

Coastal Resiliency and Water Quality in Nassau and Suffolk Counties

Recommended Actions and a Proposed Path Forward



Harmful Algal Bloom in Great South Bay at Robert Moses Causeway in 2012 – Photo courtesy of Gobler



Andrew M. Cuomo
Governor



NYS ENVIRONMENTAL
FACILITIES CORP.



Joe Martens
Commissioner

EXECUTIVE SUMMARY

Devastation from Superstorm Sandy and the risks posed by climate change and sea-level rise justify bold and continuing actions to dramatically improve coastal resiliency in Nassau and Suffolk counties. These densely populated, low-lying counties jut out into the Atlantic Ocean from the mainland United States. Poor water quality, especially from nitrogen pollution, has reached a near crisis point in many coastal areas of Long Island. Peer-reviewed science has demonstrated a connection between excess nitrogen pollution and the degradation of the coastal marshland complexes that help protect Long Island's south shore population centers from storm inundation. Nitrogen and other pollutants remain a constant concern throughout Long Island, as the drinking water for 2.8 million residents is drawn from sensitive groundwater aquifers recharged from the surface.



Marshes Collapsing -- Coastal wetlands help protect Long Island's shoreline. Throughout Long Island, these marshes are degrading and a key culprit is high levels of nitrogen in the water. Nitrogen can, among other things, shrink root systems, accelerating the collapse of marshes. Photo courtesy of Weltner

Governor Andrew M. Cuomo directed the New York State Department of Environmental Conservation (DEC) to undertake an intensive consultation process with key scientists and stakeholders concerning storm resiliency and water quality on Long Island in the context of nitrogen pollution. The Governor directed DEC to develop immediate recommendations and specific actions, and to identify a path forward for other large-scale or long-term problems – all in close collaboration with Nassau County Executive Ed Mangano, Suffolk County Executive Steven Bellone, local stakeholders, and expert state and federal agencies.

This report responds to the Governor’s directive, with a heightened focus on the challenges and opportunities posed by Superstorm Sandy recovery efforts, and the need to take direct action to protect against extreme weather. These recommendations and the proposed path forward build upon Governor Cuomo’s initiatives, including the NYS 2100 Commission report (*Recommendations to Improve the Strength and Resilience of the Empire State’s Infrastructure*), and the collaboration, planning and numerous proposed projects embodied in the community-based NY Rising Community Reconstruction Program. The recommendations contained in this report were developed cooperatively to complement the extensive recovery programs led by the Governor’s Office of Storm Recovery, the New York State Environmental Facilities Corporation (EFC), and the New York State Division of Homeland Security and Emergency Services.

***These resiliency
recommendations are
made in the context of
substantial progress***

These recommendations are made in the context of substantial progress toward protecting Long Island’s sole source aquifer and coastal resources. First, years of dedicated effort to implement the full spirit and intent of the Long Island Pine Barrens Protection Act have resulted in the permanent protection of large swaths of the deep flow recharge area for the critical sole-source drinking water aquifer. Second, municipalities along Long Island’s northern coast will complete, on time, a ten-year program to construct extensive nitrogen treatment systems at their wastewater treatment plants as part of a comprehensive Clean Water Act program to address the nitrogen-induced low oxygen “dead zone” in Long Island Sound. Third, in the aftermath of Superstorm Sandy, a massive array of coastal resiliency projects have been completed, are underway or are in advanced planning and design under the auspices of the Army Corps of Engineers and DEC. Once controversial regulatory efforts to prevent the wanton filling and destruction of critical and resilient coastal wetlands have “held the line” for this important resource. New concepts, such as advanced “green infrastructure” practices, are being implemented as well. The recommendations in this report will add to the legacy of these and many other positive actions by the Long Island community to date.

In addition to improving community resiliency and water quality, the problems cited and addressed in this report go to the fundamental economic vitality of Long Island. Success in implementing the report’s recommendations will enhance tourist economies, recreational beaches, vacation homes, markets, commercial and recreational fishing - all fundamental pillars of Long Island’s economic well-being.

Commissioner Martens extends the appreciation and gratitude of DEC to the many experts, elected officials, organizations and engaged citizens who participated in the development of these recommendations during consultations that included three days of community forums. Thoughtful and thought-provoking information was provided on a wide spectrum of concerns related to water resiliency, quality, supply, habitat and the water-based economy of Long Island. Research scientists

from the State University of New York at Stony Brook provided guidance on the full scope of problems and priority actions for addressing them. DEC also benefitted from scientific and policy guidance provided by the U.S. Environmental Protection Agency, the U.S. Army Corps of Engineers, the Federal Emergency Management Agency, the U.S. Department of Housing and Urban Development, and Nassau and Suffolk counties. In all, the spoken and written testimony, technical papers, field visits, and on-line comments dramatically improved this report and reinforced Governor Cuomo’s call to action.

NASSAU COUNTY: WATER QUALITY, MARSHLAND PRESERVATION and UPGRADING the BAY PARK WASTEWATER PLANT

The Bay Park wastewater treatment plant is designed to treat up to 70 million gallons per day (mgd) and serves approximately 43 percent of the population of Nassau County (over 500,000 people). It presently provides a “secondary” level of treatment consistent with national technology standards, and it discharges treated effluent to a water body known as Reynolds Channel, part of the larger estuarine complex called the “Western Bays.”



Bay Park Wastewater Facility Discharges to Reynolds Channel – The Bay Park Wastewater Treatment facility serves about 43 percent of the population of Nassau County. Currently, the facility discharges to Reynolds Channel, which drains into the Western Bays. Between 80 – 90 percent of the nitrogen going into the nitrogen-impaired portion of the Western Bays comes from this facility and two much smaller wastewater treatment plants. Photo courtesy of Glus

High levels of nitrogen significantly “impair” the Western Bays, meaning that the level of nitrogen violates state and federal water quality standards. Among other things, excess nitrogen contributes to two notable problems in these waters: the proliferation of macro-algae (specifically *Ulva*, or “sea

lettuce”) and extensive damage to the marsh grasses and their sub-structures that, in turn, are integral to maintaining natural shoreline protection against coastal storm surge and waves. Studies by the U.S. Environmental Protection Agency (USEPA) consultants indicate that 80 to 90 percent of the nitrogen loading to the nitrogen-impaired portion of the Western Bays is from the Bay Park facility, as well as the smaller but still significant discharges from the City of Long Beach (7.5 mgd) and Greater Atlantic Beach (1.5 mgd) wastewater treatment plants.

