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Abstracts

Autery*, M.R. (1), J. Woodruff (1), B. Johnson (2), B. Yellen (1), E. Peck (1); *(1) University of Massachusetts Amherst, Amherst, MA; (2) Bates College, Lewiston, ME*

SALT MARSH STRATIGRAPHY AND PROXIES FOR ENVIRONMENTAL CHANGE: A CASE STUDY AT COUSINS RIVER, FREEPORT, MAINE

Salt marshes in New England formed approximately 4,000 years ago following a deceleration in post-glacial sea level rise. The coast of Maine has since experienced significant climate and land use change, with implications for the geological and ecological processes governing marsh stability. Salt marshes have the potential to preserve these changes in the stratigraphic record, which we can observe through various "proxies" indicative of environmental change. These proxies relate to common sedimentary properties, like fluctuations in organic matter, stable isotope abundance, and grain size. Using sediment cores taken from a representative marsh system (Cousins River Marsh in Freeport, Maine) and historical records of land use, this project aims to 1) assess the ability of different proxies to identify periods of environmental change, 2) develop a timeline of sedimentological and human-driven change at Cousins River Marsh, and 3) investigate the legacy of salt marsh agriculture in Maine and the Northeast. mautery@umass.edu

Balint*, S.J. (1), C. Oviatt (2), H. Stoffel (2), R.W. Fulweiler (1,3); *(1) Department of Earth & Environment, Boston University, Boston, MA; (2) Graduate School of Oceanography, University of Rhode Island, Narragansett, RI; (3) Department of Biology, Boston University, Boston, MA*

TWO DECADES OF NET ECOSYSTEM METABOLISM IN NARRAGANSETT BAY, RI REFLECT AN ESTUARY UNDER CHANGE

The combined effects of managed nitrogen (N) reductions and climate change complicate the ecological trajectory of temperate estuaries, including Narragansett Bay, RI where wastewater N loading has decreased by >50% concurrently with changes to water temperature and precipitation. Here, we estimate nearly two decades (2003-2022) of production, respiration, and net ecosystem metabolism (NEM) to assess how the estuary has responded to these anthropogenic forcings. Production in the upper Bay decreased prior to 2012 and remained largely unchanged between 2012 and 2018 before a marked increase in summertime NEM is evident across the entire Bay. Preliminary analysis suggests that tidally adjusting NEM improves estimates throughout the system. We will examine benthic-pelagic coupling and meteorological changes to further explore these trends in NEM. This preliminary work indicates that the seasonality of NEM is changing in the Bay, and parsing the proportion of change due to N reductions and climate change requires further investigation. sjbalint@bu.edu

Bean*, E.E. (1), B. Oakley (1); *Environmental Earth Science Department, Eastern Connecticut State University*

DOCUMENTING STORM IMPACTS ON A COASTAL BARRIER SYSTEM: NAPATREE POINT CONSERVATION AREA, RHODE ISLAND

The Napatree Point Conservation Area (NPCA) is a 2 km barrier spit that was mapped after three storm events (12/18/23; 1/10/24 and 1/13/24); water levels in all three storms approached 1 m MHHW and offshore wave heights exceeded 7.5 m in two storms. The landward extent of overwash was mapped and compared to the dune crest and volume from spring 2022 USGS LiDAR using RTK-GPS and differential GPS, and the Digital Shoreline Analysis System within ArcMap. Transects (n = 5), measured since 2013 and surveyed pre/post storms. Additional elevation transects (n = 10) extending across the barrier as well as a surge channel and

washover fan were mapped to compare the volumes before/after the 12/18 and 1/10 storm events, improving understanding of changing barrier morphology and volume. The transects show net erosion. Timing between storm events contributes to dune erosion and barrier migration. Understanding storm impacts on barriers over different timeframes will help to predict future storm impacts at the NPCA and other coastal barriers.
beane@my.easternct.edu

Beardwood*, A., C. Wigand, S. Ayvazian, D. Cobb, P. Colarusso, N. Schafer; *Environmental Protection Agency, Narragansett, RI*

A NARRAGANSETT BAY MESOCOSM EXPERIMENT: EFFECTS OF EELGRASS DENSITY ON GREENHOUSE GAS FLUXES

Seagrass beds provide key benefits, including playing a critical role in climate mitigation. We tested the effects of different eelgrass densities on greenhouse gas (GHG) fluxes at the water-atmosphere interface by creating six treatments (4 reps ea.) with different shoot densities (per m2): bare (0), sparse (~60), low (~120), medium (~150), medium-high (~180), and high (~215) in 115-gallon mesocosms with flow-through bay water. Preliminary data suggest that there are little differences in GHG emissions measured among the different eelgrass densities. During the day and night eelgrass system emissions (CO2e-100y) are dominated by CO2 (78–88%) followed by N2O (11–21%) and CH4 (0.9–1.6 %). We observed N2O uptake in bare treatments, while CO2 and CH4 were emitted. The N2O emissions offset ~13% (CO2e-100y) of the combined CO2 and CH4 emissions in bare sediments. We suspect that there was not greater CO2 uptake by higher density eelgrass treatments as expected due to respiration from epifauna and epiphytes, which colonized leaf surfaces.
beardwood.alexandra@epa.gov

