Current New York Sea Grant projects (*2016-2018*)
(*in end date order*)

R/XG-24. Dr. Bassem Allam, Stony Brook University. **Probing Molecular Determinants of Bivalve Resilience to Ocean Acidification**. *Ends on 9/30/2018*.

Bivalve molluscs represent the first marine resource in dockside value in several states, particularly along the East Coast. While production traditionally relied on wild capture, bivalve aquaculture production in the last few decades has been displaying double digit annual growth. At the same time, hatchery production of seed, a main component of bivalve aquaculture growth, has been seriously hampered by ocean acidification in some of the major hatcheries in the nation.

Worryingly, recent studies showed that the impact of current levels of coastal acidification on bivalve production in embayments along the east coasts is likely much more dramatic than initially thought. Nevertheless, the long-term effect of ocean acidification on these animals remains unpredictable, in part because of the strikingly limited information on intra- and inter-species susceptibility to acidification and on factors affecting species and individual resilience. "Winners" and "losers" exist within each species and between species, and studies that comprehensively assess genetic determinants of resilience are lacking. This research will fill this important gap and identify molecular markers and mechanisms associated with resilience to acidification in some of the most important bivalve species along the East Coast.

This research has major implications for basic and applied science. It will determine molecular and physiological mechanisms and pathways involved in bivalve natural resilience to acidification and identify molecular features associated with resilience. This information is greatly needed for the management of wild fisheries and for the development of resilient varieties of aquacultured stocks. Resilient broodstocks will provide the industry with superior germline to face current and projected episodes of acidification in local waters.

R/XG-25. Dr. Dianna Padilla, Stony Brook University. **Flexing Mussels: Does *Mytilus edulis* Have The Capacity to Overcome Effects of Ocean Acidification?** *Ends on 7/30/2018*.

Ocean acidification (OA) conditions have already been shown to affect a wide variety of marine organisms. Shoreline systems, including estuarine areas where most shellfish aquaculture is conducted, experience greater rates of change in water chemistry than are seen or projected in the open ocean. In some cases, differences among individuals within a given species in response to OA stressors have been found, indicating variation in the capacity to respond to OA. Thus, predicting the impacts of OA on coastal systems and species, including species used in aquaculture, remains challenging. Legacies of historic conditions may result in some species being more resilient to elevated carbon dioxide conditions, or more able to adapt to changing conditions. Although most studies focus on the average response within a species to experimental conditions, all studies show a variance in response; this variance may be due to measurement error, small differences in the local conditions of individuals, or it may reflect real differences in response among individuals, with some individuals being more robust than others to environmental stressors. "Winners" and "losers" will likely exist not only among species, but also among individuals within species. Studies are needed to determine what driving factors are resulting in different responses to OA stress seen within species, especially long term, cross-generational studies.

Padilla and her colleagues will use cross-generational experiments with the common blue mussel, *Mytilus edulis*, to test for its capacity to display resilience or adapt to different OA conditions. The blue mussel is one of the most extensively studied marine organisms, has been used as a model for physiology and a variety of other studies, and is an important aquaculture species in many northern areas in the Atlantic. The short generation time of the blue mussel relative to many other aquaculture species also makes it ideal for cross-generational studies of the impacts of OA conditions. The researchers will examine multiple metrics of performance at different life stages, test for tradeoffs in performance under different OA conditions, and assess the potential for *M*. *edulis* to show resilience or adapt to changing environments. The experimental design will allow Padilla and her team to determine if blue mussels in Long Island Sound have the capacity to acclimate or adapt to OA.

The results of the experiments can then be used to develop management practices for wild populations and more robust aquaculture practices for blue mussels. From an aquaculture perspective, if animals from certain source populations are more resilient to OA stress, those locations could be targeted for collection of wild seed that will produce resilient mussels in aquaculture leases. Furthermore, the environmental characteristics of these advantageous site(s) could then be characterized to predict other sites that may also produce resilient mussels. Overall, the data obtained from this work could be used to enhance mussel culture, an economically important activity of growing importance in the Northeast region.

