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Abstracts

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WHEN TO MOVE A MUSSEL: RIBBED MUSSELS ENHANCE NITROGEN REMOVAL, BUT NOT PLANT GROWTH, IN RESTORED URBAN MARSHES

Along the eastern coast of North America, the mutualism between ribbed mussels (*Geukensia demissa*) and smooth cordgrass (*Spartina alterniflora*) is foundational to the structure and function of marsh ecosystems. We investigated whether the addition of mussels to restored marshes enhances marsh growth and promotes nitrogen-removal within urban estuaries. We performed experimental additions of mussels to two constructed marshes in New York, NY, USA that varied in sediment loading and exposure to erosion. At both sites, mussels enhanced removal of nitrogen via microbial denitrification but had no effect on plant growth. To address the generality of our results, we performed a systematic review and meta-analysis. Consistent with our field experiments, the positive effect of the mutualism on the growth of *Spartina* and *Geukensia* was stronger in nonurban than urban locations, and in natural relative to constructed marshes. The effect of both species on the marsh nitrogen cycle remains similar regardless of context. malld001@plattsburgh.edu

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THE DEVELOPMENT OF AUTOMATED BENTHIC FLUX CHAMBERS FOR HIGH TEMPORAL RESOLUTION MEASUREMENT OF SEDIMENT OXYGEN DEMAND

Remedial efforts to address anthropogenic changes to estuaries have been complicated by the uncertain magnitude and spatiotemporal variability of sediment biogeochemical processes, including O_2 flux. Sediment O_2 flux can be impacted by a variety of physical, chemical, and biological factors, but the role of each of these interconnected drivers on benthic metabolism remains largely uncertain. Our understanding of how this biogeochemical process will respond to climatic and nutrient changes is limited by the difficulty in measuring sediment fluxes at a high temporal-spatial resolution using traditional methods. Here, we present preliminary results from a fully automated benthic chamber system capable of measuring in-situ semidiurnal sediment O_2 flux at an hourly resolution. Initial testing in a shallow urbanized embayment (Wickford Harbor, RI) has suggested a strong diurnal pattern in O_2 flux that correlates with insolation. Future work will expand the capabilities of the system to include other dissolved gasses and inorganic nutrients. balint.sawyer@epa.gov

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THE IMPACTS OF THIN LAYER SEDIMENT PLACEMENT ON NITROGEN REMOVAL PATHWAYS IN A TEMPERATE SALT MARSH

Salt marshes play a disproportionate role in improving coastal water quality as they are hotspots for microbially mediated nitrogen removal pathways. However, globally they are at risk as sea level rise (SLR) is quickly outpacing rates of salt marsh net elevation gain. One SLR adaptation strategy increasingly being used is thin layer placement (TLP) in which sediment is placed on the surface of the marsh to boost elevation. Yet the impact of adding this sediment on salt marsh nitrogen cycling remains largely unknown. Results from a slurry experiment indicated that anammox was undetectable in both control and TLP plots, while potential denitrification was approximately 3.5X higher in the TLP plots than the control plots. Additionally, we found that nitrous oxide fluxes (another product of nitrogen removal) from both TLP and control plots were not significantly different from zero ($p>0.05$, $n= 30$) We will present these data along with ongoing measurements of *in situ* rates using the push pull and isotope paring technique. barto22n@bu.edu

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A META-ANALYSIS EXAMINING THE EFFECTS OF POLLUTANTS ON OYSTER HEALTH INDICATORS

Oysters are ecologically-important and economically-valuable foundation species that are exposed to a variety of pollutants. Management of wild populations, restored reefs, and aquaculture practices requires a better understanding of how pollutant exposure affects oyster health and viability. We conducted a meta-analysis to quantify the effects of biocides, heavy metals, plastics, polychlorinated biphenyls (PCBs), and polycyclic aromatic hydrocarbons (PAHs) on oyster survival, growth, reproduction, and condition in laboratory and field settings. We found mostly negative effects of pollutant exposure on oyster health indicators, but the magnitude of the effect differed among pollutant types, varied across pollutant concentrations, and depended on the oyster health metric. Our results indicate a need for updated and more nuanced regulations, and demonstrate the value of regular monitoring to identify pollutants of concern and inform management, contributing to the conservation of oyster reefs and sustainability of aquaculture practices. ecbert23@colby.edu

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ASSESSING SPATIAL DISTRIBUTION AND SPECIES BIODIVERSITY OF BENTHIC INFAUNA IN NYC SALT MARSHES

Erosion and sea-level rise, to name a few environmental stressors, put New York City tidal wetlands under threat of erasure. While tidal marshes provide a reliable ecosystem for shore birds, reptiles, and mammals, benthic infauna play a key role in bioturbation, subsequent nutrient cycling, and act as prey for larger fauna, which our tidal marsh ecosystems depend on. Several studies assess salt marsh vegetation and marsh erosion, but few focus on benthic infauna assessments. This study assesses benthic infauna species richness, abundance, and evenness across four salt marsh sites distributed across NYC. Initial results show higher species diversity in Alley Creek, Queens with results showing presence of Amphipoda, Gastropoda, Bivalvia, and Polychaeta, compared to a dominating abundance of Polychaeta in Fresh Creek, Brooklyn. Future annual benthic infauna sampling data can be used to understand how benthic communities are affected by sea-level rise and marsh edge erosion, and assess the success of salt marsh restoration projects. naiyiriblu.brooker@gmail.com

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PHYTOPLANKTON ASSEMBLAGE RESPONSES TO NITROGEN FOLLOWING COVID-19 STAY-IN-PLACE ORDERS IN LONG ISLAND SOUND (NEW YORK/CONNECTICUT)

The Long Island Sound (LIS) receives nitrogen (N) from runoff, atmospheric deposition, and wastewater. COVID-19 stay-in-place (SIP) orders reduced fossil fuel combustion and altered wastewater input patterns, providing an opportunity to evaluate linkages between N form, concentration, and phytoplankton assemblages. This study sampled shore sites along the Western LIS (Monthly, Nov 2020 – Dec 2021). Water quality (temperature, salinity, dissolved oxygen, turbidity, pH) was recorded. Species composition (microscopy) and biomass (chl-*a*) were analyzed. Dissolved inorganic N and phosphorus were evaluated. *In-situ* 72-hour bioassays were deployed (Sept 2021) to assess phytoplankton assemblage responses to N at pre-COVID levels. Phytoplankton community composition is presented in the context of localized nutrient conditions. Growth rates support linkages between diatom responses and inorganic N concentrations. Results provide insight into how SIP influenced biogeochemical processes and can inform water quality management.

