATE CHANGE – LOCAL EFFECTS AND LOCAL RESPONSES

Climate change presents us with the environmental challenge of our generation. Average global temperatures have been steadily rising and current atmospheric concentrations of two important greenhouse gases, carbon dioxide and methane, are at historic highs, with future projections for continued temperature increases far beyond anything the globe has seen in millions of years. The scientific community has concluded that the increase in atmospheric carbon dioxide over the last 150 years is a result of human activities such as the burning of fossil fuels and deforestation. Most scientists agree that these high concentrations of heat-trapping gases are driving the current changes to our climate.

Warming temperatures are already changing natural systems throughout the world, and Long Island Sound is no exception. We must take swift and immediate action to address this phenomenon in order to reduce adverse consequences on the planet's air quality, biodiversity, and natural resources and ecosystems.

New York and Connecticut have recently made major strides to reduce their contribution to global climate change. The 2008 Connecticut legislature passed an economy-wide cap on greenhouse gases that will reduce emissions by 10% below 1990 levels by 2020 and 80% below 2001 levels by 2050. New York recently created a climate change office to spearhead

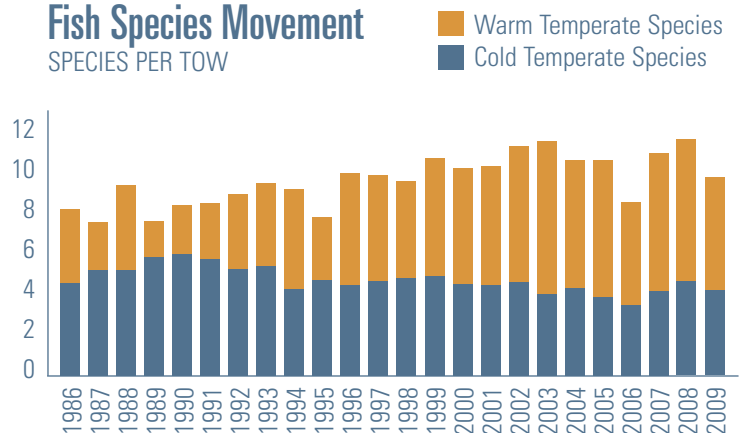
scientific analysis, community outreach and regional partnerships to reduce greenhouse gas emissions.

In addition, those two states have joined with others to require steep decreases in greenhouse gas emissions from motor vehicles and both states are members of the Regional Greenhouse Gas Initiative, the first cap and trade program in the United States to decrease greenhouse emissions from power plants.

One of the greatest challenges for Connecticut and the region will be transportation, development and land use planning. Without careful decision-making, emissions from increased auto use may overwhelm reductions in greenhouse gases from other sectors.

Fish Species Movement

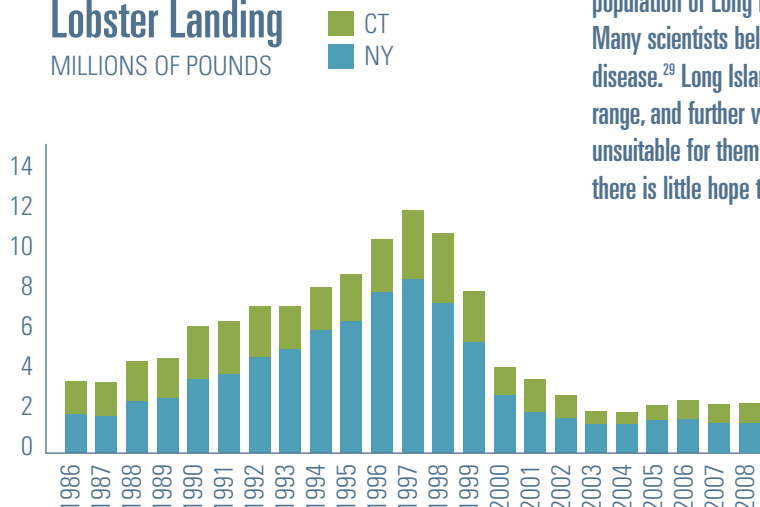
SPECIES PER TOW



In 1999, following a year with record-high temperatures, the lobster population of Long Island Sound was decimated by a neurological parasite. Many scientists believe that heat stress made the lobsters susceptible to disease.²⁹ Long Island Sound is the southern end of the lobsters' common range, and further warming of its waters may make the environment unsuitable for them. With global temperature increases expected to continue, there is little hope that the lobsters of Long Island Sound will ever recover.³⁰