R/CTP-53. Dr. Sherri Mason, SUNY at Fredonia. **Determining Degradation Rates, Products and Impacts for Prominent Plastics in Freshwater Environs**. *Ends on 4/30/2018*.

The Great Lakes contain plastic pollution comparable to that of the ocean. The vast majority of plastic particles are small enough to be ingested by plankton and other filter feeders which form the base of lake food webs. Once ingested, these plastics can serve as a source of organic contaminants to other organisms up the food chain.

This project will determine plastic degradation rates in three freshwater environments (shoreline, open-water and estuary) using laboratory-scale environmental chambers and focusing on those types of plastic found to be most abundant in Great Lakes plastic pollution open-water surveys. The research team will assess possible ecosystem impacts of micro-plastics by conducting laboratory feeding studies using zooplankton and algae to determine growth and survival rates of organisms with and micro-plastics in their feed. Project results will fill a gap in knowledge of the impacts of micro-plastics within freshwater habitats.

R/CHD-8. Dr. Sarah Adams-Schoen, Touro College. **Increasing Coastal Resilience Through Facilitated Zoning Code Assessment and Amendment**. *Ends on 2/28/2018*.

Poor sea-level rise and coastal storm preparedness in coastal communities on Long Island and throughout New York creates significant social, environmental and economic risks. This project will develop practical tools, critical information and leadership training to help coastal communities develop detailed assessments of their zoning codes and to the code's measures for sea level rise and coastal storm resilience.

The research team will develop presentations and training for community leaders, planners, attorneys and municipal officials on Long Island and in the New York City area involved with the development of future policies addressing sea level rise and severe storms.

R/FBM-38. Dr. Christopher Gobler, Stony Brook University. **Impacts of Climate Change and Ocean Acidification on Economically Important Shellfish in New York: Are There Effective Mitigation and Adaptation Measures?** *Ends on 1/31/2018*.

Climate change is warming, deoxygenating and acidifying the ocean, threatening marine resources. In NY State, shellfish support the largest fishery; bivalves are particularly vulnerable to ocean acidification. Some regions of NY's coast are experiencing levels of pH, dissolved oxygen, and temperature that are stressful to marine life. In cases, these levels exceed worse-case climate change scenarios for the next 100 years for the open ocean.

This project will monitor and map temperature, dissolved oxygen, pH, pCO_2 and carbonate chemistry in various habitats such as shellfish growing locations and estuaries. In lab trials, the research will assess the individual and synergistic effects of chronic and acute exposure to thermal stress, low oxygen and acidification on juveniles of three economically-important bivalve species: bay scallop; hard clam and Eastern oyster.

To share project goals and results with shellfish growers, hatcheries and resource managers, the researchers will host an initial workshop to introduce aspects of acidification and climate change and a wrap-up workshop to share the resultant maps of NY waters that appear most hospitable to the growth and survival of each bivalve species as well as an assessment of options to mitigate the effects of climate change.

R/XG-23. Dr. Matthew Hare, Cornell University. **Identifying Genetic and Habitat Limitations to Cisco Restoration in Lake Ontario**. *Ends 1/31/2018*.

Cisco (lake herring), a once-abundant species, served as forage for Great Lakes salmonids such as lake trout and Atlantic salmon. Industrialization and exploitation led to a collapse of the cisco stock. The last known spawning stock of cisco in NY waters is in Lake Ontario's Chaumont Bay.

Restoring dwindling cisco populations in Lake Ontario is key to successfully restoring commercially-important salmonid species. In this project, the research team will analyze mapping data from Chaumont Bay to characterize cisco spawning habitat so that other Lake Ontario bays (Irondequoit, Sodus) may be assessed as suitable for future cisco restoration.

