Colleen Bradley1*, Dr. Zion Klos1
Title: Quantifying spatial hotspots of nutrient and energy input and their influence on water quality and cyanobacteria abundance in low-order streams spanning a rural to urban gradient

1Marist College Department of Environmental Science and Policy

Abstract
This study aims to disentangle the complex relationships between factors controlling hotspots of nonpoint source inputs, and their resulting impacts on water quality, as low-order streams travel through environmental gradients in urban and rural land cover, changes from free flowing to impounded water, and across varying levels of pre- and post-event discharge. Four unique km-scale stretches of low-order creeks in Dutchess County, New York, were gauged and investigated through a fine spatial resolution (20m-scale) longitudinal mapping of changes in water quality (N, P, temperature, DO, pH, EC, including possible cyanobacteria hotspots) across these complex environmental gradients. Through Google Earth Pro and site analysis, these stretches contrasted in land cover from heavily urban channelized streams to mainly rural meandering streams with active floodplains. Observations occurred above and below areas where impounded water input to the stream, as well as before and after major storm events to see the influence of path activation on nonpoint source fluxes. Combined conclusions from all sites show that temperature, pH, and nutrient levels spike above thresholds of concern and then quickly drop below threshold levels again due to fluxes from the vadose zone, groundwater, and hyporheic water. Nitrate concentrations and temperature were higher in an urban setting and phosphate concentrations and pH were higher in a rural setting. These identified potential cyanobacteria drivers will enhance the prediction of future blooms under continued nutrient loading and climate change in low-order streams.

Undergraduate Poster

Principal investigator (PI): Bernadette Connors, Dominican College
Presenters: Stefanie Moncayo, Anna Acosta of Dominican College

Title: Population Shifts Following Herbicide Treatments in a Piermont Marsh Microbial Community

Abstract
The Piermont Marsh is a wetland that extends from the west shore of the Tappan Zee to the Piermont Pier in Rockland County, NY. Although marshes are commonly dominated by
herbaceous plant species, the Piermont Marsh has a massive population of an invasive non-native species, *Phragmites Australis*. Moreover, these plants harm aquatic ecosystems by occupying space and monopolizing nutrients, which ultimately reduces biological diversity. For this reason, the Department of Environmental Conservation proposed a management plan utilizing glyphosate, which specifically inhibits an amino acid synthesis pathway in plants (2017). Thus, we hypothesized that the herbicide treatment would only affect actively growing plants, and therefore, there would be no change in the microbial community structure. Sediment and water were collected near the Piermont Marsh and placed into sterile containers at room temperature. Containers contained various concentrations of glyphosate and were monitored for several weeks. Samples were collected from all containers and total DNA was extracted each week and sequenced. In addition to sequencing of the V4 region of 16S rDNA, a metabolomic analysis of the microbial community was completed. Upon observation, putative biofilms were formed on the untreated sample and more noxious gases were produced from the treated sample. Despite the intent of glyphosate to eradicate phragmites from the Piermont Marsh, our work suggests that the microbial populations may also be significantly affected. Therefore, herbicide treatments might have implications when considering management strategies with respect to aquatic environments.

**Principal Investigator: Donohue-Couch, K., P.I.**

Co-Principal Investigators: Ng, M1, Wilson, J.M1., Mount, S2

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**Title: Evaluating Water Quality Data and Juvenile American Eel Populations in a Brackish Tidal Wetland on the Hudson River, NY**

**Abstract**

American eels play a critical role in the aquatic food web. American eels are listed as endangered by the Union for the Conservation of Nature and are sensitive to changes in water quality conditions. The New York State Department of Environmental Conservation coordinates a citizen science project in which volunteers monitor American eel migrations in several Hudson River tributaries. The number of juvenile eels and the total weight of the catch was monitored daily from March to May since 2008. In 2017, continuously recording water quality probes were placed at one site of eel collection (Furnace Brook) to assess if any water quality parameters affected the eel monitoring data. The probes measured turbidity, dissolved oxygen, salinity and depth. Preliminary results show that mean number of glass eels found in 2017 was not significantly different than the number found in 2018. Despite the same number of eels collected, the water quality conditions were significantly different in 2017 versus 2018. Other analyses explore the relationship between the daily eel monitoring data to the water quality statistics before an eel net monitoring event. Peaks and drops in juvenile eel population were linked to these statistics. As the 2019 monitoring program for water quality and juvenile eel populations continues, predictions in number and weight of juvenile eels caught will be calculated based on the previous 2-year analyses. The predictive tool developed in this study can be extrapolated to 10 other sites that also have juvenile eel monitoring programs in the Hudson River Estuary.