Benvenuti* B. (1), K. O'Brien (2); *(1) Ducks Unlimited; (2) Rachel Carson National Wildlife Refuge*

HIGH HOPES: BUILDING MARSH ELEVATION AND UNDERSTANDING THROUGH THIN LAYER SEDIMENT PLACEMENT

Recent analysis of elevation and tidal data indicates many southern Maine tidal marshes are not building elevation at a rate that is necessary to keep pace with current sea-level rise and the signatures of degradation are already present. Restoration of these systems for ecological integrity and community resilience is urgent before they decline to a point where restoration would be more costly and less effective. This requires a combination of techniques at multiple spatial scales and a phased restoration approach. Our project knits together interdisciplinary research and evidence-based conservation to address elevation deficits due to historic marsh agriculture. Through active collaboration between conservation partners, municipalities, policymakers, scientists, and community members, we will implement the first beneficial use of sediment project in northern New England by placing ~1,000 cubic yards of dredged sediment on the marsh surface. Upon completion, we anticipate this project will serve as a template that can build the knowledge base and acceptance of this restoration practice within the regulatory, restoration, and natural resource community in Maine.
bbenvenuti@ducks.org

Berounsky*, V.M. (1,2), A. DeSilva (1,2), E. Peterson (2), R. Sharif (2), L. Green (3), E. Herron (3); *(1) Graduate School of Oceanography, University of Rhode Island, Narragansett, RI; (2) Narrow River Preservation Association, Saunderstown, RI; (3) Watershed Watch Program, University of Rhode Island, Kingston, RI*

THIRTY YEARS OF WATER QUALITY MONITORING AND MANAGING ANTHROPOGENIC INPUTS IN PETTAQUAMSCUTT ESTUARY (NARROW RIVER) IN SOUTHERN RHODE ISLAND.

The value of long-term monitoring is evident when examining a 1992 to 2022 data set (dissolved oxygen, nitrogen and phosphorus, fecal coliform and enterococci bacteria, pH, salinity, and chlorophyll) that has been collected monthly from May through September from 10 stations in the Pettaquamscutt Estuary (Narrow River). A dramatic increase in watershed residential development since the 1960's coincided with increasing bacteria

levels sufficient to close part of the estuary to shellfishing. Our sampling commenced just prior to the installation of municipal sewers and continued through the extension of sewer lines and the periodic building of neighborhood stormwater detention ponds and swales. These Best Management Practices (BMPs) appear to be reducing levels in the estuary itself but more BMPs are needed. Concentrations of ammonia and nitrate plus nitrite are lower in recent years. The reductions in nutrients and bacteria in the estuary were not seen after ten years of monitoring, emphasizing the need for long term monitoring. vmberounsky@uri.edu

Black*, S.K., D.M. FitzGerald, Z.J. Hughes; *Boston University, Boston, MA*

INCREASED SUSPENDED SEDIMENT DEPOSITION FOLLOWING STORMS ON A NEW ENGLAND SALT MARSH, PLUM ISLAND ESTUARY, MASSACHUSETTS

Under most weather and tidal conditions, the influx of inorganic sediment to New England salt marshes is low and thus, they must rely on organic sediment for accretion to keep pace with accelerating sea-level rise. However, the combined effects of strong extratropical storms and elevated astronomic tidal conditions increase current velocities and suspended sediment, delivering high quantities of mineral sediment to the marsh platform. This study examines water samples collected during several storm events at three sites within Plum Island Estuary to explore what conditions maximize sediment deposition on the marsh. We also have investigated the origin of this sediment (riverine, estuarine, or marine). We find that the impact of a single storm on sediment deposition varies greatly depending on the duration of the storm, wind direction, and timing with the tides. Maximum deposition occurs when winds are blowing onshore, the height of the storm coincides with low to mid-tide, and the following high tide is amplified by a storm surge. blacks@bu.edu

Bolt*, D.A. (1), R.W. Jakuba (2); *(1) Northeastern University, Boston, MA; (2) Buzzards Bay Coalition, New Bedford, MA*