Nitrogen from the treatment plants circulates up into the shallower back-bay waters (harming the fishery) of the Western Bays, accelerating *Ulva* growth. Tides, prevailing winds and currents push mats of the macro-algae into adjacent waters from Atlantic Beach to Jones Inlet. Throughout the Western Bays, *Ulva* mats cover surface waters for much of the summer. Eventually the *Ulva* dies and sinks to the bottom of the bay, where it decomposes in a manner that depletes oxygen from the waters or it washes up on shore, where it rots and emits noxious odors, leaving beaches unsuitable for recreation.

The "back-bay" water of southern Nassau County is characterized by extensive networks of marshlands that serve as a natural defense against coastal storm surge. Peer-reviewed scientific studies cited in a prior DEC technical report¹ show that excess nitrogen discharges damage and degrade coastal marshlands. The loss of coastal marshlands has resulted and will continue to result in significant increases in erosion and shoreline damage during even moderate storm events, placing the densely populated, low-lying, communities of southern Nassau County at risk. Reducing nitrogen pollution will serve as an effective mitigation measure, with the unique benefit of increasing in effectiveness over time as nitrogen-damaged marshlands are naturally restored.

New York has requested that FEMA provide “Public Assistance” (PA) funding for an ocean outfall (total cost approximately \$550 million) and a mid-stage level of nitrogen treatment of 8 milligrams per liter (mg/l) at the Bay Park plant. Other phases of this project that should be considered include the consolidation of flows from one or two existing municipal sewage treatment plants located on Long Beach Island into the Bay Park facility, and the sewerage of the Point Lookout community. The ocean outfall project would result in the complete removal of these nitrogen discharges from the Western Bays.



Proposed Ocean Outfall – Moving the Bay Park outfall to the ocean will remove the majority of nitrogen going into the Western Bays. Removing the nitrogen will allow the Bays to heal and bolster the marshlands that buffer southern Nassau County from coastal storm surge. Photo courtesy of Glus

\$810 Million Project

New York greatly appreciates FEMA’s determination to allocate approximately \$810 million in funding to repair treatment systems at the Bay Park facility and to rebuild the facility with components (such as a perimeter levee) with an engineered resilience against the 500-year-level storm. Work is actively underway. This phase of the project includes the use of FEMA’s Public Assistance Alternative Procedures pilot program – a program that allows FEMA the flexibility to fix the larger problem, not just repair what was damaged. This phase of work at the Bay Park plant, however, does not cure the water quality standard violation caused by excess nitrogen discharged from the plant or remove the nitrogen threat to coastal marshes.

State and Federal Water Quality Standards

Under the New York Environmental Conservation Law (ECL), it is illegal for discharged effluent from a wastewater treatment plant to cause a violation of a state water quality standard. See ECL Section 17-0501 and ECL Section 17-0511.

The water quality standards that are most relevant to the Bay Park facility are those for nitrogen and ammonia (ammonia contains nitrogen and is a component of overall nitrogen pollution). Nitrogen acts as a powerful fertilizer during warmer weather, spurring unsustainable rates of plant and algae growth that lead to a chain reaction of adverse environmental impacts. Excessive nitrogen in the Western Bays results in substantial and degrading algal growths (especially Ulva or “sea lettuce”) that cover surface waters and wash up onto the shore in mats that then decay and cause foul odors. The nitrogen loading,



Piles of Rotting Sea Lettuce on Beach - Nitrogen acts as a powerful fertilizer and spurs the rapid growth of sea lettuce in the Western Bays. The sea lettuce covers surface waters and washes up on shore in mats that decay and cause foul odors. Photo courtesy of Weltner

among other things, also initiates a biological process that causes low dissolved oxygen in these waters that is harmful to fish and other aquatic life (e.g., the low-oxygen “dead zone” in the Gulf of Mexico or Long Island Sound).

The narrative water quality standard for nitrogen that applies here is “none in amounts that will result in growths of algae, weeds, and

slimes that will impair the waters for their best usage” (6 NYCRR Part 703.2). For ammonia, the calculated effluent limit for the Bay Park discharge to the Western Bays is a concentration of 8.9 mg/l (6 NYCRR Part 703.5). Levels exceeding 8.9 mg/l have the reasonable potential to have negative impacts on the survival of juvenile aquatic organisms, as ammonia is toxic.

In 2006, DEC, with USEPA approval, first adopted the formal Clean Water Act listing of certain Western Bays waters as "impaired" due to excessive nitrogen. A water body is classified as “impaired” if it violates quality standards. This formal listing has continued to this day. The violation of state water quality standards places these waters in violation of federal Clean Water Act requirements.

Over the 60-month period from April 2009 to March 2014, the Bay Park plant reported that the level of ammonia exceeded the 8.9 mg/l limit during 50 out of 60 months. The average discharge level was 20.50 mg/l, and the maximum discharge level was 39.7 mg/l. A discharge level of 39.6 mg/l occurred in February 2011, prior to Hurricane Sandy. This level of ammonia causes and contributes to a violation of a water quality standard. Ammonia is a component of total nitrogen and is removed through the same treatment processes. The nitrogen treatment program described in this report would also cure the violation caused by excess ammonia.

Limitations on Nitrogen Discharges to Achieve Water Quality Standards

The federal Clean Water Act (CWA or the Act) requires all sewage treatment plants nationally to implement treatment systems that achieve a “secondary” level of treatment to remove pollutants. When secondary treatment is not adequate to achieve compliance with water quality standards, however, additional (“tertiary”) treatment systems are required to cure the violation. Heightened nitrogen treatment systems are tertiary treatment systems within the framework of the Act.

In 2004, New York State embarked on an approximately \$2 billion nitrogen treatment upgrade program covering 23 facilities that discharge to Long Island Sound. Connecticut conducted a comparable nitrogen reduction program for LI Sound. Similarly, New York State entered into enforcement orders with New York City requiring the addition of nitrogen treatment systems to the four large wastewater treatment plants that discharge to Jamaica Bay, also for the purposes of curing a violation of a water quality standard caused by excess nitrogen. This regulatory program also applies to the Bay Park facility.