This project will also investigate the genetic diversity of cisco to address a further threat to cisco populations: its hybridization with lake whitefish. Hybridization compromises cisco reproductive success and its ecological niche in the Lake Ontario food web.

This project will provide needed information on the availability of suitable spawning habitat and the genetic integrity of the spawning stock-- both vital for a resilient, self-sustaining cisco population.

R/FHD-14. Dr. Karin Limburg, SUNY College of Environmental Science and Forestry. **Reconnecting Waters for Eels and River Herring: A Mediated Modeling Approach to Assess Receptivity to Dam Removal in the Hudson-Mohawk Watershed**. *Ends on 1/31/2018*.

In the Hudson River watershed, 800 registered dams and many hundreds more smaller dams and culverts act as barriers for native migratory fish populations. These species are in decline due to restricted access to upriver spawning and rearing habitats caused by dams, as well as from overharvesting and marine by-catch. Although interest in habitat restoration via dam removal is gaining traction among resource managers, the acceptance of these actions by upper level management, other agencies, politicians and residents that live near dams in the watershed is largely unknown.

The research team in this project is investigating issues related to watershed and habitat restoration for the Hudson River's heritage migratory fish species: American eel and river herring (blueback herring and alewife). This research will engage stakeholders in four communities within the Hudson/Mohawk Rivers watershed to assess different methods of informing communities about dam removal. By using three educational interventions--lectures, field trips and mediated modeling workshops-- it is hoped that deeper stakeholder engagement and understanding will improve community receptivity to dam removal to restore access to spawning habitat.

Results from the project will provide information about which methods or combination of methods increase community understanding and support for dam removal. This first step toward opening dialogue and determining public receptiveness to dam removal in the Hudson/Mohawk Rivers will be of utility to stakeholders and managers engaged in dam removal and restoring river connectivity.

R/CTP-54. Dr. Anne McElroy, Stony Brook University. **Pharmaceuticals in New York Waters: Effectiveness of Advanced Treatment Options, Environmental Levels and Potential Effects**. *Ends on 1/31/2018*.

Pharmaceutically-active ingredients (APIs), including drugs, personal care products and their breakdown products (metabolites), form a group of "contaminants of concern" that have dominated recent discussions about human and environmental health of NY's Great Lakes and marine coastal surface waters. The number of APIs and their known or suspected active metabolites in coastal waters is in the hundreds and continues to increase. Field and laboratory studies and a number of risk assessment approaches provide evidence that sub-lethal, acute or chronic exposure to some APIs could be ecologically important, particularly those substances affecting fish and their behavior.

This project fill important data gaps and enhance knowledge about sewage-derived APIs and their effects on fish behavior and how well advanced wastewater treatment technologies reduce API discharges and mitigate these effects.

The research team will conduct coordinated field sampling and laboratory analysis involving advanced mass spectroscopic chemical analytical approaches, and detailed behavioral and cellular gene expression analysis using a laboratory species model (zebrafish) and then indigenous fish species.

The research will provide an environmentally grounded and unique data set that will indicate to what degree neuro-active APIs are an important ecological issue in Great Lakes and marine coastal surface waters.

R/FBF-24. Dr. Lars Rudstam, Cornell University. **Vertical Habitat of Salmonids in Lake Ontario Using Archival Tags and Hydrodynamic Models**. *Ends on 1/31/2018*.

Native and introduced salmonids are an integral component of a healthy Lake Ontario ecosystem. Recreational angling for these species provides key economic benefits to many New York communities along the Lake. Little is known about the horizontal and daily vertical movements of salmonids in offshore Lake Ontario. Recent advances in tagging technology, such as satellite pop-off archival tags, provide researchers with new tools to study fish movements in the Great Lakes.

This technology will help researchers identify the potential effects of ecosystem shifts and climatic change on Lake Ontario's salmonid populations throughout the year and over their ranges. In this project, the research team will use archival tags and other new technology to determine the movements of salmonids and forage fish in Lake Ontario. This data will be compared with environmental data of the Lake to assess the effects of climate change on salmonid growth due to changing temperatures and prey encounters. Bio-energetic equations for temperature and feeding will be used to infer changes in fish growth rates.