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DIAMONDBACK TERRAPIN POPULATIONS ESTIMATES FOR THE MIDDLE BAY OF HEMPSTEAD BAY, LONG ISLAND, NEW YORK

The Department of Conservation and Waterways, Town of Hempstead, has collected data on Malaclemys terrapin (Diamondback Terrapin) for many years. The most complete data set is of nesting females at the Oceanside Marine Nature Study area using scute patterns for identification. In 2017, funding was obtained for the expansion into the use of pit tags and the collection of nesting data on the shores along the barrier beach side of the bay from Lido to Point Lookout. Some trapping was also funded and was focused on Middle Bay between the Lido and Oceanside nesting areas, providing the opportunity to tag male terrapins and females who use different nearby nesting locations. Tags were installed on 221 females and 12 males during the subsequent seasons, totaling 306 total captures, and 241 turtles overall. Mark and recapture statistics were calculated for the more lengthy Oceanside 21-year data set (2001-2021), and the presence of about 120 to 140 females nesting per year was estimated there. Results indicated that approximately 1/3 of the Oceanside terrapin were not captured and photographed or tagged, indicating that the total is near 200. Mark and recapture works best with longer data sets, but the shorter set of tagging data from Point Lookout and Lido provided initial estimates of about 700 nesting females, and trends are not yet available. Trapping data on males is not yet sufficient for estimates. With further assistance, possibly including volunteers, we hope to include other Middle Bay nesting beaches, as well as both nesting and trapping data from West Bay and East Bay. jamebro@hempsteadny.gov

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COMBINING STABLE ISOTOPE AND TRACE ELEMENT DATA FOR TRACING THE STRUCTURE OF THE ESTUARINE FOOD WEBS WITHIN MIDDLE BAY, HEMPSTEAD, NY

Funding obtained from the South Shore Estuary Reserve in 2017 provided the opportunity to take a more detailed look at the food webs and contaminants in the Middle Bay subsection of Hempstead Bay. Organisms

most closely associated with the Spartina marshlands tend to have a unique stable isotope signature that differs from organisms exclusively supported by algal productivity. It was hypothesized that legacy trace elements (e.g., Hg, Pb) would also show distinct signatures at this location, as trace elements linked to atmospheric deposition are likely to concentrate in different locations from those originating in runoff, treated effluent, or other water associated sources. To test this hypothesis and start to distinguish food web structures, samples of over 20 organisms including vegetation, grass shrimp, bivalves, crabs, forage fish, predatory fish, birds, and terrapins were collected. Varied trophic levels were represented, starting with primary producers (Ulva sp. and Spartina), then forage fish and crustaceans representing middle trophic levels, and finally predatory fish and birds representing upper trophic levels. This opens the possibility that by including natural and anthropogenic trace metals in a food web analysis, a better understanding can be achieved from the same sampling effort. Results will be discussed. jamebro@hempsteadny.gov

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TIDAL INUNDATION PATERNS IN HEMPSTEAD BAY: TEMPORAL AND SPATIAL TREND ESTIMATES FROM TIDAL DATA AND SEDIMENTATION

Tidal changes are having a deleterious impact on salt marshes throughout the east coast of the United States. However, the impact on marshlands will vary depending on local factors such as sedimentation rate, restrictions of tidal flow, and the availability of upland into which it can retreat. Local data is required before we can understand the effects on a specific marshland. In this study we collate data from NOAA LIDAR, Local TOH tidal data from multiple stations, and TNC SET sedimentation rates, with tidal inundation records from loggers. The Onset HOBO pressure loggers were fixed in place inside stilling wells located at 7 marshes forming an east to west transect through TOH West, Middle and East Bays. A north to south transect in Middle Bay included 3 of these loggers. All loggers and the immediate surrounding marsh were zeroed in using a centimeter grade GIS instrument. All data were converted into the same spatial datum and interpolated into temporal intervals to allow comparisons. Python code was then developed to calculate and visualize the trends in marsh inundation for this dynamic system. The results indicate that while the tidal trends are recording approximately an inch of rise per 5 year period, the sedimentation is falling short of that. The surrounding land use is mostly urbanized, with only parkways and some public parks having unhardened edges. This leaves little room for marshland retreat inland. The loss of vegetated marsh is occurring both internally with expanding ponds and pannes and externally along the edges. The higher Spartina patens coverage, a critical habitat for some species, is particularly vulnerable to loss to encroachment by S. alterniflora that is also losing habitat. jamebro@hempsteadny.gov

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EXPLORING THE IMPORTANCE OF MICROPLASTIC SURFACE PROPERTIES AS A VECTOR OF TOXIC METAL TO SUSPENSION FEEDERS

Microplastics (MPs) are ubiquitous in marine and estuarine environments. MPs can be similar in size to suspended sediment particles and algal cells and, as such, they may be ingested by marine filter feeders. Metals readily adsorb to the surface of MPs; ingestion therefore represents a pathway for plastic and associated toxins to enter and be transferred within the food web. This study aims to answer the following questions: Do MP surface properties influence Cd sorption and do surface properties subsequently affect Cd transfer when MPs are consumed by a model marine zooplankton? To answer these questions *A. salina* were fed MPs with different surface properties and adsorbed Cd-109. Following feeding, *A. salina* were radioanalyzed at 5, 10, 15, 30, 45, 60, 90, and 120 minutes after feeding. MPs from biofilm treatments sorbed significantly ($p<0.0001$) more Cd than those from other treatments. Most importantly, *Artemia* having fed on biofilm MPs retained more Cd than those from all other treatments. christine.bruno@csi.cuny.edu

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THIS LAND IS YOUR LAND, THIS COULD BE MARSH LAND: PROPERTY PARCEL CHARACTERISTICS OF MARSH MIGRATION CORRIDORS IN RHODE ISLAND, USA