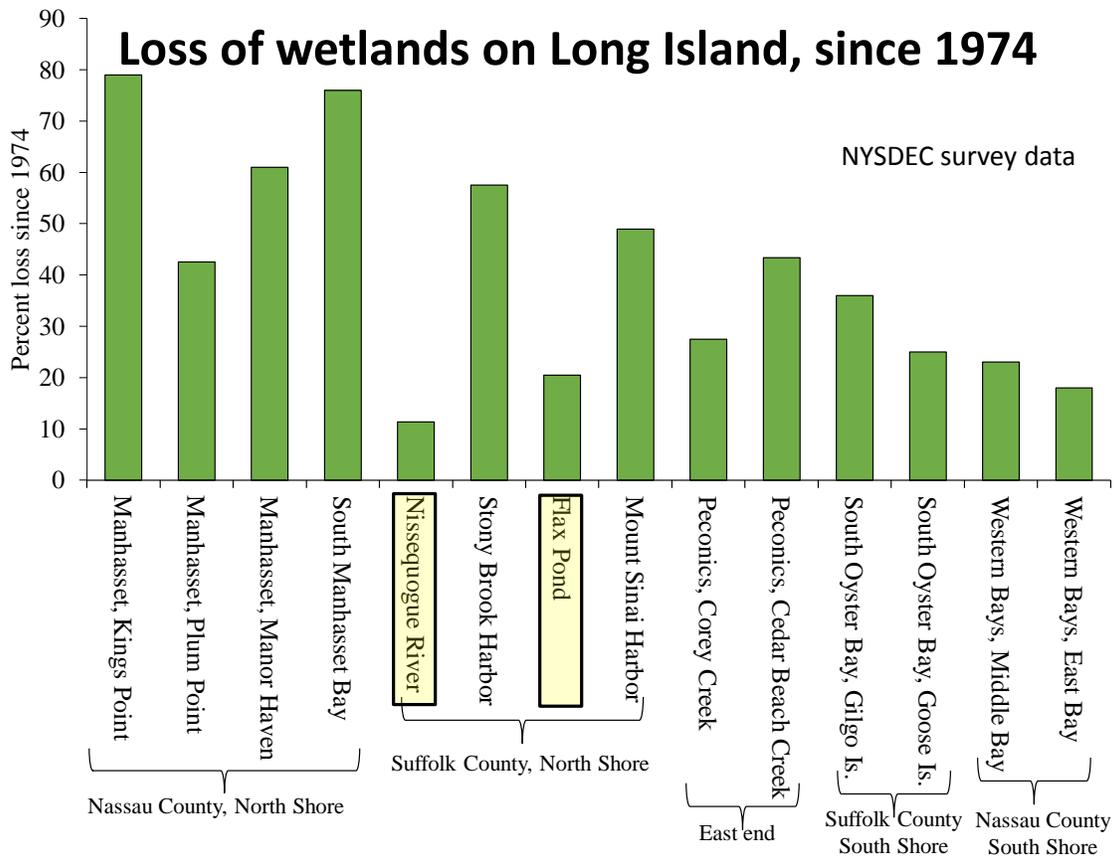
Correcting a Water Quality Standard Violation Caused by the Bay Park Plant

On June 11, 2011, DEC and Nassau County entered into an administrative order that addressed, among other things, water quality standard violations caused by the Bay Park plant. The order required Nassau County to conduct a feasibility study to evaluate eliminating the existing Bay Park outfall to Reynolds Channel and instead discharge through an outfall that extended well out into the ocean.

Nassau County submitted this study in June 2013. The construction of a new outfall to the Atlantic Ocean ranked highest among the five alternatives, including variations of the “limit-of-technology” nitrogen treatment alternative. The conclusion of the study was that constructing the ocean outfall was the best alternative for ensuring that water quality standards will be met, as compared to the limit-of-technology nitrogen treatment options that were evaluated.

Nitrogen Impacts on Resilient Coastal Marshlands in Nassau and Suffolk Counties

In both Nassau and Suffolk counties, excess nitrogen pollution poses a serious threat to coastal marshlands. These salt marshes are highly productive coastal wetlands that provide a wide array of important ecosystem services, including storm surge protection for coastal communities, nutrient removal, carbon sequestration, and habitat for numerous fish, shellfish, and wildlife species.² There has been an accelerated loss of salt marshes in recent decades all around Long Island, but most notably along the south shore of Long Island and within Jamaica Bay. Under this process, high marsh vegetation and structures are also being converted to less resilient low marsh vegetation and structures.



Wetlands on Long Island are Shrinking – Wetlands along the shores of Long Island have disappeared at an alarming rate. This chart shows the percent of wetlands lost since 1974. In some cases, 80 percent of the wetlands have been lost. A significant cause of the loss is the high amount of nitrogen in the water. Graph courtesy of Gobler

By way of example, due to various factors, including wetland fills and coastal development, there was an estimated 18 to 36 percent loss in tidal wetlands within the Suffolk County’s Great South Bay from 1974 to 2001.³ As a result, continuing marshland loss along the south shore of Long Island is occurring in an ecosystem that, in many areas, already has experienced significant adverse impacts.



Damaged Marshlands – Although excessive nitrogen causes marsh grass to grow tall, these plants produce fewer roots. The poorly rooted grasses eventually grow too tall and fall over. This destabilizes the creek-edge and bay-edge marsh, causing it to slump and exposing soils to erosion. Photo courtesy of The Nature Conservancy

Recent scientific studies have focused on excess nutrient nitrogen as a significant driver of tidal marsh loss. Nitrogen enrichment increases above-ground leaf biomass, yet decreases the dense below-ground biomass of bank-stabilizing roots. There is also an increase in microbial decomposition of organic matter within the soils that underlie the marsh biomass that can cause marshes to subside.⁴

Excessive nitrogen causes marsh grass along tidal creeks and bay coasts to initially become greener and grow taller in a manner similar to the effects of fertilizing a lawn. The tall marsh grasses, however, produce fewer roots and rhizomes – plant attributes that are critical to stabilizing the edges, soils and structure of marshlands. The poorly rooted grasses eventually grow too tall and then fall over, thereby destabilizing the creek-edge and bay-edge marsh, causing it to slump and exposing soils to erosive forces. The destabilization of creek-edge and bay-edge marshes makes these areas much more susceptible to the constant tugging and pulling from waves, accelerating erosion and the ultimate loss of stabilizing vegetation.