These results will provide fishery managers with information to improve the management of fish resources in Lake Ontario.

R/CHD-9. Dr. Gregory Boyer, SUNY College of Environmental Science and Forestry. **Coupling Biophysical Observations and Economic Impacts of Harmful Algal Blooms in Sodus Bay, Lake Ontario**. *Ends on 11/30/2017*.

Sodus Bay Lake Ontario experienced an extensive cyanobacterial bloom of *Microcystis* in late summer 2010. The bloom was concentrated along the western and northern shores of the bay, particularly in the marina areas located at the northern end near the Village of Sodus Point, reaching levels well above the guideline values for drinking water or recreational contact. In response to the bloom, NYS Department of Health (NYSDOH) restricted the use of the bay. This event continued over the Labor Day weekend and had a significant economic impact on the region. Visitors canceled their vacations, yachts left the harbor, and the estimated economic impact to local businesses was in the hundreds of thousands of dollars.

In response, Sea Grant funded a study to that developed a coupled biological and physical model to better understand the bloom dynamics in the bay. In this new study by researchers led by Dr. Gregory Boyer at SUNY College of Environmental Science and Forestry will expand on the earlier work to include economic impacts from harmful and nuisance blooms and the management practices to manage and mitigate them.

The project will also expand the model to include higher spatial resolution near the Village of Sodus Point and an expanded macrophyte component. The information from the economic analysis and the model will provide the ability to assess the economic impacts of both blooms and various measures to reduce or prevent future blooms.

R/XG-26. Dr. Gregory O'Mullan, Queens College, City University of New York. **Combining Chemical, Bacterial, and DNA-based Indicators to Decipher Sources of Fecal and Sewage Contamination in the Hudson River Estuary**. *Ends on 7/31/2017*.

Traditional fecal indicator bacteria (FIB) are commonly monitored in the Hudson River Estuary to assess sewage and fecal contamination, but data on contaminant source are also needed for efficient management. EPA researchers plan to sample for emerging chemical sewage tracers during the May (sucralose) and July (sucralose and caffeine) 2016 Riverkeeper Hudson monitoring cruises at locations where FIB are routinely monitored.

This project will use this opportunity to analyze DNA-based source tracking samples in parallel with chemical tracers and traditional FIB. The combined data would provide the most comprehensive information on Hudson contaminant sources available and parallel evaluation of two emerging water quality research tools.

R/XG-27. Dr. Gary Pettibone, SUNY Buffalo State. **Impact of Point and Non-Point Sources on Indicator Bacteria Loading at the Gallagher Pier Area of Buffalo Harbor State Park (Erie County, NY) as Determined by Next Generation Sequencing**. *Ends on 7/31/2017*.

Outer Harbor development is an important part of the future of Buffalo, New York. Towards that end, in 2014 the Erie Canal Harbor Development Corporation acquired approximately 180 acres of Outer Harbor property from the Niagara Frontier Transportation Authority for the establishment of the Buffalo Harbor State Park (BHSP). The Gallagher Pier area at Buffalo Harbor State Park is an approximately 1400 foot long shoreline property included within BHSP and currently is used seasonally for a variety of water-related activities. These include partial-body exposure activities like kayaking and sailboarding but the Gallagher Pier area is not classified as a full-body contact bathing beach partly due to concerns of high bacteria levels.

Remediation of fecal pollution point-sources at/near the Gallagher Pier area could improve water quality to an extent that it could be purposed for swimming. However, the source(s) of fecal input need to be identified so that targeted corrective actions may be taken.