Poster Type: Graduate Student (poster analysis compiled by Mary Ng)
Principal investigator (PI): J. Stephen Gosnell, Department of Natural Sciences, Baruch College & PhD Program in Biology, The Graduate Center, City University of New York, New York, NY 10010 USA;
Names and affiliations of all Co-PIs: Chester Zarnoch and Jennifer Zhu, Department of Natural Sciences, Baruch College & PhD Program in Biology, The Graduate Center, City University of New York, New York, NY 10010 USA

Title: Incorporating species interactions into restoration planning

Abstract:
Species interactions play a central role in determining the diversity of ecological communities. They may also influence the type and amount of services communities can provide. However, interactions are rarely considered in restoration planning. Our lab explores how interactions in salt marshes and oyster reefs may influence the growth of restored communities and the services they provide. Given the eutrophic conditions found in local waters, much of our work focuses on how interactions may influence denitrification, or the removal of nitrogen from waters via biological processes. The existence of nitrogen markets and the need to limit nitrogen levels in many systems also mean a focus on nitrogen provides a quantifiable monetary outcome for projects. Working in the nitrogen-polluted waters of New York City, we have shown that including ribbed mussels in salt marsh restorations may double the amount of nitrogen removed from local waters. Oyster reef restoration may also increase denitrification rates. However, some of these benefits may be erased when predators return to the system due to both consumption and fear effects. Considering interactions can help predict how communities and the services bivalves provide will change as communities mature and can inform and justify restoration planning efforts.
Poster type: Faculty

Principal investigator (PI): Katherine Meierdiercks, Department of Environmental Studies & Sciences, Siena College
Names and affiliations of all Co-PIs: Catherine Hill, Eileen Fitzgerald, Lauren Gallagher, Anna Kuhne, Department of Environmental Studies & Sciences, Siena College
Title: Road Salt Delivery Mechanisms and Water Quality Impacts in the Hudson River Watershed

Abstract
Road salt entering surface stream channels can negatively impact water quality and ecosystem and human health. While it is well understood that salt runs off into surface water with melting snow, much less is known about how and when salt enters surface streams through groundwater baseflow. This presentation highlights research examining how land use and watershed structure control delivery of road salt to the Hudson River using data collected through the Hudson River Subwatershed & Tributary (THuRST) Research Network (bit.ly/THuRSTnetwork) network and available through the Hudson River Environmental Conditions Observing System (HRECOS).
Poster type: undergraduate
Principal investigator (PI): Philip Orton
Philip Orton¹, Sarah Fernald², Bennett Brooks³, Kristin Marcell⁴
Collaboratively assessing the effects of storm surge barriers on the Hudson River Estuary
¹Stevens Institute of Technology
²Hudson River National Estuarine Research Reserve and NYSDEC
³Consensus Building Institute
⁴NYSDEC Hudson River Estuary Program, and Cornell University Water Resources Institute

Abstract
Gated storm surge barriers are currently being evaluated by the U.S. Army Corps of Engineers as an option for flood risk reduction for the New York metropolitan area. The decision of whether or not to build surge barriers to protect one of our nation’s main commercial hubs and ports, potentially altering the Hudson River and other connected estuaries, is a major decision worthy of collaboration. This one-year Catalyst project is working in parallel with the Corps of Engineers’ study with frequent interaction, helping to bring in many additional voices and improve its scientific basis.