Lobster Landing

MILLIONS OF POUNDS



Winter flounder and other cold-water species in the Sound are moving out and species that thrive in warmer waters, like summer flounder, weakfish, scup, sea robin and lion fish, are moving in.³¹

SEA LEVEL RISE ADAPTATION

Sea level rise threatens coastal wetlands, beaches, waterfront homes, highways, railroad tracks, sewage treatment plants and aquifers. Those living along the coast and the regional economy must start preparing now for future sea level rise, as the pace of change this century may outstrip expectations and scenarios developed only ten years ago. While estimates published in 2007 predicted global sea level would rise by seven to 23 inches by the end of this century, this is now considered conservative. Factoring in the melting of polar ice caps, some studies now indicate a rise of three to six feet in the same time frame. Already the coastline of the United States is changing – and Long Island Sound is no exception.

Rising global temperatures cause sea level to rise both by melting land ice and through thermal expansion of warmer ocean waters. The risk that ice sheets may become unstable and disintegrate more rapidly than foreseen till now is real, and the coastal zone should have a plan to deal with such effects. Salt marshes should be vigorously protected and restored: they serve as nurseries for many marine species, are a carbon sink and form an important protective buffer between the sea and land. (The devastating effects of Hurricane Katrina in New Orleans were likely worsened by the degraded state of local coastal marshes.) However, marshes cannot migrate upland with rising seas because coastal development such as highways, railroad tracks and urbanized regions are in their way. We must start adapting now. Administrators of coastal infrastructure should develop, and begin implementing, plans for an ever-closer sea front.

WHERE ARE WE NOW?

New York State has created an Ocean and Great Lakes Ecosystem Conservation Council, which has begun a coordinated effort to address sea level rise as part of a comprehensive coastal management plan. New York City's PlaNYC includes protection of urban infrastructure in the lower Hudson estuary. Connecticut has created an adaptation subcommittee tasked with assessing the impacts of climate change on infrastructure, natural resources, habitats, public health and agriculture/aquaculture. Recommendations were made in summer 2010 and are presented at <http://ctclimatechange.com/index.php/learn/adaptation>.

- Sea level rise threatens coastal habitat and infrastructure, while warming waters disturb the marine environment.
- Connecticut is restoring high-elevation marshes, which are more resilient to sea level rise. New York has begun coordinating and investigating a comprehensive sea level rise assessment.
- Both states need coastal zone management plans that incorporate sea level rise adaptation and neither state has yet invested in protecting upland areas.

WHAT'S NEXT?

Government agencies in New York and Connecticut should work together to build a flexible, coordinated response to this complex challenge, including:

- Development of a mechanism to ensure agency cooperation between the two states on issues related to coastal management and sea level rise, including a regularly updated vulnerability and economic impact assessment which can be used to raise public awareness, update laws and inform land use decisions.
- Funding state agency recommendations.
- Permitting and encouraging naturalized/vegetated buffers and other methods of shoreline protection that do not destroy coastal habitat. Prioritizing restoration of the marshes most resilient to sea level rise and concurrent protection of upland areas so marshes can spread inland. Investigating and investing in rolling conservation easements to protect public access.

PREDICTION:

New England's sea level will rise

1 foot to 3 feet
over the next century.