This process results in the loss of the naturally resilient coastal marshland barrier – a barrier that protects shoreline communities from major storm surges and wave action. Tidal wetlands can protect coastal communities from storm damage by dissipating wave energy and amplitude, reducing the erosive effect of waves by slowing water velocity, and by stabilizing shorelines through sediment deposition. Some studies estimated that more than half of normal water energy is dissipated within the first three meters of marsh vegetation, such as cord grass, while other studies concluded that wave height is reduced by 80 percent over fairly short distances as waves travel through marsh vegetation.⁵

Given sufficient sediment deposition, healthy marshes are able to build elevation in response to sea-level rise, providing a buffer against climate change and coastal submergence. However, excessive

nitrogen concentrations accelerate microbial decomposition of leaves, stems, and other organic biomass in the marsh and prevent the deposition of sediment and the ability of these marsh communities to keep up with sea-level rise.⁶ Longer term exposure to enhanced nutrient levels caused impacts at higher marsh elevations and a 2.5 times greater probability of stream channel destabilization.⁷

Coastal Resiliency, Water Quality and the Bay Park Ocean Outfall



Flooding Inside Bay Park Facility – Superstorm Sandy caused flooding inside the Bay Park Treatment Facility. The treatment facility was badly damaged, and it could not adequately treat the sewage during and immediately after the storm. Recommended improvements include rebuilding and enhancing the facility to remove nitrogen in a manner that is consistent with state and federal legal requirements. Photo courtesy of Nassau County

The Western Bays are badly impaired by excess nitrogen from effluent discharged by the Bay Park facility. And, excess nitrogen damages could ultimately destroy the coastal marshland complexes that serve as an important component of resiliency against coastal storm surge and wave action. These factors are a strong basis for finding that the use of FEMA Public Assistance (PA) funding for this project is reasonable, especially given the high-density, low-lying, population centers of southern Nassau County that are protected by the extensive network of marshlands.

The Bay Park plant’s sewage effluent treatment systems were badly damaged by Superstorm Sandy. Bay Park’s inadequate sewage effluent treatment systems must be upgraded beyond secondary treatment levels under state and federal legal requirements. New York is seeking FEMA PA funds so that Bay Park treatment systems inundated and damaged by Sandy will be rebuilt and enhanced so as to operate in a manner that is consistent with state and federal legal requirements.

Flexibility in the Use of Requested FEMA Funds - The Alternate Procedures Program

Two additional wastewater treatment plants located on Long Beach Island (the coastal barrier island along Nassau County’s south shore)—the Long Beach and Atlantic Beach plants—were also damaged by Superstorm Sandy. Because these two facilities discharge to the Western Bays, they are also required to treat effluent to remove nitrogen, which would add significant FEMA regulatory compliance reimbursable costs to these projects should they be pursued independently.

Nassau County and local officials are evaluating the removal of one or both of these facilities from their exposed location by converting them into sewage pumping stations. All of the associated sewage would then be piped to the Bay Park facility for treatment. Under this scenario, the treated effluent from these two systems would ultimately be discharged through the Bay Park ocean outfall. Consolidation of one or both of these facilities into the Bay Park plant is a more cost-effective and resilient approach than stand-alone repairs. It would also be better for marshlands, water quality and habitat. New York State will work with federal and local officials to facilitate consideration of this highly cost-effective option.

Under this approach, FEMA PA monies that would normally go toward plant repairs would be redirected toward supporting the costs of the ocean outfall project and plant consolidation. While achieving many millions of dollars in overall savings for sewage plant restoration, this option would increase resiliency, as pump station structures and equipment are much easier to protect from storms than entire sewage treatment plants. By reducing nitrogen loadings to the Western Bays, this approach would further protect and enhance resilient marshlands as well.

Recommended Immediate Actions: Nassau County

- ***Nassau County's Bay Park Wastewater Treatment Facility.*** There is broad support for repairing this Sandy-damaged plant with a high level of flood resiliency and in a manner that dramatically reduces nitrogen discharges. Excess nitrogen from the Bay Park plant significantly impairs water quality in Nassau County's south shore bays, threatens to destroy an extensive network of coastal marshlands that help to protect the mainland from storm surge, and deprives New York of a once-vibrant shellfishing industry. A project that would completely remove nitrogen discharges from the south shore bays is fully feasible.
 1. Expedite \$810 million in repairs at the Bay Park facility, pump stations and collection systems to be funded by the Federal Emergency Management Agency (FEMA) Public Assistance Alternative Procedures Pilot Program. This program will restore basic effluent treatment systems and provide resiliency to a 500-year-level storm.
 2. Mitigation of the primary and secondary electrical power generation systems at the Bay Park facility at a cost of approximately \$20 million. The State of New York, using funds or financing of the state's choice, agrees to be responsible for the cost of this mitigation element.
 3. The federal government should support additional federal Sandy recovery funds for the construction of an outfall from the Bay Park plant well out into the Atlantic Ocean. New York has requested funding for the estimated \$550 million cost of the ocean outfall from the FEMA PA program. New York also supports the use of FEMA PA monies to implement a mid-stage level of nitrogen treatment of 8 mg/l.
 4. The Long Beach wastewater treatment plant and (possibly) the Atlantic Beach plant should be consolidated into the Bay Park facility, with additional FEMA PA funding re-allocated

under FEMA’s Public Assistance Alternative Procedures Pilot Program, so that these smaller yet significant sources of nitrogen pollution are removed from the back bay. The extension of sewers to the Point Lookout community should be evaluated as part of this project.

5. Nassau County would be responsible for funding the 10 percent non-federal share of the overall ocean outfall project, should FEMA PA funds be secured. This cost would be financed through 30-year low-interest loans from the EFC.
6. Nassau County should explore the creation of a sewer district for the communities served by the Bay Park plant to assure adequate and equitable funding, and long-term facility maintenance through a user-based rate-payer system as an alternative to the current property tax system.
7. New York State should consider ongoing financial assistance to Nassau County to assist in addressing priority water quality problems involving excess nitrogen from Bay Park, sub-standard septic system “hot-spots” in northern Nassau County, and pathogen pollution affecting beaches and shellfish. Such funding could be leveraged, offsetting debt service payments on low-interest EFC loans, to more rapidly advance nitrogen reduction projects across Nassau County.

SUFFOLK COUNTY: ADDRESSING the CONSEQUENCES of DEVELOPMENT WITHOUT ADEQUATE SEWER and SEPTIC SYSTEMS

A fundamental water quality problem is presented by the fact that approximately 70 percent of Suffolk County wastewater is managed through on-site disposal systems – an estimated 360,000 structures often in densely populated areas. Many of those on-site systems are simple cesspools placed within coarse and sandy soils, especially the older systems in older communities. Cesspools and standard septic systems remove little of the nitrogen from wastewater. There are many older high-density communities without sewer systems concentrated along Suffolk County’s coast. This situation allows large quantities of nitrogen-enriched effluent to flow into groundwater, which travels to surface waters or infiltrates drinking water aquifers. For example, 61 percent of the population of Suffolk County lives within the Great South Bay’s watershed.