Major project activities so far include a Scoping Session, a scientific workshop, and research on the estuary effects of the barriers and how they will change with future sea level rise. The scientific workshop helped bring together 20 scientists with expertise on past surge barrier environmental effects and potential effects on migrating organisms and tidal wetlands. Remaining steps include a report on completed workshops and research, and a collaborative workshop to develop a Future Scope of Work that lays out a broader plan for continuing the momentum the project has created.

Poster type: Faculty

PI: Grant Pace, Columbia University
Co-PIs: Dorothy Peteet, PhD, Lamont-Doherty Earth Observatory, Columbia University; Jonathan Nichols, PhD, Lamont-Doherty Earth Observatory, Columbia University; Molly Dunton, Columbia University; Carol Wang-Mondaca, Martin Van Buren High School

Title: Quantifying the Blue Carbon stock in Jamaica Bay, New York salt marshes

Abstract:
Constraining uncertainty in the global carbon cycle depends greatly on both Blue Carbon and terrestrial carbon stocks. Coastal wetlands, potentially the most efficient carbon-burying ecosystems in the world per unit area, represent a key knowledge gap in both fields. However, coastal wetlands are increasingly at risk due to climate change, sea level rise, and anthropogenic disturbance and destruction. Despite the fact that salt marshes often sequester carbon several meters deep, nearly all estimates of salt marsh carbon stocks consider only the top 50cm or 1m. This presentation focuses on a calculation of full-depth carbon stock of the marshes in Jamaica Bay, Queens, New York, salt marshes heavily affected by anthropogenic disturbance and sea level rise. These estimates use probe depth data collected from 2000-2019 and the area of the marshes obtained from Landsat satellite imaging to estimate the volume of the marshes. Carbon density obtained from loss-on-ignition (LOI) analysis of sediment cores is then multiplied by the volume of the marsh to get the carbon stock (kgC). This value is then compared to a simple calculation
using average values as well as estimates using only the first 50cm and 1m to compare methodologies. These findings have important implications for the global carbon cycle and the incorporation of Blue Carbon into global climate models, advocacy efforts aiming to conserve these marshes’ sequestered carbon, and the movement towards a more accurate standard of calculating Blue Carbon in salt marshes.

Poster type: Undergraduate

Principal investigator (PI): Ellie Petraccione
1Marist College Department of Environmental Science and Policy.
Co-PIs: Dr. Zion Klos2, Dr. Raymond Kepner3, Professor Lucy Holtsnider4
2Marist College Department of Environmental Science and Policy. 3Marist College Department of Biology. 4Marist College Honors Program.

Title: Double Trouble in the Hudson River Estuary: Dominant abiotic factors controlling harmful algal bloom risk and the compounding influence of invasive water chestnut

Abstract
Low-current tributary-estuaries and embayments along the margin of the Hudson River are uniquely at risk for harmful algal blooms of cyanobacteria (cyanoHABs) due to rising temperatures as a result of climate change. An increased prevalence of cyanoHABs in low-current sections of the Hudson River could be extremely harmful to nearby communities, aquatic organisms and wildlife. High-risk locations are also susceptible to growth of the invasive species *Trapa natans* (European water chestnut). The weekly changes in the background abundance of cyanobacteria in *Trapa* blooms and their abiotic drivers were measured along the Hudson River. Cyanobacterial growth was most influenced by surface temperature, pH, and turbidity. The species of cyanobacteria and whether they were nitrogen fixers fluctuated throughout the summer, and depended on whether they were growing within the *Trapa* beds. It is apparent that *Trapa* moderate the growth of certain harmful cyanobacteria, which could be attributed to efficient denitrification.

This project includes a standard scientific poster, and an approachable, user friendly, interactive Prezi (via iPad). This project will present the complete story of cyanoHABs in the Hudson Valley with personal pictures and a powerful narrative. This story includes the reasons cyanoHABs occur, the consequences of HABs, and finally, actionable steps to combat it. In the wake of anthropogenic climate change, it is important to educate people about the small ways they can be empowered and foster stewardship for their environment. Combining a conventional poster with a creative interface expands this research project and presents science in a novel, unique way.