As sea levels rise, salt marshes can migrate inland if there is adjacent, undeveloped, permeable land available. However, extensive coastal development can make finding suitable migration corridors challenging. This work seeks to characterize the property parcels within Rhode Island's projected marsh extent in 2050. We find that most parcels currently containing salt marsh are publicly owned, whereas most adjacent parcels projected to contain new salt marsh by 2050 are privately owned. Additionally, parcels containing new marsh in 2050 have higher per-hectare assessed values than parcels containing current marsh. We also describe the parcels within migration corridors with the lowest per-hectare values that may be the most cost-effective to acquire for marsh conservation. Our study highlights the expanding land use types and landowners that will be involved in marsh conservation decisions, and the economic value of potential migration corridors where costly tradeoffs may be necessary to promote coastal resilience. burman.erin@epa.gov

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CONTEXTUALIZING NEW ENGLAND TIDAL WETLANDS: NEW DATA FROM BURIED PEATS

Sediment cores offshore Long Island contain submerged peat layers that reveal clues to the ice sheet and sea level history of eastern North America. We present new analyses from these layers, including loss on ignition, pollen and macrofossil analysis, and radiocarbon dates. We determined that the peat layers were deposited in a terrestrial environment due to their high organic content (80-90%). Macrofossil specimens are also consistent with a terrestrial environment, and include abundant violet (Viola) seeds, sedge achenes (Carex trigonous, Carex lenticular), moss capsule opercula and insect elytra. Macrofossil AMS dates range from 10,000 years BP to 40,000 BP. Pollen types are consistent with radiocarbon dates and contemporaneous terrestrial pollen records; dominant types are pine (Pinus) and spruce (Picea). Overlying the peat layer is fine grained mud with abundant sphagnum leaves. This ongoing research is relevant to contextualizing the formation and history of New England's wetlands. cchang@ldeo.columbia.edu

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DRAINAGE IMPACTS ON THE PRODUCTIVITY OF WETLAND SPECIES SPARTINA ALTERNIFLORA AND SALICORNIA PACIFICA

Tidal regimes have different groundwater levels over their specific tidal cycles. It is unclear how this variable level of tidal drainage directly impacts biotic and abiotic factors in coastal wetland ecosystems. To determine the impacts of drainage levels, simulated tides in mesocosms with varying degrees of drainage were created with the U.S. Atlantic coast dominant species, *Spartina alterniflora*, and the Pacific coast dominant species, *Salicornia pacifica*. We measured biomass production and photosynthesis as measures of plant health, and we supplemented these measures with those soil and porewater characteristics to help interpret patterns of productivity. We found the greatest plant production in soils with intermediate drainage levels, with production values that were 13.7% higher in the intermediate levels for *S. alterniflora*, and 57.7% higher for *S. pacifica*.

Understanding how drainage impacts plant species is vital for predicting wetland resilience to sea level rise, as increasing water levels alter ecohydrologic zonation. kycherneskie@gmail.com

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COASTAL STORMWATER RESILIENCY: CHALLENGES AND SOLUTIONS

The global population is projected to reach 9.725 billion by 2050 and by this time, approximately 66% of the world's population will reside in urban areas with most of these cities located along coastlines. The population growth-driven land use and land cover changes in these urbanized coastlines, coupled with chronic and extreme rainfall have exacerbated environmental problems such as stormwater runoff and flooding and have increased demands on municipal water systems. These impacts will continue to get worse unless adequately addressed. J. Cherrier will share her perspectives on challenges and solutions for coastal stormwater resiliency with a specific focus on her work in metropolitan New York City coastal waters.

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THERE'S SOMETHING IN THE WATER: PATTERNS IN GROUNDWATER CHEMISTRY IN THE LAKE CHAMPLAIN BASIN

Human activities such as industrial discharge, agriculture, and road management can result in groundwater contamination. In this study we described spatial patterns in groundwater nitrate and chloride concentrations within the Lake Champlain Basin. Using the USGS National Water Quality dataset, we investigated changes in groundwater nitrate and chloride concentrations within each watershed of the Lake Champlain Basin from 1960-2020. Results from these analyses show relatively stable nitrate concentrations over this time period, but a significant increase in chloride content from 2017-2020. Of the seven New York sub-basins, the Ausable contained the highest concentrations of chloride, while the Boquet contained the highest amount of nitrate. We investigated potential drivers of nitrate and chloride contamination within the landscape using spatial data from the USGS 2019 national landcover dataset. We tested for potential associations with the proportion of the land within the watershed classified as agricultural or urban. scoop012@plattsburgh.edu

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RESILIENCE OF NATURAL AND RESTORED SALT MARSHES TO SEA-LEVEL RISE

Salt marshes are highly valued habitats due to their ecosystem services to people as well as their role in estuarine biodiversity. As a result, they are commonly targeted for restoration activities to offset the widespread habitat loss that has occurred across the Northeastern U.S. A growing emphasis on conservation and restoration will be key to protect these habitats in the future under increasing stressors from climate change. Despite the importance of these habitats, our understanding of how best to restore them for a resilient future with warming and sea-level rise is still developing. Here, we present a study of 12 natural and restored salt marshes that explored the interplay of structure, function, and genetics, and how we expect restored salt marsh responses to climate to differ from those of natural marshes. Improving our understanding of the role of foundation species genetics in these habitats will enable us to improve restoration planning and adaptive management in the future to improve outcomes.

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MICROBIAL COMMUNITIES (BACTERIA, ARCHAEA) IN AN EMBAYMENT OF LONG ISLAND SOUND DURING SUMMER HYPOXIA

The bottom waters of Western Long Island Sound (WLIS) experience hypoxia every summer due to thermal stratification and eutrophication. Bacteria and Archaea are hypothesized to both contribute and respond to these changes given their metabolic flexibility and varying ability to grow under hypoxia. To study changes in the taxonomic composition and metabolic potential of prokaryote communities, we collected surface and bottom

waters from a WLIS embayment (Hempstead Harbor) every two weeks from June to September 2022. We extracted DNA and used it for PCR amplification and Illumina sequencing of the 16S rRNA gene (V4 region). Preliminary results show changes in alpha- and beta-diversity during the summer. Ongoing analyses include annotation of metabolic potential and correlations with environmental parameters (e.g. concentration of dissolved oxygen and nitrogen compounds, temperature, etc.). We expect to find significant links between prokaryotic communities and changes in environmental conditions as hypoxia intensified during the summer. jdharam1@pride.hofstra.edu