IMPACTS OF *SESARMA* CRABS IN A FAIRHAVEN, MASSACHUSETTS SALT MARSH

Sesarma reticulatum are native, nocturnal crabs in Eastern U.S. salt marshes. Increased burrowing and foraging near creeks was observed at multiple sites in the Little Bay marsh. We hypothesized a direct correlation between these bare, burrow-ridden areas and expanded *Sesarma* abundance. A pitfall trapping experiment was conducted to compare abundances along creek edges in bare “die-off” zones to vegetated "healthy" zones. We counted the number of small vs. large burrows, *Spartina alterniflora* stems, and *Sesarma*-grazed stems in each zone type. Our results show there were more *Sesarma* in die-off zones than healthy zones in most cases. There were always more burrows and higher percentages of clipped stems in the die-off zones. Our results suggest that *Sesarma* are the current culprit of marsh grass loss in the die-off areas of our study. More research is needed involving the reason behind *Sesarma* population booms and the ways to combat the degradation of coastal salt marsh vegetation. devonab20@gmail.com

Bonacchi*, E.C. (1), J.P. Browne (1), C. Freudenberg (1), R.L. Burke (2); *(1) Town of Hempstead Department of Conservation & Waterways, NY; (2) Department of Biology, Hofstra University, NY*

EVALUATING EXPOSURE OF DIAMONDBACK TERRAPINS TO MICROPLASTIC POLLUTION IN HEMPSTEAD BAY

Coastal communities contribute to marine plastic pollution from various anthropogenic activities. Estuaries act as reservoirs for microplastic contamination. Current research shows the infiltration of microplastics in the marine food web and the potential risk for ecotoxicity once ingested. As a keystone species, Diamondback Terrapins serve as models for the abundance of microplastics present in estuarine ecosystems. Fecal samples were collected from Diamondback terrapins in two locations. Samples were subjected to wet sieving, wet peroxide oxidation, density separation, and lastly vacuum filtration and ultimately mounted onto slides for fluorescence microscopy. The total particle area and the total number of particles were calculated for each sample. Microplastics were found in all samples analyzed. These results stress the role that coastal populations have on surrounding ecosystems. The abundance of microplastics present suggests food chain contamination and microplastic contaminated residential wastewater runoff. embonacchi@gmail.com

Bressette*, A (1), Thomas*, S (2), Branco, B (2,3); *(1) Center for Environmental Studies, Virginia Commonwealth University; (2) Department of Earth and Environmental Sciences, Brooklyn College, City University of New York; (3) Science and Resilience Institute at Jamaica Bay, NY*

FACTORS DETERMINING THE SUCCESS OF RECENTLY PLANTED SPARTINA ALTERNIFLORA ON A LIVING SHORELINE IN JAMAICA BAY, NY

Natural and nature-based features have been implemented throughout New York City to provide habitat and reduce flooding, erosion, and pollution. The West Pond Living Shoreline in Jamaica Bay, NY was designed with organic breakwaters and native marsh plants, including *S. alterniflora*. Post-construction monitoring in 2021 found that percent coverage of *S. alterniflora* was lower than expected. To inform future management, we studied the effect of elevation, planting method, and shoreline energy exposure on the percent cover, average stem height, and average stem density of *S. alterniflora*. Elevation and plant growth data were collected within 8 one sq. meter quadrats at 12 locations. We found variation in mean percent cover amongst the locations. Linear models revealed negative relationships between elevation and all three measures of planting success. Erosion rates are likely higher on the east of the living shoreline, which was breached during Superstorm Sandy, indicating a historic vulnerability to erosion. shakirathomas493@gmail.com

Burdick*, D.M. (1), S.C. Adamowicz (2), G. Wilson (3), J.G. McKown (1), N. Maher (4), G.E. Moore (1); *(1) Jackson Estuarine Laboratory, University of New Hampshire, Durham, NH; (2) Rachel Carson NWR, USF&WS, Wells, ME; (3) Bear Creek Sanctuary, Saugus, MA; (4) TNC, Cold Spring Harbor, NY*

SALT MARSH ECOLOGY AFTER EUROPEAN SETTLEMENT: REJECTING FALSE ASSUMPTIONS TO RESTORE SURFACE HYDROLOGY

The study of salt marshes often includes a reference area considered to be pristine or largely unimpacted by humans, but all salt marshes in the Northeast have been altered for agriculture. All marshes examined to date show evidence of intensive agriculture that controlled drainage and tidal hydrology through ditching, tide gates and embankments. Abandonment of most farming practices (except for salt haying) has recently combined with greater rates of seal level rise to interfere with marsh building where remaining ditches oxidize peat and where impounded waters kill off vegetation. Natural-looking tidal creeks can be found everywhere, but once we understand they are the result of marshes adapting to impairments, a paradigm reveals misguided assumptions. By reading these patterns in the context of secondary succession, surface hydrology can be restored using complementary techniques that either improve drainage through runnelling or reduce excessive drainage through ditch remediation. david.burdick@unh.edu

Cashel, F.S. (1), C.D. Knightes (2); *(1) Oak Ridge Institute for Science & Education at United States Environmental Protection Agency, Narragansett, RI; (2) United States Environmental Protection Agency, Narragansett, RI.*