Spotlight: The Sound's Resilience

COASTAL RESILIENCE AND ADAPTATION IN THE FACE OF CLIMATE CHANGE

Today, the world's leading climatologists agree that global climate change will be expressed through the inundation of coastal cities by rising sea levels, extreme heat waves in selected urban areas, and reoccurring drought conditions in some places and increased rain and flood conditions in others. They predict that climate change could wipe out significant areas of agriculture. Even if the world's carbon emissions were significantly cut right now, many of the effects of climate change may continue for many more centuries. Currently, climatologists are not debating whether the negative impacts of climate change will occur – in fact they are happening right now – but are instead studying and modeling how fast and extreme they will be.

Here in the Northeast and Long Island Sound, various climate models predict that sea level will rise between one and three feet over the next century. The combined impacts of sea level rise with the increased probability of extreme storm or hurricane events create a situation where people, plants, animals and buildings are at risk from damaging storm surges along the shoreline. Entire cities and towns are in harm's way, along with many natural habitats.

Along the Atlantic Coast, the scientific community, environmental organizations and policy makers are beginning to look at ways that communities can plan for climate change and assist nature in becoming more resilient and adaptive. This means the use of a variety of habitat restoration, land use planning, protection and best management and policy strategies. If living systems in the Long Island Sound area, like coastal forests, rivers, tidal creeks, salt marshes and sand dunes, are given the opportunity to adapt in response to our changing climate, then we are also helping ourselves. For example, we rely not only on the food supplied by salt marshes, but also on their ability to provide a significant buffer against storm surges and protect coastal property.

The Nature Conservancy is embarking on an important initiative in Long Island Sound to develop science-based strategies and planning tools to assist people and their communities while protecting critical habitats throughout the Sound. One tool, ClimateWizard, is a web-based program that enables technical and non-technical audiences to access climate change information from leading scientific organizations and visualize the impacts anywhere around Long Island Sound (visit www.climatewizard.org). The program allows users to view both changes in climate over the last fifty years and predictions for the future, zooming to view the whole globe or targeted areas. The Conservancy, along with other partners, is also developing a web-based decision support tool (Coastal Resilience) that will enable municipal and state leaders to constructively develop adaptation solutions for both people and nature as sea level rises and storm surges increase.

The states of New York and Connecticut are just beginning to incorporate the threats of climate change, including sea level rise, into their coastal management plans and regulations.



Spotlight: The Sound's Food Web

MISSING LINKS: WHAT LONG ISLAND SOUND'S FOOD WEB MAY BE TELLING US

Western Long Island Sound has seen profound environmental and ecological changes over the last century, and many scientists who study it are concerned about what those changes mean for the Sound's food web.



Microscopic single-celled algae form the base of its food chain, along with strands of algae attached to rocks or floating in the water. Underwater vegetation is now found only in a few locations in the easternmost Sound. Feeding on the phytoplankton are filter feeders like oysters and other shellfish, as well as abundant copepods, tiny shrimp-like creatures that are themselves a food source for many fish. Snails including periwinkles, sea urchins and the small *Lacuna* are important herbivores; in turn they feed a whole host of other marine animals.

There are a number of environmental stresses to Long Island Sound. They include changes on land (deforestation, impervious surfaces) which have increased the freshwater runoff into the Sound. Contaminants such as copper, zinc and mercury, as well as organic compounds, have accumulated in sediment in some areas, creating toxic conditions for seafloor species. The nutrients nitrogen and phosphorus have fueled large phytoplankton blooms, as well as larger algae like sea lettuce. Phytoplankton blooms are difficult to map because they come and go, but studies suggest that phytoplankton may increase in the western Sound where nutrient levels are high. These phytoplankton blooms increase the amount of organic carbon in the Sound, and changes in land use have increased the flux of carbon from the land as well. Some of this carbon is oxidized in the water column and at the seafloor, leading to the seasonal hypoxia.

Disappearance of large oyster reefs has impacted the ecosystem, because oysters are efficient filter feeders, and overfishing has decimated the once super-abundant menhaden fish. Blooming phytoplankton species can produce toxins that are taken up by shellfish, making them hazardous for human consumption. Copepods have increased ten-fold since the 1950s, possibly as a result of more phytoplankton or the demise of predators such as the menhaden. Tracing cause and effect in food web relations can be tricky.