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INVESTIGATING SALT MARSH ACCRETION RATES AND DEPOSITION EVENTS USING LONG-TERM SET DATASETS FROM PLUM ISLAND, MA

We combined two decades of sediment elevation table (SET) data from both the Plum Island Ecosystems LTER and the Parker River National Wildlife Refuge to examine the relationship between salt marsh elevation and accretion. Accretion rates varied from less than 0.1 to over 1.1 cm/year. At lower elevations, we found a relatively strong negative relationship between marsh elevation and accretion, however above elevations of 1.4 m there was no apparent relationship. We also looked at "deposition events" which we defined as an annual accretion of more than 1 cm. The frequency of deposition events has remained fairly stable from 2007-2020 with an average of three events per year occurring at different SET sites within the estuary. The highest accretion rates and deposition amounts per year were located along the Rowley River, which comes from the west and feeds directly into the southern extent of the estuary system. jade.fiorilla@gmail.com

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COMPARISON OF MICROPLASTIC ABUNDANCE BETWEEN NANTUCKET ISLAND AND CAPE COD MASSACHUSETTS

Plastic is the main source of marine debris, and the highest concentrations are found in coastal waters. Plastic can enter coastal waters by way of rivers, wind, land use, and human interaction with the water. This study's objective was to compare microplastic abundance in surface water and beach sand at two contrasting land-use sites on Cape Cod and Nantucket Island. The sites chosen include harbors with high development and year around ferry service (Hyannis Harbor on Cape Cod and Nantucket Harbor on Nantucket Island) in comparison to open ocean beaches in less developed areas (Nauset Beach on Cape Cod and Surfside Beach on Nantucket Island). Samples were collected at low tide in November and March. Results from this study will be discussed in the context of the relationship in microplastic concentration between Cape Cod and Nantucket and how it is related to human population and seasonal land-use. ryan.giffee001@umb.edu

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COMPARING BLUE CARBON STOCKS OF SEDIMENT CORES FROM A PARTIALLY RESTORED TIDAL MARSH IN PELHAM BAY PARK, NYC

New York City's Pelham Bay Park is home to nearly 500 acres of salt marshes, including Turtle Cove (40.857759, 73.805889), which generously provide ecosystem functions critical for the region's climate resiliency. These benefits range from carbon sequestration, coastal protection, water filtration and fish nursery habitat. However, the park's tidal wetlands are increasingly vulnerable to anthropogenic impacts like sea level rise and coastal development. Severe erosion and physical barriers restrict the ability of these wetlands to migrate and survive in the near future. We extracted 1.5-meter sediment cores from remaining marshes, in both a disturbed and restored area. Our data results present the analysis of loss on ignition (LOI), x-ray fluorescence (XRF), Carbon (C) isotopes, foraminifera and AMS radiocarbon dating of terrestrial macrofossils to examine

past, present and future conditions for this retreating urban wetland. The study also explores land management approaches that support the marsh's ability to store organic carbon. nlg2132@columbia.edu

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WHAT CAN WE LEARN FROM AN EMERGING WEST COAST WHELK FISHERY?

Although whelks are commonly fished and prone to overexploitation, information needed to help guide management for these species is often unavailable . This is likely due to the perceived market for these species and related (often incorrect) expectations for growth. We review these issues and their impact on northeast fisheries and relate them to the emerging fishery for Kellet's whelk in California. Harvest of the species increased dramatically over the past 50 years, and the species now supports the second largest commercial molluscan fishery in California. However, harvest regulations were not in place until 2013, and basic information needed for management is still missing. We determined the length–weight relationship for the species and considered if it differed among locations or sex. Neither whelk sex or collection region was found to significantly influence the length-weight relationship. These findings and context can be used to inform management decisions for Kellet's whelk and related species. stephen.gosnell@baruch.cuny.edu

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COASTAL ACIDIFICATION MONITORING IN LONG ISLAND SOUND TRIBUTARIES AND EMBAYMENTS

Coastal acidification threatens shellfish, aquaculture, and fishing by reducing available oxygen and impacting aquatic habitat and water quality. Coastal acidification is driven primarily by microbial respiration and is affected by eutrophication, tidal cycles, stratification, and atmospheric interaction. Estuaries and embayments in southern New England and Northern Long Island show effects of eutrophication and hypoxia, defining potential for coastal acidification. For this project, monthly samples for total alkalinity, dissolved organic carbon, dissolved inorganic carbon, and pH, along with continuous pH monitoring, will be collected as a baseline to determine areas of concern and document acidification trends within LIS. These parameters are integral in the chemical process of acidification and can be used to determine aragonite saturation, enhance our understanding of how coastal acidification relates to climate change in LIS, and identify potential impacts of freshwater inputs and salinity gradient on coastal acidification. ggroseclose@usgs.gov

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ECTOSYMBIOTIC BACTERIA OF ANAEROBIC CILIATES IN NEW ENGLAND MARINE SEDIMENTS: A NOVEL PARTNERSHIP FOR SULFATE REDUCTION

Ciliates are a diverse group of microbial eukaryotes that can thrive in anoxic habitats such as coastal marine sediments, where they form symbiotic relationships with bacteria and archaea. Anaerobic ciliates typically rely on fermentative metabolism supported by their bacterial and archaeal symbionts. However, the diversity of these partnerships, particularly in the ocean, is poorly understood. Here, we use 16S rRNA gene sequencing and fluorescence in situ hybridization (FISH) to identify and visualize the ectosymbionts associated with two marine anaerobic ciliates isolated from estuarine New England sediments. We've found that ciliates harbored species of sulfate-reducing bacteria (SRB) that act as epibionts. Anaerobic microbes converting sulfate to sulfide drive the

sulfur cycle in marine sediments, and studying their partnerships with ciliates may reveal their role in the biogeochemical cycle. ragutierrez@uri.edu

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MULTI-YEAR DYNAMICS OF FORESTED WATERSHED NURIENT EXPORT UNDER CHANGE