Poster Type: Undergraduate

Principal investigator (PI): David Ralston
In the tidal Hudson River, sediment from dam removals has little impact on turbidity or marsh resilience, and many marshes are currently growing faster than SLR

Authors: David Ralston1; Brian Yellen2; Jon Woodruft2; Sarah Fernale3; Ona Ferguson4 Elizabeth Cooper4
1Woods Hole Oceanographic Institution; 2University of Massachusetts Amherst; 3NYSDEC Hudson River National Estuarine Research Reserve; 4Consensus Building Institute
Abstract
Thousands of legacy dams impound streams within the Hudson River watershed. These dams are being removed at an increasing pace to improve aquatic connectivity or public safety, yet the impact of remobilizing impounded sediments on downstream tidal environments remains unclear. Here we present results from surveys of sediments behind small impoundments in three tributary catchments along the Hudson River estuary. We pair results from tributary impoundments with observations of tidal marsh sediments at the mouth of each of the catchments. In some tidal marshes, we find that anthropogenic alterations to the estuarine bathymetry (e.g. railroad trestles, dredge spoils emplacement) have initiated or dramatically increased deposition of fine-grained marsh muds. Marshes have accreted at 1-2 cm/yr, much faster than relative sea level rise, despite the onset of these marshes during the period of peak dam building and associated reduction in sediment supply. This suggests that marsh building sediment originates predominantly from the main stem of the river, not local tributaries, and that the supply is sufficient to maintain rates much greater than sea level rise. Any increase in sediment supply due to dam removal on these tributaries would have little impact on tidal wetlands along the main channel of the Hudson.

Colleen Schmid, Ossining High School

Title: Shifting Environmental Factors Influence the Fitness and Abundance of Juvenile American Eels

Abstract
The American eel (Anguilla rostrata) is a catadromous migratory species, whose drastic decline has placed this fish on the IUCN endangered list. This study examined environmental factors linked to climate change that may influence the abundance and fitness of juvenile eels during their spring migration into a Hudson River tributary. A fyke net was deployed annually (2008-2019) in Furnace Brook to track seasonal glass eel migration. Eels were counted daily, weighed, as a proxy for fitness, and released upstream. A HOBO Logger, installed above the head of tide, measured water depth (a proxy for flow), with water temperature recorded separately. Our eleven-year analysis reveals an annual peak arrival of glass eels, occurring mid-season, likely in response to optimal water temperatures ~55°F between Julian dates 95-116. It was found that the fittest eels arrive at lower water temperatures and higher water flows, earlier in the season. Glass eels arriving later were lighter and therefore weaker, likely the result of longer, more strenuous migrations. These findings suggest that the fittest eels have the highest chance at survival; however, shifting environmental conditions, particularly water temperature and flow may pose challenges for migrating eels in terms of overall energy reserves and food availability, furthering the grim outlook for this species. Collectively, our findings provide novel insight on patterns of American eel abundance and fitness in a tributary of the Hudson River, a critical habitat for this culturally, economically, and ecologically important species.

Principal investigator (PI): Y. Peter Sheng

Understanding the Role of Piermont Marsh in Buffering Piermont Village from Damages by Storm Surge, Wave, and Flooding during Current and Future Climates
Abstract
Piermont Marsh provided some protection to the Village of Piermont during Superstorm Sandy. The marsh’s buffering capacity from waves and flood was assessed for Sandy conditions and future conditions and under various management scenarios. Management scenarios included partially restoring the marsh, which is heavily invaded by *Phragmites australis*, to native *Typha*. The project characterized marsh vegetation distribution and structure data and sediment data across both Piermont & Iona Island marshes for use in hydrodynamic models. Conditions for Sandy were simulated to obtain maximum flood elevation and maximum wave height. Piermont Marsh reduced the surge/flood by only 2%: the marsh reduced wave reduced the wave height by 2/3 in the southern Village. Ensembles were produced of extreme events for current and future climates and these ensembles used to simulate flood risk and wave heights for present & future climate for various management scenarios. The ecosystem service values for flood protection of the Piermont Marsh are being assessed. The collaborative science project is advised by local end-users including marsh managers and village residents to insure applicability of the research and utility of end products.