This project will use recently developed culture-independent molecular analyses to compare the genetic signatures of bacteria from selected samples (those with elevated fecal coliform/E. coli counts) collected from area point and non-point sources with the genetic signatures of bacteria from samples collected from swimming water adjacent to the Gallagher Pier area. Signature agreement between Pier area water-isolated bacteria and point-source-isolated bacteria could provide direct evidence of contributions from potential pollution sources to the Gallagher Pier area.

R/CHD-8. Dr. Richard Vogel, Farmingdale State College. **Leveraging Long Island's Coastal Heritage for the Future: Integration and Diversification of Long Island's Coastal Industries**. *Ends on 7/31/2017*.

Coastal New York has a long history of commercial and recreational uses, including commercial and recreational fishing and a variety of other residential and tourist recreational uses. Over the past fifty years, lifestyle and industrial/residential land use changes in the greater New York City metropolitan area including Long Island have impacted coastal economic activities and the use of coastal resources.

New York State's annual landed commercial catch (all species) from 1990 to 2012 declined 16 million pounds and the population employed in agricultural and natural resource related industries in the area has continued to decline and represents a very small constituent of the overall regional economy (National Marine Fisheries Service, 2014).

Recent studies find that coastal resources and ecosystems can contribute significant economic benefits to regional economies especially in terms of coastal tourism and recreational services. Sea Grant has funded a study led by Dr. Richard Vogel of Farmingdale State College that focuses upon Long Island's recreational and commercial fishing industry and its interrelationship with the Island's tourism and recreational sectors as well as its integration with the greater regional economy.

The project addresses the economic strength and vitality of the industry and public policy initiatives that would help to develop greater linkages of these industries with Long Island's and New York's service economy.

The research team will apply a computable general equilibrium model (CGE) to come up with more generalized techniques to compute the impact of changes. The main objective of using a CGE model is to present a methodology that policy makers can use in evaluating the cost and benefits of potential policies to be implemented in these coastal communities.

R/CTP-51-CTNY. Dr. Mark Altabet, University of Massachusetts. **Recent Temporal Evolution of Nitrogen Loading and Oxygen Dynamics in Long Island Sound Studied Using Stable Isotope Geochemistry**. *Ends on 3/31/2017*.

It is well recognized that anthropogenic nitrogen loading is the primary cause of eutrophication and summertime hypoxia in LIS. Accordingly, regulatory efforts and expenditures have focused on reducing N loading (TDML), mainly from sewage and wastewater treatment plants (SWTP). In parallel, on-going monitoring is intended to detect improvement from these efforts and computer models have been developed to predict and inform these regulations. Geochemical isotope budgeting of the kind we are proposing has been shown in numerous studies of other marine systems to be an important complement to standard direct measurement of fluxes which can overlook unrecognized or underappreciated terms and are also highly sensitive to under sampling.

R/CTP-50-NYCT. Dr. Robinson W. Fulweiler, Boston University. **Quantifying Benthic-Pelagic Coupling in Long Island Sound**. *Ends on 3/31/2017*.

Benthic-pelagic coupling is an important characteristic of coastal systems. Understanding the linkages between water column productivity and benthic metabolism is a necessary step in determining the ecological status and ecosystem services (e.g. removal of N through denitrification) of marine systems.

In a new Sea Grant project being conducted by Dr. Robinson Fulweiler of Boston University the goal is to quantify benthic-pelagic coupling in Long Island Sound (LIS) as a mechanism to better understand the current state of organic matter decomposition and internal nutrient recycling in LIS.

The project will involve field sampling in LIS and field and laboratory experiments to quantify downward flux of organic matter, benthic metabolism, and estimated of nutrient fluxes. Data collected in this study will help determine updated nutrient budgets for LIS and the data will be directly applicable to the System Wide Eutrophication Model (SWEM), a tool widely used in research and management.

R/CTP-52-CTNY. Dr. Craig Tobias, University of Connecticut. **Biogeochemical Nitrogen Loss vs. Recycling in Long Island Sound: Connecting Sediments to Overlying Water**. *Ends on 3/31/2017*.