Changing climate is another stressor, with warmer-water species moving into the Sound from the South, while colder species are leaving. Invasive species (European green crab, Japanese shore crab, Pacific compound sea squirt and some seaweeds) that were accidentally introduced to the Sound now thrive in its warmer waters. The freshening of the Sound and warmer waters may also make the hypoxia worse and stimulate algal blooms native to more southerly waters. Events like the lobster die-off in 1998, oyster diseases and rapid changes in abundance of starfish and jellyfish may all be evidence of this environmental stress.

When organisms live under such stressed conditions, they are less able to resist disease, parasites and hypoxia, as well as cope with changes in temperature and pH. To keep this ecosystem functioning and restore its health, it is essential that we reduce the pollutants flowing into it. We have already seen major improvements in water quality in rivers leading into the Sound with the Clean Air Act and Clean Water Act, and the region is working to reduce human-caused nitrogen inputs. But more must be done, and significant investment is needed to fund research on how the changing climate affects the Sound's food web, with issues ranging from identifying priority species for protection, to better understanding the chemistry of the Sound's waters.

Biological solutions

FOR EXAMPLE, filter-feeders such as oysters remove phytoplankton from the water, preventing decomposition and associated oxygen consumption. Increasing shellfish farming could improve water quality, reduce hypoxia and add to the regional economy. Algae take up nitrogen and phosphorus during photosynthesis, so harvesting algae could also remove these nutrients from the Sound. The algae could even become the basis for a new biodiesel industry!

can be both
effective and
economical

Sound Stewards

Throughout the communities surrounding Long Island Sound, there are people making a difference. We interviewed three of them to learn more about how they turned their love of the Sound into action. They inspire us to discover what each of us can do to become Sound Stewards.

Ann Berman



Photo credit: Laurel Lobovitz

Anyone who thinks one person can't change a whole town has never met Ann Berman. Ann chairs the Environmental Concerns Coalition of Milford and its "Freedom Lawn" movement, which persuades local residents to free their lawns of pesticides and chemical fertilizers. She and other volunteers go door-to-door, educating homeowners about how

to maintain an attractive lawn while still protecting their health and the environment.

"Once I knocked on a door," Ann said, "a gentleman told me a story of how his two dogs died shortly after spraying his yard with chemical pesticides. After learning how he could create a freedom lawn, he has now become one of our most fervent freedom lawn contestants each year." Another time a mother told Ann that her children had become sick after playing in the yard – a day after pesticides had been sprayed. These stories and many others motivated Ann to get involved in legislative work.

Because of Ann, Milford became the first town in Connecticut to pass a resolution requesting that all residents forgo the use of pesticides and chemical fertilizers. Next, Ann took her campaign to the state level. She successfully lobbied for a law that bans all pesticide use at schools for kindergarten through eighth grade. Now, she is working to get the same law passed for high schools.

Ann is optimistic about the improvements that Milford and the state of Connecticut have made in enforcing environmental regulations. "Recently, a citizen in Milford spotted an out-of-state car pulling up to a storm drain, and the driver proceeded to dump oil into a storm drain," said Ann with excitement. "The police came, caught the offender, and now I hear that the criminal will get a fine of \$25,000 or a year in prison. Now, that is progress!"

Ann lives on the shore of Long Island Sound, which she says has been a blessing and at times, a spiritual life-saver. She wants people to know that in addition to protecting their own health, joining the Freedom Lawn movement also protects the Sound's health. "When I see something beautiful like Long Island Sound,

I feel obligated to protect it," said Ann. "Each homeowner has a responsibility to protect the water that runs off their property because, eventually, the water all ends up in the Sound."

To find out more about the Freedom Lawn movement, visit www.milfordecc.com.