Nitrogen Impacts on Water Quality

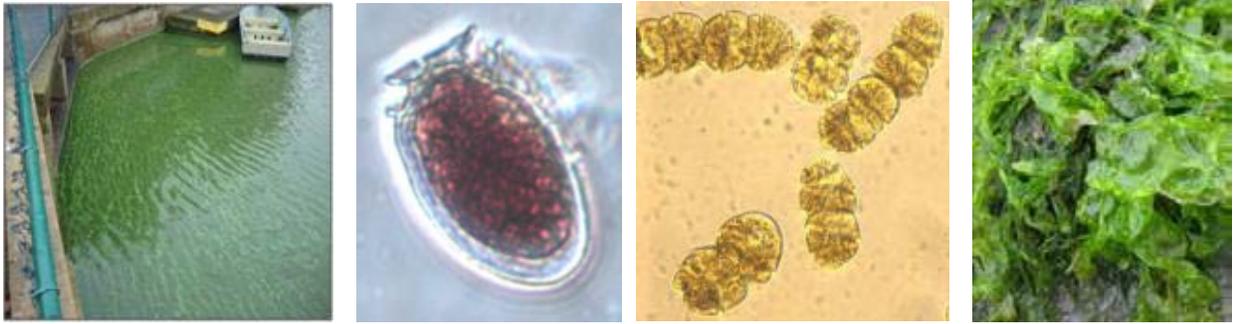
Suffolk County recently released an executive summary of its *Comprehensive Water Resources Management Plan Report*⁸ that details the extensive adverse impacts associated with the discharge of undertreated human wastes, particularly nitrogen pollution. The report deems nitrogen “public water enemy number one.”



Brown Tide Clouding Moriches Bay – High levels of nitrogen from failing septic systems flows into most of Suffolk County’s bays, causing algae levels to spike in warm weather and making the water unsuitable for swimming, fishing, and other recreational uses. Photo courtesy of Kuntz

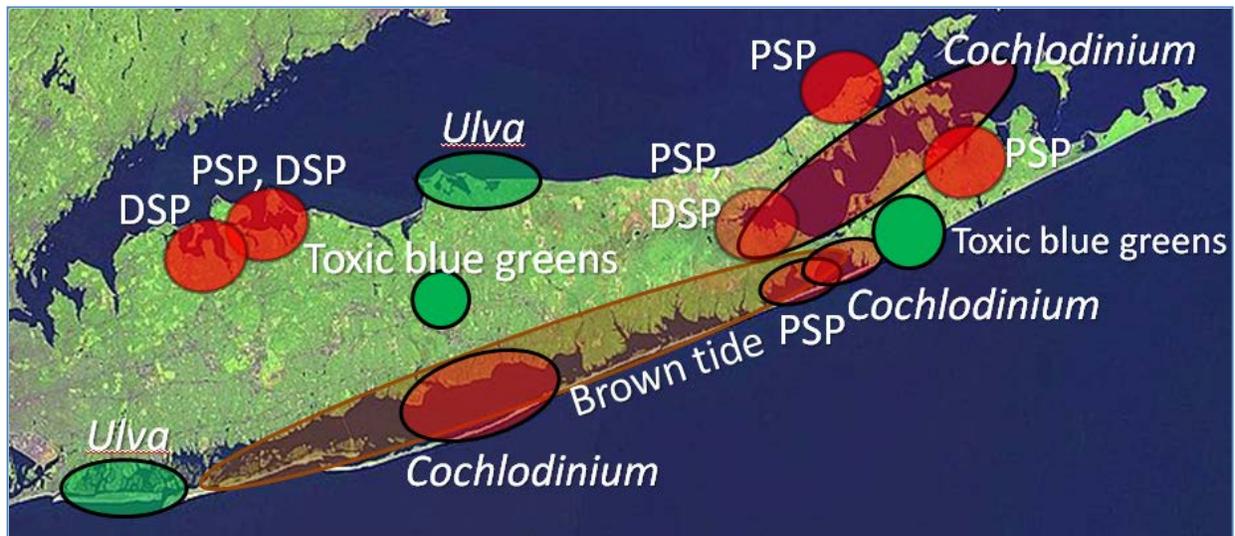
According to Suffolk County’s report and DEC’s findings, most of the bays along Suffolk County’s southern coast are designated as impaired; that is, they are in violation of water quality standards. A variety of algae blooms proliferates in warmer weather. In addition to regular algae blooms, there are “harmful” algae blooms, “red tides,” “rust tides” and “brown tides” comprising different types of problematic microscopic organisms, all linked to excess nitrogen pollution. These algal blooms have seriously adverse impacts on swimming, fishing, shellfishing, and boating.

According to one study⁹, wastewater-derived effluent is the source of approximately 68 percent of the total nitrogen that enters the Great South Bay. This finding is roughly consistent with more focused studies undertaken by Suffolk County that estimated that septic systems and cesspools are the source of approximately 68 percent of nitrogen in certain bays and tidal rivers. The largest other source of nitrogen is the difficult-to-reduce atmospheric deposition of nitrogen from combustion of petroleum hydrocarbons, chiefly coal and oil.



Harmful Algal Blooms – From left to right: Toxic Blue Green Algae and Diarrhetic Shellfish Poisoning (DSP) – including red tide, *Cochlodinium* and *Ulva* – are all responsible for harmful algae blooms across Long Island. Photos courtesy of Gobler