Climate change and invasive pests are causing widespread declines of the Eastern Hemlock in New England Forests. As these foundation tree species are lost, we anticipate changes in watershed nutrient export. To examine this, we collect weekly dissolved inorganic nutrients in three gauged streams at the Harvard Forest Long Term Ecological Research site. Dissolved inorganic nitrogen concentrations vary by stream, season, and flow. Ammonium and nitrite increase each year in spring and summer in two streams. Nitrate is highly variable from all streams. Phosphorus is consistently low. N:P concentrations suggest that nitrogen removal is taking place within a wetland through which one of the streams flows. Dissolved Si (DSi) is variable across the streams and shows a distinct spring decline supporting the emerging idea that forests help control downstream DSi availability. We will present these data and flux estimates to address how nutrient concentration and potential downstream availability has changed during this study. mehagy@bu.edu

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MEASURABLE SALT MARSH ELEVATION CHANGE IN NYC DURING A DECADE OF ACCELERATED SEA LEVEL RISE

The U.S. east coast is a hotspot for accelerated sea level rise (SLR) and urban salt marshes are particularly at risk of inundation. NYC Parks collected ten years of data from Surface Elevation Tables and associated feldspar marker horizons (SET-MH) at six salt marsh locations. To determine if salt marshes had an elevation surplus or deficit we compared net elevation change at each SET-MH unit with relative SLR at The Battery tide gauge station. The results are seemingly contradictory; the marsh with the greatest elevation surplus ranked lowest in condition. We surmise that a higher rate of accretion can be an indicator of transition toward more aquatic wetland types (high marsh to low marsh and low marsh to mudflat) and that it cannibalizes itself with the eroding edge supplying the sediment to the more internal portions of the marsh. Meanwhile, subsurface waterlogging and root-thickening processes boost elevation temporarily while still contributing to the collapse of the marsh. These findings inform restoration efforts in NYC. ellen.hartig@parks.nyc.gov

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CALORIC AVAILABILITY FOR WATERFOWL AS A METRIC FOR WETLAND MITIGATION SUCCESS

Wetland mitigation is the replacement of unavoidably lost wetland resources with created or enhanced wetlands with the goal of replacing, as fully as possible, the functions and public benefits of the lost wetland. The proposed project examines the plant and invertebrate communities of various mitigated wetlands to determine caloric availability for waterfowl. We will quantify plant species abundance within each vegetation cover type, and collect seed heads, tubers, and submerged aquatic vegetation to estimate resource availability in terms of "duck-use days." We will also conduct camera-trap surveys during the fall migration to estimate the actual use of the wetlands by waterfowl. The caloric availability and actual use will be compared to assess a mitigation project's "success." We will also determine whether commonly measured variables like plant abundance can be used to predict suitability for waterfowl. lucaskemmerling@gmail.com

Laabs*, K.L., *United States Geological Survey, New England Water Science Center*
U.S. GEOLOGICAL SURVEY COASTAL MONITORING PROGRAMS
The U.S. Geological Survey New England Water Science Center, in cooperation with various state and federal agencies, has several ongoing water quality studies in multiple embayment's and estuaries in Connecticut and Massachusetts. Currently the studies include several embayment's along the Connecticut coast of the Long Island Sound as well as the Merrimack River estuary in Massachusetts. These coastal studies combined create a large-scale active data collection network that include both discrete water-quality sampling and continuous water quality monitoring. The freshwater watersheds of each of these embayments are also monitored for nutrients to compute nutrient loading into the estuaries. The objectives of these studies are multifaceted, ranging from simple water quality conditions assessment to more complex with coastal water quality models being developed. Data collected from these estuaries will provide useful information regarding the water quality condition of estuaries at multiple scales across New England. klaabs@usgs.gov

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NUTRIENT FLUXES AND MICROBIAL COMMUNITIES RESPOND TO SEASONAL HYPOXIA IN COASTAL ZONES Coastal eutrophication alters availability of dissolved oxygen in the benthic region on seasonal timescales, with detrimental impacts on local ecosystems. Hypoxia, <below 2mg/L oxygen, impacts important geochemical cycles in the sediment. Hypoxia enhanced efflux of nutrients such as ammonium and phosphate into the water column serves as a potentially positive feedback on primary production and eutrophication. We compared in situ fluxes of ammonium and phosphate under normoxic and hypoxic conditions in Greenwich Bay, RI and through mesocosm manipulations. The magnitude of nutrient fluxes varied significantly under hypoxic conditions, highlighting a dynamic chemical and microbial response. Sediment microbial community composition, abundance, and activity is likely regulated by oxygen availability. However, other factors, such as temperature, availability of energy sources (organic matter), and abundance of other substrates (sulfide) appear important. nicole_mucci@uri.edu

Orton, P. *Stevens Institute of Technology*
ESTUARY EFFECTS OF RISING SEAS, WORSENING COASTAL STORM HAZARDS … AND MITIGATION EFFORTS
Climate change and human activities both have had and will in the future have large impacts on estuaries. Here, I will discuss how sea level rise can affect estuaries, including increasing salt intrusion and flooding. While there is little evidence that storm changes are having an impact on coastal hazards in the Northeast, human activities such as landfill and dredging are well-known to have had major influences on flooding, and I will compare these effects to those of sea level rise for the heavily urbanized Jamaica Bay area of New York City. Lastly, I will review how storm surge barriers are being considered as a potential solution to increasing coastal flooding of estuary-adjacent populations, yet pose a major threat to estuary ecosystems.

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TEMPORAL AND SPATIAL VARIATION OF THE MICROBIAL EUKARYOTE COMMUNITY IN A SEASONALLY HYPOXIC EMBAYMENT OF LONG ISLAND SOUND
Climate change is expected to expand the deoxygenation of marine waters, which in turn has effects on the entire ecosystem. Hypoxic conditions are both a cause and result of the proliferation of certain microorganisms, including microbial eukaryotes. To contrast microeukaryote communities under hypoxic and normoxic conditions, we sampled bottom and surface waters from four stations along Hempstead Harbor, Long Island Sound, every two weeks throughout summer 2022. We analyzed samples by: 1) microscope observation and

counting of microeukaryotes in water fixed with non-acid Lugol's solution; and 2) DNA sequencing of the V4 region of the 18S rRNA gene. Our preliminary results show significant correlations among microeukaryote abundance, taxonomic composition, and diverse environmental factors, including dissolved oxygen and temperature. aqureshi1@pride.hofstra.edu

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QUANTIFYING THE PHOSPHORUS CONTRIBUTIONS OF URBAN STREET TREES TO LAKE CHAMPLAIN