Sequel US



Sixteen volunteers. Two miles. Three hundred pounds of debris. May 19, 2009, was no normal day at the office for Sequel US employees, who spent the day picking up waste and garbage from Sheffield Island in an effort to celebrate Sequel's 25th anniversary with

GUESS Watches. Sequel US, based in Norwalk, CT, is a subsidiary of Timex Group and designs Guess watches. With the help of the Norwalk Seaport Association and Kierran Broatch of Save the Sound, the sixteen Sequel employees ferried from Norwalk Harbor to Sheffield Island and spent the day collecting plastic debris, bottles and wrappers.

"Sequel is in the process of 'Going Green.' We have a number of recycling programs in place and are working towards recyclable watch packaging in the near future," said Meghan Trepkau, a junior designer for Sequel and a participant in the coastal cleanup. "Experiencing where a lot of trash ends up first-hand showed us how important these efforts are to the environment."

When Meghan was asked why her company chose to volunteer to help protect Long Island Sound, she said, "We wanted to find a way to give back to the community that we have been a part of for the last 25 years. Although there are many volunteer programs available we felt that most people would strongly connect with the beach and be passionate about the environment."

An "eye-opening" experience for the Sequel team, the cleanup of Sheffield Island stirred some thought about how much trash we each produce daily and where it all ends up. After an exhausting but extraordinarily productive day, the team capped off the day by touring the Sheffield Lighthouse. As a representative of Sequel,

Meghan wrote, "It was a wonderful team building experience and taught us a lot about our community's environment and how we can help protect it."

Josie Merck



Photo credit: both courtesy of Josie Merck

For many of us in our childhoods, summers were defined by trips to the shore and freedom to play in plenty of sunshine. The difference between many of us and Josie Merck is that instead of just splashing about in the Sound's waters for some summer fun, she uses the landscape, the wildlife and the water as inspiration for art. Using her artist's eye, she sketches fleeting moments in local scenery, paints shore birds as they capture their morning breakfast, or recycles odds and ends into collages of the ever changing natural world.

Merck, who received her Masters of Fine Arts from Yale, has lived among all sorts of exciting landscapes, including Brazil and Mexico. These places not only introduced her to new and beautiful colors and cultures, but also to endangered animals and the human effect on their habitats, which comprise our environment. This awareness for the impact she, along with the rest of society, has on the environment helped to create a more intimate relationship between Merck and the environment around her.

Though she has lived in the same Cos Cob house with her husband, Jim Stevenson, an op-ed columnist for the New York Times, for 30 years, she summers at her second home in Block Island, where she has always been drawn to the landscape. She understands the integrity and importance of these waterbodies right in our own backyard and it is in her role as an advocate, artist, and philanthropist that she kindly agreed to sit with Save the Sound for a quick Q & A.

STS: Why is the Sound important to you?

Josie: The Sound's waters impact everyone's right to recreation and a living. Our actions have a direct impact on the swimming waters, the beaches of our parks and municipalities, the waters we sail, row and paddle in. Looking out over a "Soundscape" filled with sails and lighthouses and shore birds and sea birds and imagining all the fish and clams and lobsters within those waters is to contemplate a magnificent beauty. And that is good for my soul!

STS: How did you get involved with environmental issues?

Josie: I did not grow up near any ocean but would sail with my family on a borrowed sail boat from Shelter Island around through Long Island Sound and Block Island Sound in the summers. My father was an avid birder and we were trained to be alert to sea and shorebirds, from the ruddy turnstones to the elegant tern. We had animals of all types at home in New Jersey and we had a family garden using our chicken and horse manure as fertilizer. My father also kept bees – so an ecological underpinning was established that we could have a benign impact or a deadly one on the land and the crops. *Rodale Magazine* was a part of my parents' reading, and it rubbed off on me.

STS: What has felt the most rewarding along the way?

Josie: I think being involved with organizations that excite me (and their members) to take an active part in protecting their environment. CFE has its beach report card in conjunction with the NRDC, has worked with stormwater runoff, and has won cases to hold parties accountable for the pollution downstream. Witnessing the successes on the ground is the best.