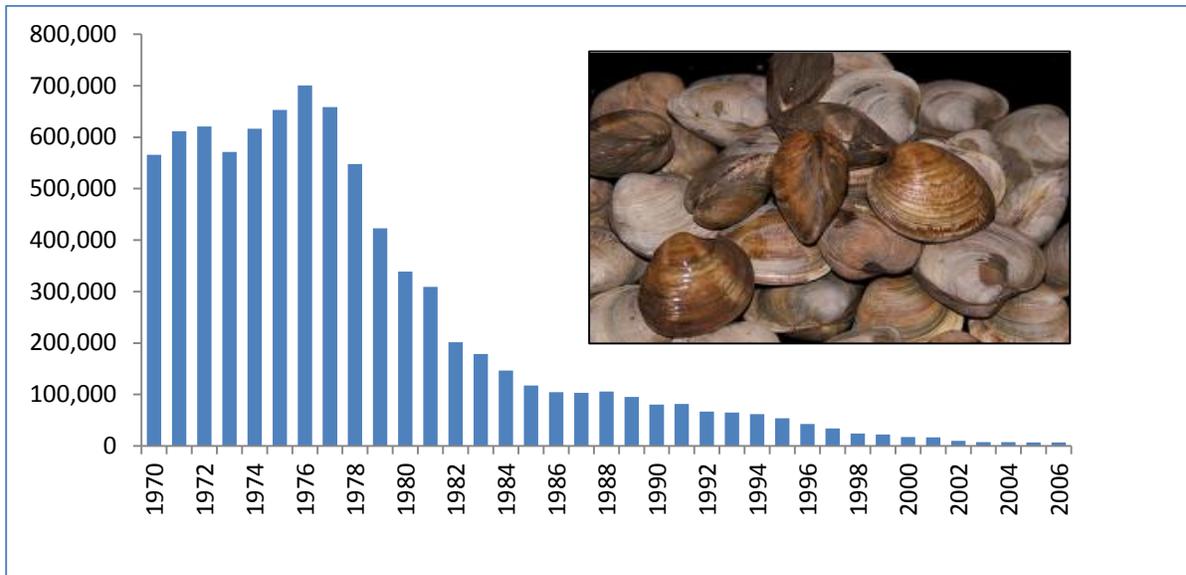
A prime example of the adverse impacts of excess nitrogen is the Forge River.¹⁰ This river has a history of significant pollution events, including fish kills and crab die-offs, foul odors, rotting mats of algae and even sections of the river turning milky white. *The Forge River Watershed Management Plan*¹¹ describes how residents along the Forge River continue to report malodorous conditions, discoloration and fish kills. Scientists report hypoxic and anoxic conditions (i.e., low or no oxygen) that are inhospitable to aquatic life. All of this is in clear violation of state and federal water quality standards.



Locations of Harmful Algal Blooms – Each shaded area represents the location of a recent harmful algal bloom or multiple blooms. The blooms are fueled by excessive nitrogen and can be harmful to both humans and other animals. Map courtesy of Gobler

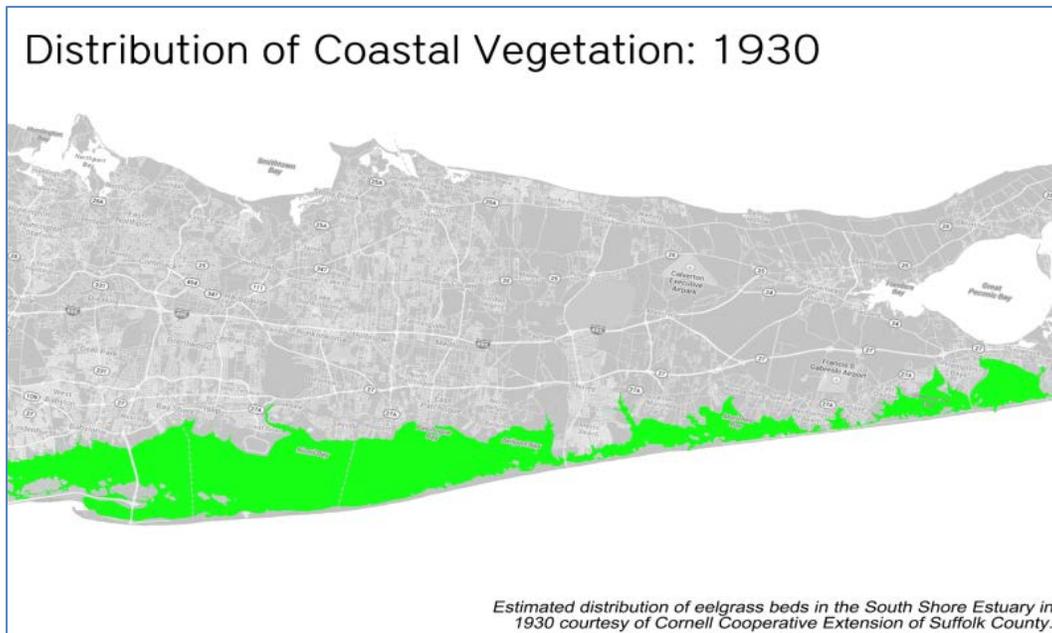
Nitrogen Impacts on Shellfish and Sea Grass

Poor water quality has severely degraded the ecology of the Great South Bay. For example, New York Bay scallop landings routinely exceeded 200,000 pounds per year in this water body in the 1970s and 1980s; they are now nearly nonexistent. Hard clam landings in the Great South Bay once exceeded 500,000 bushels per year in the 1970s (a \$62 million-per-year industry employing thousands). The hard clam take is now essentially zero.

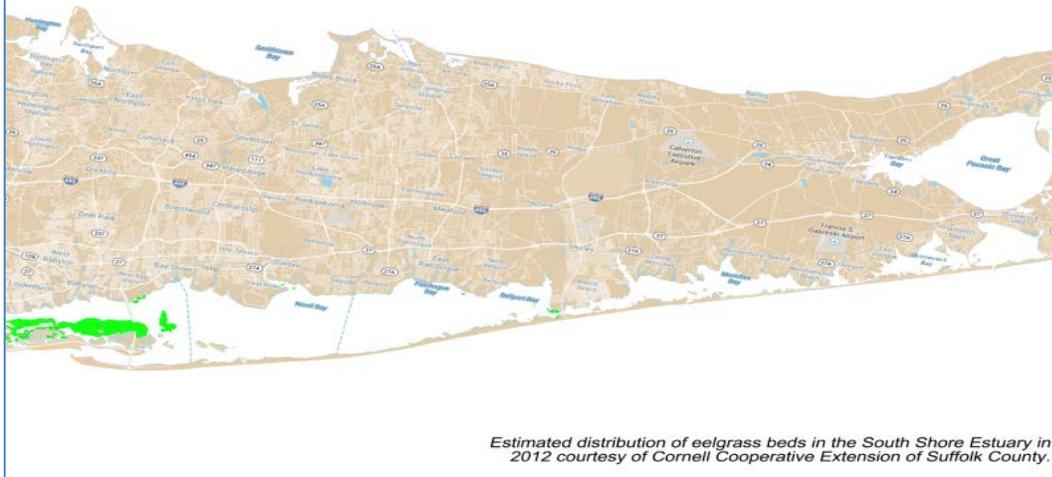


Decrease in Bushels of Clams Harvested in Great South Bay – In the 1970s, over 500,000 bushels of clams were harvested annually from the Great South Bay. It was a \$62 million-per-year industry and employed thousands of people. Today, due to overharvesting and poor water quality, no clams are harvested from the Bay, and that revenue has been lost. Chart and photo courtesy of Gobler