Excess phosphorus in freshwater ecosystems contributes to eutrophication and algal blooms. Our study focuses on quantifying the phosphorus loads from leaf litter for urban street trees in the City of Plattsburgh. We collected four leaves from randomly selected trees in the City of Plattsburgh tree database developed by Dr. Michael Burgess. We identified each tree to species and measured the diameter at breast height (dbh). Five circular samples 0.5" in diameter were punched from each fresh leaf. Samples were dried, combusted and analyzed for phosphorus content using standard colorimetric techniques. We then used allometric equations developed by the USDA for urban trees in the Northeastern United States to predict the total amount of litterfall and phosphorus load for each tree. The ultimate goal of this project is to improve future urban plantings and identify management strategies to reduce phosphorus pollution. arand008@plattsburgh.edu

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LARGE-SCALE SEDIMENT ADDITION RESTORES RESILIENCE TO A DROWNING RHODE ISLAND SALT MARSH

Thin-layer sediment placement (TLP) is an adaptation tool used to enhance tidal marsh resilience to sea-level rise. Most TLP projects have occurred along the Gulf and southeast U.S. coasts, but projects are now underway in other regions, including New England. Here, we report responses of a drowning Rhode Island marsh (Ninigret Marsh, Charlestown RI) to the addition of a thick (10-48 cm) layer of sandy dredged material to increase elevation capital and enhance declining high marsh plant cover. Elevation capital, rates of marsh elevation gain, and soil drainage all increased quickly, while signs of marsh drowning declined. Most of the marsh revegetated within a few years, leading to new areas of high marsh; low marsh Spartina alterniflora recovered more slowly. Nekton and birds were largely unaffected by project activities. Sediment placement provided the marsh with 67-320 years of ambient elevation gain and new migration corridors, increasing its long-term resilience and allowing for future expansion. kenneth.raposa@dem.ri.gov

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THE INFLUENCE OF INORGANIC NITROGEN AND PHOSPHORUS SPATIAL DISTRIBUTIONS ACROSS LONG ISLAND SOUND ON PHYTOPLANKTON BIOMASS DURING 2020 AND 2021

Long Island Sound (LIS) receives nitrogen (N) inputs from the NYC metropolitan area du runoff, combined sewer overflows, and other sources. Despite known linkages between N and algal bloom development, LIS phytoplankton assemblage spatial and temporal variability remains less characterized. This study leveraged water quality monitoring conducted by the Connecticut Department of Energy and Environmental Protection

emphasizing Western LIS (WLIS), though Central and Eastern LIS (CLIS, ELIS) were also surveyed. Water was sampled from two depths (0.5 m and 2 m) then evaluated for water quality, nutrients, phytoplankton biomass (>20 &mum, 20-5 &mum, <5 &mum), and species composition. Inorganic N and phosphate concentrations, as well as picoplankton biomass, were higher in WLIS and decreased towards ELIS coincident with less urbanization. In contrast, microplankton biomass increased west to east, paralleling clearer, more oceanic waters. Results will refine our understanding the spatial trends of phytoplankton and water quality across LIS. zaroldanayala@vims.edu

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NORTHEAST REVERTING SALT MARSHES

Unditched salt marshes have continuous levees supporting *Spartina patens* and an interior basin dominated by stunted *S. alterniflora*. Miller & Egler (1950) would note that "until ditched marshes are allowed to revert to a natural equilibrium, many important problems must remain unsolved." Given time, marshes drained for reclamation (agriculture) or mosquito control will revert to the natural equilibrium through the restoration of a continuous levee which disconnects the basins from the creeks and restores the pre-ditching sedimentation rates and stable vegetation patterns. saltmarshmd@charter.net

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A MESOCOSM EXPERIMENT: EFFECTS OF OYSTER AND TEMPERATURE ON SEAGRASS SYSTEMS

Warming trends in estuaries may affect system functioning. Seagrass and oyster beds are biogenic habitats of global importance in shallow waters as they provide many critical ecosystem functions. We simulated seagrass systems in mesocosms to test the main effects and interactions of oysters (presence/absence) and water temperature (ambient, +2 C) on water quality, eelgrass, macroalgae, and chlorophyll. Eelgrass biomass and chlorophyll under ambient temperature were significantly greater than under elevated temperature. There was no apparent effect of oyster presence on nutrients, light, eelgrass biomass, or chlorophyll. The presence of oysters alone and elevated temperature alone significantly increased dissolved carbon. In addition, algal cover showed a significant oyster by temperature interaction with greater algal cover in the mesocosms with both oysters and elevated temperatures. This research highlights the importance of considering the interactive effects of seagrass and oysters when investigating climate impacts on systems. schafer.natalie@epa.gov

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OBSERVATIONS OF WICKFORD HARBOR, RI BEFORE AND DURING NON-POINT SOURCE NUTRIENT REDUCTIONS

Septic inputs are considered to be the primary source of nutrients in some shallow embayments in Wickford Harbor, RI. In 2017, the town of North Kingstown installed a sewer line to decrease non-point source nitrogen (N) contributions, and in the years since then local shops, restaurants, and some homes have tied in. In 2018 we began monthly monitoring of nutrients, stable isotopes, and water quality parameters to characterize the embayments before and during reductions in septic inputs. Fecal coliform counts averaged 65.4 CFU/100ml with a maximum of 588.0 CFU/100ml, indicating the presence of septic effluent. Particulate organic matter analyzed for N stable isotopes has an average $\delta^{15}N$ of 7.9 permil, consistent with sewage influence, but seasonal decreases to < 5 permil suggest complex N dynamics. Definitive responses to the non-point N reductions have not yet been detected but we expected slow responses. We will continue to monitor so that we can draw conclusions about the reduction of non-point source pollution in the future. schwartz.morgan@epa.gov

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URBAN WATERS INITIATIVE: EVALUATING POTENTIAL IMPACT OF URBAN RUNOFF ON WATER CHEMISTRY OF LOCAL RIVERS