STS: How have you seen things change since you first started working on behalf of the environment?

Josie: I first "woke up" in the era of the Love Canal and of course Silent Spring before that. I think if Americans can recall the Cuyahoga River fires they will remember the havoc we can reap, and they will support regulations and protections. Of course climate disruption is the biggest crisis any of us has been alerted to in all of our lifetimes. And so many more of us are realizing what each of our giant human footprints can do. Recycle, reuse, reduce has been a mantra since Earth Day and yet maybe now we are beginning to take heed, and I pray not too late.



OSPREY, JOSIE MERCK

STS: Why do you contribute to environmental causes?

Josie: I support environmental advocacy organizations as a way to participate in our democratic system – I believe in our system of laws which works to protect the innocent, including vulnerable species and the earth and air and land we all need to share to thrive together. Laws for clean air and clear water would not happen without good science and good lawyers acting on our and our children and grandchildren's behalf. There is no greater cause as I see it.

A coin-operated binocular viewer is the central focus, mounted on a concrete pier. The viewer has a silver, textured faceplate with two eyepieces and a central handle. A red circular sticker on the top right says "TURN TO CLEAR TO OPEN". Below the eyepieces, a small plaque reads "U.S. Manufacturing and Distributors Inc. 1000 10th St. SE, P.O. Box 101, Kent, WA 98040". A larger plaque in the center has instructions: "TO OPERATE: 1. DROP COIN IN SLOT 2. PULL HANDLE DOWN ALL THE WAY LET GO 3. TO CLEAR VIEW: TURN RED KNOB". A coin slot is visible with a "25¢" coin inside. The viewer is set against a backdrop of a sandy beach, the blue ocean, and a clear sky.

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YOUR CHOICES COUNT.

Resources

SIGN ME UP! ORGANIZATIONS AND VOLUNTEER OPPORTUNITIES

Save the Sound

<http://ctenvironment.org/save-the-sound.cfm>
Save the Sound, a program of Connecticut Fund for the Environment, has a robust volunteer program that includes coastal cleanups, habitat restoration and activism.

American Littoral Society

<http://www.littoralsociety.org/contribute.aspx>

Audubon Society

http://ny.audubon.org/GetInvolved_EmployVolunteer.html

Citizens' Campaign for the Environment

http://www.citizenscampaign.org/campaign_categories/water_protection.asp

Clean Water Action

http://www.cleanwateraction.org/volunteer_signup

Connecticut Department of Environmental Protection

http://www.ct.gov/dep/cwp/view.asp?a=2719&q=325608&depNav_GID=1654
http://www.ct.gov/dep/cwp/view.asp?a=2705&q=323820&depNav_GID=1654
Storm drain marking

Earthplace – The Nature Discovery Center (Westport, CT)

http://www.earthplace.org/environment/water_quality.html

Friends of the Bay (Oyster Bay, NY)

http://www.friendsofthebay.org/Get_Involved.htm

Land trusts operating in Connecticut

http://www.ct.gov/dep/cwp/view.asp?a=2706&q=323832&depNav_GID=1641

Long Island Sound Study

<http://www.longislandsoundstudy.net/volunteer.htm>

The Maritime Aquarium (Norwalk, CT)

http://www.maritimeaquarium.org/support.asp?PAGE=make_gift.html

The Nature Conservancy of Connecticut

<http://www.nature.org/wherewework/northamerica/states/connecticut/volunteer/>

Project Oceanology (Groton, CT)

<http://www.oceanology.org/about.html>

Schooner, Inc. (New Haven, CT)

<http://www.schoonerinc.org/Volunteer.asp>

The Sound School (New Haven, CT)

<http://www.soundschool.com/>

Soundkeeper

<http://www.soundkeeper.org/default.asp>

SoundWaters

<http://www.soundwaters.org/about/index.shtml>

Stewart B. McKinney National Wildlife Refuge (CT)