The loss of critical eel grass habitat has occurred on a similar scale. Historic photography and records indicate that there may have been 200,000 acres in 1930; today, only 21,803 acres remain. Both the Chesapeake and Tampa Bay estuary programs have seen increases in various eel grass species, following their efforts to reduce nitrogen loadings, address human impacts and implement restoration efforts.¹²



Distribution of Coastal Vegetation: 2012



Coastal Vegetation Decreasing – High levels of nitrogen have been linked to the loss of eel grass habitat. These marine grasses are part of a critical vegetative buffer that provides resilience to storms and habitat for marine organisms. Maps courtesy of Cornell Cooperative Extension of Suffolk County

Nitrogen in Drinking Water Aquifers

There is a disconcerting trend in the quality of groundwater in Long Island’s Upper Glacial and Magothy aquifers. According to Suffolk County, median groundwater nitrogen levels in the Upper Glacial Aquifer have risen 40 percent to 3.58 mg/l, and the Magothy Aquifer has seen a 93 percent increase in nitrogen levels to 1.76 mg/l since 1987. While nitrogen levels are generally below the drinking water standard, there are some areas that now exceed the 10 mg/l limit, with this troubling trend apparently accelerating. These aquifers, of course, are recharged through surface water and subsurface wastewater infiltration.

Nitrogen Impacts on Coastal Marshlands

As presented above, excess nitrogen pollution is a serious threat to coastal marshlands. Salt marshes are highly productive coastal wetland habitats that provide storm surge protection for coastal communities. They must be protected and enhanced. In Suffolk County, planned efforts to install or rehabilitate naturally protective systems through the Army Corps’ Fire Island to Montauk Point coastal project or various New York Rising projects could be thwarted by nitrogen pollution, increasing the need for action now.

New Sewage Collection Systems and Septic System Upgrades

The most effective solution for nitrogen pollution in high-density communities that employ individual disposal systems is the installation of sewage collection and treatment systems. In Long Island, this should generally include a significant level of nitrogen treatment, particularly if there is no ocean outfall. The cost of new sewage treatment systems in densely populated coastal areas of Suffolk County is significant, however, and essentially unaffordable to many ratepayers without significant funding assistance.

Suffolk County has evaluated priority areas for new sewer systems. Suffolk County has developed assessment criteria that focuses on: (i) high-density communities, (ii) within a 25-year groundwater-to-surface water travel time (50-year travel time to a water supply well), (iii) which contribute nitrogen to an impaired surface water, and (iv) have a depth-to-groundwater of less than 10 feet. The results of that analysis are the recommendations for the installation of new sewage collection systems in the four priority areas of Mastic (Forge River); North Babylon and West Babylon (Carlls River); Great River (Connetquot River); and Patchogue (Patchogue River).

Sewer connections, however, are unlikely to be feasible or appropriate for most of the structures currently serviced by septic systems and cesspools in Suffolk County. Suffolk County, DEC, SUNY Stony Brook and the Town of Southampton are collaborating on the establishment of a program to upgrade and implement localized cluster and individual subsurface treatment systems to reduce nitrogen discharges to groundwater. Such a program will help protect both coastal surface waters affected by groundwater flows and drinking water aquifers. This program will include a research and development effort to improve the effectiveness of nitrogen treatment systems, reduce their size, decrease the complexity of operation and maintenance, and limit their cost.

The Bergen Point Wastewater Treatment Plant

Suffolk County's largest sewage treatment plant, Bergen Point was perilously close to being compromised during Superstorm Sandy but was able to avoid closure due to advanced preparation before the storm. It serves 120,000 households in the Towns of Babylon and Islip, discharging its effluent into the Atlantic Ocean through a 72-inch diameter 32,000-foot-long pipe that runs under the Great South Bay and Fire Island. The pipe comprises two different materials: from the landside effluent pump station to the barrier island, the pipe is pre-stressed concrete cylinder pipe, and from the barrier island to the ocean discharge location, it is concrete-lined steel pipe. Another storm of a similar magnitude would create a high likelihood of failure for the bay portion of the outfall pipe. Such a pipe failure would significantly degrade the Great South Bay.

Recommended Immediate Actions: Suffolk County

- ***Suffolk County Bergen Point Wastewater Treatment Facility.*** New York State could provide \$242 million in low- and/or zero-interest financing for the Bergen Point Wastewater Treatment Facility in Suffolk County through the EFC. These funds would help offset the cost of repairing the Bergen Point ocean outfall pipe as it extends under Great South Bay, along with the associated effluent pump station. Improved materials would be used to address concerns that the pipe could fail if pressure increases due to heavy flow from storms. A separate Bergen Point plant expansion project, to increase treatment capacity from 30.5 mgd to 40.5 mgd, would allow significant areas of failing septic and cesspool systems to be joined into the Bergen Point sewage treatment system over time. The at-risk ocean outfall from this facility would operate to completely remove this potential source of nitrogen pollution from Great South Bay.

- ***Suffolk County Sewer Extension Projects.*** To reduce nitrogen pollution, Suffolk County has proposed technically sound, large-scale projects to extend sewers to four priority areas. DEC supports efforts to obtain federal funds toward addressing these four areas that are characterized by: (i) substandard septic systems and cesspools, (ii) small lots, (iii) dense populations, (iv) a short depth to groundwater, and (v) short travel times for nitrogen-enriched groundwater to enter surface waters. The extension of sewers to these areas would be an important first step in a comprehensive effort to reduce nitrogen pollution adversely affecting south shore shellfish beds, sea grass, water quality and resilient marshes. These priority projects are defined as follows:

1. **Mastic:** an estimated \$196 million project to address extensive nitrogen and pathogen pollution to the Forge River and south shore bays. A total of 2,893 parcels would connect to a sewer collection system that would flow to a new wastewater treatment plant (that would include advanced nitrogen treatment) located on municipal property near the Brookhaven Town Airport.
2. **North Babylon and West Babylon:** an estimated \$136.3 million project to address nitrogen and pathogen pollution in the Carlls River and Great South Bay. A total of 6,606 parcels would be connected to the Bergen Point sewer system within the Southwest Sewer District for treatment at the Bergen Point Wastewater Treatment Plant.
3. **Great River:** an estimated \$33 million project to address nitrogen pollution and pathogen pollution in the Connetquot River, Nicoll Bay and Great South Bay. Some 500 parcels would be connected to the Southwest Sewer District for treatment at the Bergen Point Wastewater Treatment Plant.
4. **Patchogue:** an estimated \$17.9 million project to address nitrogen and pathogen pollution in the Patchogue River and Great South Bay. A total of 648 parcels would be connected to the Village of Patchogue sewer system for treatment at the Village of Patchogue Wastewater Treatment Plant.