Coastal New Haven waterways have historically been at the center of commercial and ecological studies. With negative impacts frequently observed, all suggest better management of these waters is a necessity moving forward. This study was designed to evaluate connections between pollution threats from the watershed and changes in already ecologically sensitive coastal waters. Student teams evaluated changes in abiotics such as dissolved oxygen, nutrients content (nitrate and ammonia), and water clarity as a product of heavy rain events within the watershed. Student teams have deciphered multiple emerging patterns of connections between both rainfall and water chemistry in local bottom waters (dissolved oxygen $R^2 = 0.712$, ammonia $R^2 = 0.625$) as a result of flushing events and this in turn has spawned several new initiatives looking at the potential implications for bacterial and oyster populations. In addition, community outreach initiatives have allowed students to bring this awareness to several groups within the New Haven area. charles.mulligan@new-haven.k12.ct.us

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LOUIS AGASSIZ AND DAVID STARR JORDAN: CONTRASTING LIVES IN SCIENCE

Louis Agassiz made his initial name in Europe with his studies of fossil fish and glaciers. He was invited to the US in 1846 to give a series of lectures ending with the Lowell Lectures in Boston. After the lectures, his presence was so coveted that he remained in Boston until he died in 1873. During his time in the US he became known for a number of accomplishments: establishment of The Museum of Comparative Zoology at Harvard, over 400 books/articles on a variety of topics including glaciers and natural history, his role as advisor of graduate students at Harvard, and the establishment of the marine station on Penikese Island upon which the Marine Biological Laboratory at Woods Hole was modeled. He is also famous (infamous) for crowdsourcing science, rejecting Darwinism, for being a horrible model of a major professor and for his positions on racism. David Starr Jordan was in Agassiz's graduate student pool. He is known for his knowledge of fish, being the President lts@plymouth.edu

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50 YEARS OF THE CLEAN WATER ACT - TURNING THE TITANIC AFTER STRIKING THE ICEBERG

The Clean Water Act (CWA) has been a durable foundation for water quality regulation and management; however, its overarching mission …to restore and maintain the chemical, physical and biointegrity of the Nation's waters has not been attained. Despite measurable improvements with the egregious impacts of xenobiotics, the CWA has struck a proverbial iceberg: landscape degradation and climate change, major drivers of a looming biodiversity crisis. Associated chemical and physical pressures from degraded watershed ecosystems have caused widespread cultural eutrophication and contributed to ecosystem service losses essential to human health and welfare. I will explore the looming biodiversity tragedy in context of regulatory controls that have not preserved watershed integrity, and prospects for navigating the sinking Titanic through troubled waters in today's social-ecological system context. Long Island Sound coastal watershed examples illustrate the CWA's ability to combat these intractable problems, and what changes may be needed. footprintsinthewater@outlook.com

Stinnette*, I.S., *Hudson River Foundation*

AQUATIC CONNECTIVITY THROUGH CLIMATE-READY INFRASTRUCTURE

Restoring aquatic connectivity removes barriers to provide more habitat for fish and other wildlife that migrate up and downstream as part of their lifecycle. This is especially critical for anadromous fish species that are already vulnerable due to climate change and fishing pressure. While aquatic connectivity has been studied in Estuary watersheds with respect to dams, the effectiveness of aquatic passage at road-stream crossing infrastructure is less certain. Longer stretches of connected stream habitat are also more resilient to changes in climate and land use. Dams and undersized culverts affect hydrology, sediment transport, and water quality, and cost money to replace and maintain. HEP's assessment combined a model that evaluates aquatic connectivity

with one that evaluates hydrologic issues that can lead to erosion and flooding. The resulting prioritization is being shared with stakeholders to advance planning and capital projects that will replace problematic crossings with climate-ready, connectivity-friendly versions. istinnette@hudsonriver.org

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THE EFFECTS OF GEOGRAPHY, MICROHABITAT, AND COMPETITION ON SEMIBALANUS BALANOIDES AND CHTHAMALUS FRAGILIS

Semibalanus balanoides and *Chthamlus fragilis* are two common barnacles in New England. This research attempts to determine the effects of intraspecific competition and microhabitat on *S. balanoides* in Beverly, MA and Kittery, ME, and determine whether *C. fragilis* is present in either location. It is expected that *C. fragilis* will be in places where competition from *S. balanoides* has been eliminated, and that *S. balanoides* will have higher recruitment in ME and higher growth rates in MA. *C. fragilis* was not found in either site. More recruitment occurred in MA. More growth was found in individuals at a lower tide height, which corresponded with higher carbon content, likely due to more food availability. Subtle temperature differences between sites may explain differences. Further research should pinpoint recruitment timing for both species in both locations, and should investigate the true northern limit of *C. fragilis*. bthie923@mail.endicott.edu

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ASSESING CHANGES IN COASTAL ECOSYSTEM ENGINEERS IN NARRAGANSETT BAY

The use and development of Narragansett Bay, RI has changed drastically from the 1960's to today, with increased urban development and anthropogenic factors impacting nearly all aspects of Narragansett Bay's diverse ecosystems. Rockweed, *Ascophyllum* and *Fucus*, and kelp, *Saccharina*, are ecosystem engineers in the rocky intertidal and subtidal ecosystems across Narragansett Bay. As ecosystem engineers, these species form the foundation of benthic habitats and provide many essential ecosystem services, but both groups may be impacted by a changing climate. To investigate this, we recently conducted extensive underwater video surveys at several rockweed and kelp sites in Narragansett Bay, from which we quantified the percent coverage and distribution of each species present. By comparing these findings with historical published data from the past several decades, we are investigating how these systems have changed from the 1960's to today. rebecca_venezia@uri.edu

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UNDERSTANDING THE OUTCOME OF COMPETITION BETWEEN SPARTINA ALTERNIFLORA AND PHRAGMITES AUSTRALIS USING A MODEL AND FIELD COLLECTED DATA

Phragmites australis has been invading salt marshes along the Atlantic coast of the US, in many cases displacing the native *Spartina alterniflora*. The purpose of this study was to examine competition between the two salt march species. We combined field data collected at Plum Island, Massachusetts, with a mathematical model to see the influence of climate change on the competition between the two species. We tested three scenarios over 100 years; a doubling of CO_2, an increase in temperature of 3.6 Celsius, and both. We found that under all future simulated climate conditions, *Phragmites* can become a better competitor than *Spartina* based on three results: 1) *Phragmites* has larger above ground biomass and is taller than *Spartina*; 2)Under all climate change scenarios Phragmites biomass increases faster than *Spartina*; 3) *Phragmites* takes up more nutrients into biomass and loses less carbon and nitrogen from the ecosystem than *Spartina*. wang278y@mtholyoke.edu