<http://www.fws.gov/refuges/profiles/index.cfm?id=53546>

U.S. Fish and Wildlife Service

<http://www.fws.gov/volunteers/>

LEARN MORE: LONG ISLAND SOUND RESOURCES

History of Long Island Sound

<http://arboretum.conncoll.edu/publications/34/FRAME.HTM>

http://en.wikipedia.org/wiki/Long_Island_Sound

The Long Island Sound Watershed

http://cfpub.epa.gov/surf/huc.cfm?huc_code=01100007

The Long Island Sound Resource Center

<http://www.lisrc.uconn.edu/lisrc/index.asp>

A central clearinghouse for Sound-related information and data. Access scientific research, view interactive maps, search and download literature related to the Sound, or browse a directory of organizations and information sources.

The Long Island Sound Foundation

<http://lisfoundation.org/index.php>

Connecticut Sea Grant

<http://web2.uconn.edu/seagrant/>

Sea Grant New York

<http://www.seagrant.sunysb.edu/>
National network of 30 programs at universities in coastal and Great Lake states and Puerto Rico. Encourages wise stewardship of our marine resources through research, education, outreach and technology transfer.

NOAA: National Oceanic and Atmospheric Administration in CT

<http://www.legislative.noaa.gov/NIYS0107/NIYSCT.doc>

Under the US Department of Commerce, NOAA is comprised of the National Ocean Service, National Weather Service, National Marine Fisheries Service, National Environmental Satellite Data, and Information Service, and Office of Oceanic and Atmospheric Research.
<http://mi.nefsc.noaa.gov/> NOAA Lab in Milford, CT

Resources

Connecticut Department of Environmental Protection's Long Island Sound Program
http://www.ct.gov/Dep/cwp/view.asp?a=2705&q=323790&depNav_GID=1635

New York Department of State Coastal Program
<http://coastalmanagement.noaa.gov/mystate/ny.html>

New York Department of Environmental Conservation's Coastal Erosion Management Program
<http://www.dec.ny.gov/lands/4926.html>

New York City Department of Environmental Protection
<http://www.nyc.gov/html/dep/html/home/home.shtml>

Waterfront Alliance of New York and New Jersey
<http://www.waterfrontalliance.org/>

Long Island Sound LNG (Liquefied Natural Gas) Task Force
<http://www.ctlng.state.ct.us/>

New England Interstate Water Pollution Control Commission
<http://www.neiwpcc.org/>

NEMO: Nonpoint Education for Municipal Officials
<http://nemo.uconn.edu/about.htm>
Information, education and assistance to local land use boards and commissions on how accommodating growth while protecting their natural resources and community character.

US Environmental Protection Agency's Beach Watch Program
<http://epa.gov/waterscience/beaches/>

A Guide to Water Quality Standards
<http://www.neiwpcc.org/waterquality.asp>
Water quality management process and standards set forth in the Clean Water Act.
http://www.ct.gov/dep/cwp/view.asp?a=2719&q=325534&depNav_GID=1654
CT DEP on water testing.

<http://www.epa.gov/water/states/ct.html>
EPA on CT water quality issues.

<http://www.epa.gov/water/states/ny.html>
EPA on NY water quality issues.

Summer Hypoxia Maps of Long Island Sound
http://www.ct.gov/dep/cwp/view.asp?a=2719&q=325532&depNav_GID=1654

Tide Charts for Connecticut
<http://www.tidesonline.com/state.php?state=Connecticut>

Tide Charts for New York
<http://www.tidesonline.com/state.php?state=New+York>

WRITING TO ELECTED OFFICIALS

<http://www.votesmart.org/>
Find your officials and their contact information.

<http://www.congress.org/congressorg/issues/basics/?style=comm>
Tips on communicating via phone, letter or email.