The intensity and duration of eutrophication in response to high N loading, and the rate of estuarine recovery in response to reduced N loading, is dependent on the ecosystem residence time of N. The residence time of N depends on the input fluxes, which have received well-deserved attention in Long Island Sound, but also the recycling and loss rates, which have received almost no direct measurement in LIS.

Previous LISS-supported work identified “significant anthropogenic N reserves in LIS sediments which may continue to be released back into the water column for some time to come”… suggesting further… that the winter time NO3 - build up in LIS that occurs at “a rate almost twice that of WWTP and riverine inputs, is caused most likely from regeneration from the sediments”. Despite the importance of sediment mediated N dynamics there is a surprising lack of sediment-water flux measurements or direct measurements of reactions that remove N from sediments (denitrification and ANAMMOX). Current formulations of SWEM have ill constrained parameterization with respect to denitrification in particular, no mechanistic connection to likely geochemical drivers or other N cycling reactions that may regulate sediment N retention vs. export, and model derived N removal rates are wholly unconstrained due to a lack of actual measured rates in LIS for validation. Collectively the sediment-water DIN flux dynamics and characterization of the N-cycle reactions behind them is both important and unknown.

This proposal seeks to fill the data gap that currently exists for LIS with respect to sediment nitrogen recycling vs. loss. A better understanding of the balance of, mechanisms behind, and controls on sediment N recycling vs removal reactions is necessary for gauging the susceptibility of LIS to increased N loading, and/or predicting a realistic eutrophication recovery trajectory in response to decreased N loading.

R/FBF-23. Dr. Rodman Getchell, Cornell University. **The Potential Impact of VHSV on Future Population Recovery of St. Lawrence River Muskellunge**. *Ends on 12/31/2016*.

In the upper St. Lawrence River (SLR), muskellunge, a top predator and economically important sportfish, has not recovered from the viral hemorrhagic septicemia (VHS) epidemic that swept through the Great Lakes from 2005 to 2008.

This disease not only hinders the muskellunge population itself, but it also hinders the economic benefit from this fishery supplied to the Thousand Islands Region. In Lake St. Clair (LSC), just east of Detroit, MI where VHSV was first detected in the Great Lakes and significant mortality in muskellunge documented, there has been a recovery to pre-2005 population levels. It is thought that slight genetic differences between the two populations of muskellunge and the VHS virus might account for the differences in recovery outcomes of muskellunge between LSC and SLR. There could either be a difference in virulence of the VHS virus or in muskellunge susceptibility between two regions may explain the failure of the population to recover.

A research project led by Rodman Getchell, at State University of New York, College of Environmental Science and Forestry, will examine the interaction between VHS and fish population genetics in order to better understand the relationship between VHS virulence and muskellunge susceptibility.

The research team will conduct non-lethal sampling of upper SLR muskellunge which will be assayed to determine the current endemic strains of VHSV in this region. In addition laboratory experiments will be conducted to assess virulence and susceptibility using muskellunge fry exposed to different VHSV strains. Project results will help managers and policy makers protect this economically and culturally important fishery. This project contributes to NYSG’s goal of promoting sustainable fisheries for New York.

R/ATD-13. Dr. Gregg Rivara, Cornell Cooperative Extension. **Development of Small, Local Shellfish Hatcheries and Increasing Hatchery Production Methods for Existing Hatcheries Culturing the Eastern Oyster, *Crassostrea virginica***. *Ends on 11/30/2016*.

Shellfish culture on the East Coast of the United States is a fast-growing business that requires high quality seed stocks. The culture of the eastern oyster in particular has seen strong growth in the last decade. This has led to seed shortages in some states and issues with seed importations that are either illegal or untested for diseases and exotic hitchhikers.