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ANALYSIS OF *ZOSTERA MARINA* BED CHANGES IN LITTLE NARRAGANSETT BAY, R.I.
Zostera marina (Eelgrass) is a marine angiosperm that grows in shallow bays and estuaries and is an essential habitat/food source for marine organisms and migratory waterfowl. The largest contiguous patch of *Z. marina* in Rhode Island is in the Little Narragansett Bay (LNB) estuary. We analyzed side-scan sonar, oblique aerial photography, digital orthophotography, and underwater video imagery to document historical changes in the LNB Eelgrass bed between 2019-2022. Previous studies suggested a decline between 2012 and 2016. Side-scan sonar data recorded an increase between 2019 (0.52km^2 (128 Acres)) and 2022 (0.75km^2 (185 acres)). LIDAR surveys with bathymetric returns from 2010, 2014, and 2018 were analyzed to identify a relationship between elevation and eelgrass beds. With only a small area along the eastern border exceeding the identified vertical uncertainty, a correlation could not be identified. Annual monitoring of *Z. marina* extent and condition is vital and will be continued. watlinge@my.easternct.edu

Weis*, J.S., *Rutgers University*
THE NEWEST "HOPE SPOT": THE NY/NJ HARBOR ESTUARY
The NY/NJ Harbor Estuary has been designated a "Hope Spot" by Mission Blue (Sylvia Earle's organization) because of the amazing improvements in water quality, biodiversity, habitat, and public access that have taken place over the past several decades. This astounding improvement is due to the federal Clean Water Act and the actions of many government and non-governmental organizations which work in different parts of the estuary. This illustrated presentation by the scientist who nominated our estuary and who has studied it for several decades, will recall the "bad old days" and demonstrate how far we have come. We still have a way to go, but its good to be rewarded for what we have accomplished. jweis@newark.rutgers.edu

Weiss, **A.** *Billion Oyster Project*
COMMUNITY ENGAGEMENT AND COASTAL RESILIENCE
Communities are integral to creating resilience along vulnerable coasts. Restoration projects and other mitigation efforts are not sustainable without community buy-in, and by centering those most impacted, we can design long-term responses to coastal change. I will review how communities and societies are affected by hazards such as climate change and pollution and discuss innovative, community-centered solutions that are being implemented in New York City. This talk will provide insight and examples of community engagement from the Community Science Program at the Billion Oyster Project, focusing on the Community Water Quality Testing Program and Oyster Research Station Program.

White*, J., S. Brown, S. Wood, J. Urban-Rich, *School for the Environment, University of Massachusetts Boston*
THE DIET OF GRAY SEALS IN NEW ENGLAND
The North Atlantic Gray Seal, (*Halichoerus grypus*), is found in Nantucket Sound with several large haul out sites within Nantucket Island. As a generalist feeder the Grey Seal, feeds on multiple fish species, crustaceans, and cephalopods. This project examines the diet of a local population of Grey Seals using 112 scat samples collected on Great Point, Nantucket Island from 2017-2022 using hard parts (e.g. fish otoliths, squid beaks, dermal denticles and vertebrae) and DNA metabarcoding. This data can also help observe how microplastics can move into top predators in the food web in intourist-heavy commercial areas like Nantucket island. The most common otoliths we have observed in our samples are *Ammodytus americanus*, known as the American Sand Lance, as well as multiple species of Hakes. The samples will be analyzed for seasonal and annual changes in diet and the results presented and discussed in relationship to commercial fishing and microplastic abundance in the scat. jack.white001@umb.edu

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VARIABILITY OF GREENHOUSE GAS FLUXES IN WETLANDS AND IMPORTANCE TO BLUE CARBON ASSESSMENTS

Blue carbon (C) represents long-term C storage in wetlands and rivals C stored in land forests. Methane (CH_4) and nitrous oxide (N_2O) emissions from wetlands may offset C stored. We examined greenhouse gas (GHG) fluxes associated with elevation enhancement, urbanization, and proximity to oyster aquaculture. Placement of sediments on drowning salt marshes is a restoration approach to build elevation. In a lab study, additions of 5 and 10 cm of dredged sand to the marsh surface resulted in short-term increases in CH_4 and N_2O emissions. Along an urbanization gradient in the San Juan Bay Estuary (PR), CH_4 emissions from urbanized mangrove sites were five times greater than less urbanized sites. GHG fluxes in eelgrass beds near and distal to oyster aquaculture are now being studied. Using carbon dioxide (CO_2) equivalent coefficients for CH_4 and N_2O, the balance between wetland CO_2 uptake and CH_4 and NO_2 fluxes are assessed. Consideration of anthropogenic stressors on GHG fluxes in wetlands is important to better understand blue C sinks. wigand.cathleen@epa.gov

Yellen*, B., W. Teng, Q. Yu, B. Turek, J. Richardson, T. Cook, J. Woodruff, *University of Massachusetts*

PROCESS-BASED MAPPING OF NORTHEAST US TIDAL MARSH BLUE CARBON AND MINERAL SEDIMENT BUDGETS

The term blue carbon refers to carbon stored in the world's oceans, which collectively capture about one quarter of the CO_2 emitted by fossil fuel combustion. In recent decades, a growing body of work has highlighted the disproportionate amount of this blue carbon stored in tidal wetland soils, enabled by their high bioproductivity, saturated anoxic conditions that tend to preserve soil carbon, and accommodation space for new carbon provided by continual sea level rise. With the rise of carbon markets, we face the challenge of quantifying carbon stocks and sequestration rates to properly incentivize nature-based carbon mitigation. Previous efforts to map tidal marsh carbon content have employed geostatistical methods. Here, we present process-based mapping methods based on lidar and spectral remotely sensed observations that capture heterogeneity in soil carbon content within and between tidal wetland complexes. We applied our model to the entire Northeast US tidal wetland coverage from New York to Maine to quantify carbon stocks and sequestration rates for the region. Further, we have leveraged our blue carbon modeling results to quantify mineral sediment accumulation across the Northeast US to identify the ongoing sediment needs of tidal marshes in the region to keep pace with current rates of sea level rise. byellen@umass.edu