Connecticut General Assembly
<http://www.cga.ct.gov/>

New York State Assembly
<http://assembly.state.ny.us/>

EVERYDAY CHOICES TO HELP LONG ISLAND SOUND

Find a Farmer's Market Near You
<http://www.localharvest.org/farmers-markets/m>

Sustainable Seafood Choices
http://www.eartheasy.com/eat_sustainable_seafoods.htm

Freedom Lawn Initiative
http://www.milfordecc.com/freedom_lawn/info.html
Voluntary program to decrease the use of pesticides and chemical fertilizers on residential lawns and gardens. Local competition and brochures on organic lawn care.

Organic Land Care for Homeowners
<http://organiclandcare.net/whatisolc.php>

Easy Household Steps to Avoid Pollution to Long Island Sound
http://www.ct.gov/dep/lib/dep/long_island_sound/stormdrain_marker/stormdrainbrochure.pdf

How to Maintain your Septic System
http://www.epa.gov/owm/septic/pubs/homeowner_guide_long.pdf

Pledge to be a Clean Boater
http://www.ct.gov/dep/cwp/view.asp?a=2705&q=323526&depNav_GID=1620

Consider Low Impact Development
Jessica Morgan, LID Coordinator for CT DEP, (860) 418-5994 or jessica.morgan@ct.gov.

Purchase a Preserve the Sound License Plate (CT)
[http://www.ct.gov/dmv/cwp/view.asp?a=811&q=245110&dmvPNavCtr=\[41827\]#41835](http://www.ct.gov/dmv/cwp/view.asp?a=811&q=245110&dmvPNavCtr=[41827]#41835)

Purchase a Marine and Coastal District License Plate (NY)
<http://www.nydmv.state.ny.us/org.htm>

READING SUGGESTIONS

This Fine Piece of Water: An Environmental History of Long Island Sound
(Tom Andersen. Yale University Press, 2002.)

Sphere: Tom Andersen's Blog about Long Island Sound:
<http://thissphere.blogspot.com/>

Going Coastal:
<http://goingcoastal.wordpress.com/>

The Urban Sea: Long Island Sound
(Lee Koppelman. Praeger Publishers, 1976.)

The Long Island Sound: A History of Its People, Places and Environment
(Marilyn Weigold. NYU Press, 2004.)

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<www.ongislandsoundstudy.net>
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25. Coastal Vision and Synapse Energy.
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<www.epa.gov/NE/eco/lis/assets/pdfs/2003agreement.pdf>
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Who We Are

Save the Sound is dedicated to the restoration, protection and appreciation of Long Island Sound and its watershed through advocacy, education and research. Originally founded in 1972, Save the Sound merged with Connecticut Fund for the Environment in 2004. Through our Advocacy, Habitat Restoration and Coastal Cleanup programs we strive to accomplish our mission: **saving Long Island Sound.**

Through the support of our members, funders and coalition partners, Connecticut Fund for the Environment and Save the Sound have:

- Gained \$875 million in state funding for better treatment of sewage on our rivers and Long Island Sound.
- Completed 24 and begun six more major restoration projects with a broad spectrum of partners, including opening or repairing ancestral fish migration runs and restoring wetland and marsh function to increase the quality and health of ecosystems and allow native plant, bird and other species to return.
- Fought Broadwater, the proposed liquefied natural gas facility that threatens to industrialize Long Island Sound.
- Organized volunteers to remove over 75,000 pounds of litter from Connecticut's shoreline in the last five years alone.
- Stopped bulldozers from turning wetlands and forests into shopping malls and protected thousands of acres of pristine lands surrounding our drinking water, and championed laws that make it more profitable to conserve certain lands than to develop them.
- Gained adoption of the toughest auto emission standards in the country while working hard to reduce the need for cars and expand public transit, passed legislation to fight global warming through an economy-wide carbon cap, and forced power plants to use cleaner technology.
- Legally challenged five corporations for chronically discharging toxic chemicals into our rivers – and won.

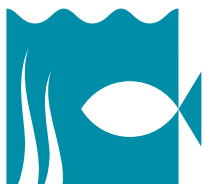


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