Working with two industry cooperators and a federally-recognized Native American tribe, a research team with Cornell Cooperative Extension plans to evaluate the primary bottlenecks for shellfish hatcheries- algal production and larval tank space. Traditional shellfish hatcheries use batch culture for larvae, which leads to metabolite build-up in the culture water between water changes and limits the density of larvae in the culture tanks. Instead, the researchers will experiment with raising the larval density an order of magnitude by using continuous water flow in larval culture vessels. In addition, the researchers plan to investigate the use of a commercially available algae concentrate to take the place of live algae in both a new "pocket" hatchery and two established larger-scale hatcheries.

R/FBM-36. Dr. Bassem Allam, Stony Brook University. **QPX Distribution and Persistence in the Environment**. *Ends on 9/30/2016*.

The disease known QPX (Quahog Parasite Unknown) has had a major impact on the hard clam shellfish industry in NY State. Due to a variety of reasons hard clam abundances have declined greatly compared to historical levels. One area in NY where hard clams are still abundant are the waters of Raritan Bay off the coast of Staten Island. Though these waters are uncertified, meaning clams harvested from these waters are not suitable for consumption, a NYSDEC transplant program allows for Raritan Bay hard clams to be harvested and transferred to certified waters in the Peconic Bays. There the clams are kept until purged of bacterial contaminants through the clams filtering activity and re-harvested as a safe food product. The fly in the ointment though was an outbreak of QPX disease in Raritan Bay clams in 2002. The transplant program was suspended to prevent spread of the disease to certified waters of the Peconic Bays.

Since that time research and monitoring has allowed for a gradual reopening of the Raritan Bay though the transplant program operates under stricter rules. The research and monitoring conducted by the Marine Animal Disease Laboratory of Stony Brook University in partnership with the NYSDEC, has elucidated many aspects of QPX disease. However much remains to be known about this poorly understood organism. To further our understanding a research team led by Bassem Allam at Stony Brook University will conduct a study that builds upon earlier NYSG funded work. This project will use field sampling and laboratory experiments to identify factors affecting QPX distribution and persistence in the environment.

The team will identify the reservoirs of QPX and study the release of QPX into the environment from infected clams and determine factors affecting the persistence of infectious parasite cells in the environment. Results from the project will provide information for improved state regulations, allowing for a better exploitation of the resource. This project contributes to NYSG's goal of a safe and sustainable NY seafood supply for high quality seafood products from profitable NY seafood businesses.

R/CMC-12. Dr. Henry Bokuniewicz, Stony Brook University. **The Role of Submarine Groundwater Discharge (SGD) In Promoting Hypoxia in Smithtown Bay**. *Ends on 9/30/2016*.

Within the western central region of the Long Island Sound (LIS), Smithtown Bay regularly experiences hypoxia in the summer months. Hypoxia occurs due to increased oxygen consumption from microbial decomposition of excess organic matter. Much this organic matter is from increased planktonic and bacterial biomass stimulated from a surplus of nitrogen loadings from point and non-point sources into LIS. In Smithtown Bay, nonpoint sources of nutrients may be especially important since there is little stream discharge and the only point source is a small sewage treatment plant.

An underappreciated non-point source of excess nutrient inputs is submarine groundwater discharge. Although hard to quantify, submarine groundwater discharge is known to release nutrients into coastal waters. The calculated total maximum daily loads for LIS do not include this nonpoint source that likely contributes to eutrophication and ultimately hypoxia in Smithtown Bay.

A research team led by Dr. Henry Bokuniewicz at Stony Brook University, will conduct a project to assess the importance of SGD in adding nutrients to Smithtown Bay.

The project will use radon and radium isotopes, and nutrient measurements from porewater samples along with aerial thermal infrared (TIR) imagery surveys to identify areas of nutrient input associated with SGD. These results will be integrated into GIS to create maps identify areas subject to SGD inputs. The results can be utilized by coastal zone managers for implementation of updated policies to improve coastal water quality and habitat. This work contributes to NY Sea Grant's focus area to promote healthy NY coastal ecosystems and habitats through improved water quality.