DEC supports Suffolk County's proposal to implement these stand-alone projects as part of a broader sewer extension program for densely populated areas of Suffolk County. Other initiatives are being formulated to address septic hot-spot areas through cluster or individual nitrogen treatment systems. New York State should aggressively pursue federal funds to support these projects and minimize the financial impacts to Suffolk County residents. EFC zero-interest five-year financing could be made available to fund project implementation where federal funds become available and EFC low-interest financing (over 30 years) would be needed to subsidize ratepayer-supported loans.

- ***State Budget Assistance.*** New York State should consider on-going financial assistance to Suffolk County in addressing priority water quality problems involving excess nitrogen from

unsewered areas, substandard septic systems, and pathogen pollution affecting beaches and shellfish. Such funding could be leveraged, offsetting debt service payments on low-interest EFC loans, to more rapidly advance nitrogen-reduction projects across Suffolk County.

- ***Sewer Extensions as Part of the “Fire Island to Montauk Point” (FIMP) Coastal Resiliency Project.*** The FIMP Army Corps Coastal Resiliency Project extends across 83 miles of the south coast of Suffolk County. It is to be paid for with 100 percent federal funds. The current project proposal includes an innovative program to increase the elevation of approximately 4,500+ near-shore structures (on the mainland) to a height that is at least consistent with the New York State building code’s storm resiliency/flood plain management requirements. As part of this highly beneficial effort, DEC recommends that the Army Corps fund the extension of sewer service to these elevated structures, many of which are on inadequate septic and cesspool systems that are a potent source of nitrogen pollution to nearby coastal waters. The removal of nitrogen discharges from these near-shore homes would bolster resilient coastal marshlands.

- ***Suffolk County Septic and Cesspool Nitrogen Upgrades.*** There are extensive areas of Suffolk County where it will not be feasible or prudent to extend sewer lines. A significant multi-year program is needed to upgrade and implement localized cluster and individual subsurface treatment systems to reduce nitrogen discharges to groundwater. Such a program would protect both coastal surface waters affected by groundwater flows and drinking water aquifers. As advocated by Southampton Town Supervisor Throne-Holst, this would present an economic development opportunity to incubate and pilot improved individual nitrogen treatment systems for the national and international market. Suffolk County rightly proposes to proceed with this effort, using county and state funding sources on a prioritized “worst-goes-first” basis. This program would include an on-going research and development effort to improve the effectiveness of nitrogen treatment systems, reduce their size, decrease the complexity of operation and maintenance, and decrease their cost.
 1. New York State should consider further appropriations to Suffolk County to continue funding toward a 50/50 match program established in this year’s state budget. These funds would continue to support a partnership among New York State, Suffolk County, SUNY Stony Brook and the Town of Southampton to address on-site sewage disposal issues, improve the nitrogen treatment technology and foster a business incubator on Long Island.
 2. The EFC would continue formulating a program that would provide a low-interest loan funding pool to Suffolk County. Suffolk County would then be able to loan homeowners the funds necessary to install advanced on-site septic treatment systems at reduced interest rates. While the details of this endeavor are under review, the EFC is tentatively considering a \$5 to 10 million pilot loan program.

- ***Blue Ribbon Panel on Suffolk County Clean Water Infrastructure Funding.*** Suffolk County’s blue ribbon panel established by the Suffolk County legislature has highlighted the

need for a range of funding mechanisms for advanced wastewater treatment. Ongoing efforts should be coordinated with the development of Suffolk County's watershed management plan.

PATH FORWARD on RESILIENCY and WATER QUALITY

For several months, DEC conducted extensive public forums and consulted with scientific experts, leading civic, environmental and business organizations, and federal, state and local officials on Long Island. The level of community interest, and the scope and complexity of issues, is substantial. DEC's recommended path forward involves a continuing process, or collaborative partnership, involving consultation, study, planning and real action to improve water resiliency and water quality on Long Island. Given the scale of the issues, there must be a joint effort to establish a process and set a prioritized agenda. While DEC is ready to serve as a central partner in this effort, any successful initiative to address Long Island's water future must be led locally.

DEC proposes an October initiation of this process and partnership in collaboration with Nassau and Suffolk counties. A non-exclusive list of key topics raised by stakeholders, beyond those discussed above, includes:

- Implementation of Army Corps coastal projects with significant "natural infrastructure" components where feasible
- Updates to maps and the management of tidal wetlands and coastal erosion hazard areas
- Long Island Sound habitat restoration, public recreational access and water quality
- Sea grass and shellfish restoration
- Reduction of pathogens that affect shellfish harvesting
- Aquifer safe-yield capacity, groundwater quality monitoring and saltwater intrusion
- Pesticide minimization strategies, including DEC's "Long Island Pesticide Pollution Prevention Strategy"
- Specific watershed/water body plans, such as that for the Forge River
- Water conservation and re-use
- Long Island Pine Barrens protection
- Flood plain management programs

- Waterbody-specific water quality targets and guidance for key pollutants
- State and federal “Superfund” sites and associated impacts on drinking water sources
- Priority septic “hot spot” areas in Nassau County
- Review the current SPDES-permitted groundwater dischargers in both Nassau and Suffolk counties

CONCLUSION

Long Island is at ever-increasing risk due to its coastal location and the climate disruptions associated with global warming. The capacity of Long Island's natural and water resources to handle nitrogen pollution is clearly exceeded. This is the time for action.

DEC respectfully submits these recommendations and the proposed path forward in the spirit of continuing improvement, collaboration and cooperation that will be essential to restoring Long Island water quality and aquatic habitats and to creating the more resilient Long Island of the future.



Healthy Long Island Wetland – Photo Courtesy of Gobler

END NOTES

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