IMPROVED SIMULATION OF DO AND WATER CLARITY WITH INCREASED ECOLOGICAL COMPLEXITY IN A 3D WATER QUALITY MODEL

Anthropogenic disturbances have increased the frequency, area, and intensity of eutrophic events in coastal ecosystems, harming seagrass and macrofauna. The Pawcatuck River and Little Narragansett Bay (CT/RI) is a small, shallow estuary with zones of hypoxia due to algal growth. Here, we study the governing mechanisms of dissolved oxygen (DO), water clarity, phytoplankton, and macroalgae blooms using observed data and a mechanistic modeling approach. We developed a three-dimensional hydrodynamic-water quality model with macroalgae and multiple size classes of phytoplankton. The high spatial resolution and ecological complexity of the model captured the spatiotemporal variation of DO, with depth, stratification and sediment oxygen demand, as well as phytoplankton growth dynamics in the mid-river, and macroalgal-driven light and nutrient limitation in the Bay. This work provides a greater understanding of the factors impacting DO and water clarity, which may increase the capacity of management to recover coastal seagrass populations. cashel.finnian@epa.gov

Castagno*, K. A. (1), T. Tucker (1), M. Borrelli (1), T. Smith (2); *(1) Center for Coastal Studies, Provincetown, MA; (2) Cape Cod National Seashore, Wellfleet, MA*

A SYSTEM IN TRANSITION: GEOLOGIC HISTORY AT DUCK HARBOR, WELLFLEET, MA

The system at Duck Harbor, Wellfleet, MA, has undergone many landscape changes in the past century, transitioning from an open harbor to a marsh to a forest. Episodic overwashing at astronomically high tides has led to the formation of a two-acre washover fan at the beach. Inundation by salt water has killed 120 acres of trees and shrubs in the low-lying basin behind the washover fan. As the salt-killed vegetation is removed and regular salt water inundation continues, salt marsh vegetation has begun to repopulate the basin. Using a series of more than 200 cores, we present stratigraphic maps spanning approximately 40 acres of the low-lying basin, reconstructing how it has transitioned over time. Duck Harbor is part of the Herring River floodplain, and transitions at Duck Harbor are natural analogues to the restoration of the larger Herring River, the largest tidal restoration project in New England. As such, our understanding of the present and past dynamics of the system will aid in better management of the entire floodplain. kcastagno@coastalstudies.org

Champlin*, L. K. (1), E.M. Wilson (1), K. Raposa (2), J. Vaudrey (3), M. Tyrrell (4), C. Peter (5), J. Goldstein (6), R.W. Fulweiler (1,7); *(1) Dept. of Earth & Environment, Boston University, Boston, MA; (2) Narragansett Bay National Estuarine Research Reserve (NERR), Portsmouth, RI; (3) Connecticut NERR, Groton, CT; (4) Waquoit Bay NERR, Falmouth, MA; (5) Great Bay NERR, Greenland, NH; (6) Wells NERR, Wells, ME; (7) Dept. of Biology, Boston University*

A NEW ENGLAND GRADIENT OF SALT MARSH GREENHOUSE GAS FLUXES

A large uncertainty surrounds the function of salt marshes as a source or sink of greenhouse gases (GHG). Specially, limited vertical flux measurements across regional climate gradients and lack of wintertime sampling constrain our understanding of how warming temperatures will impact carbon sequestration. A need for coordinated datasets led us to measure winter GHG fluxes at National Estuarine Research Reserves (NERR), as a baseline for monitoring during warming winters. Using new, portable sensors, we measured CO2 fluxes in marshes at five NERRs from Maine to Connecticut during the dormant season (December and February). Across this latitudinal gradient, we investigated spatial scaling within meters across a marsh, between marshes, and between estuaries. By examining spatial autocorrelation of fluxes across these scales, we reveal high variability within marshes. Year-round monitoring of regional GHG fluxes could provide significant perspective on the impact of climate change on salt marsh carbon sequestration. lkc4@bu.edu

Claesson*, S., E. Linder, M. Duckett, C. Shipley; *Nearview, LLC*

USING MULTISPECTRAL IMAGERY FROM DRONES AND SATELLITES TO ESTIMATE BIOMASS OF INTERTIDAL SEAWEED

Intertidal seaweed has emerged as a crucial resource for both consumer and industrial applications. Balancing conflicting interests of seaweed harvesters and conservationists requires frequent assessment of intertidal seaweed biomass. Traditional in-situ biomass measurements are costly and often limited in distribution, requiring extensive extrapolation. In this study, we employ Partial-Least-Squares models to predict wet weight and canopy depth based on reflectance from multispectral drone imagery. Our methodology involves down-sampling hyperspectral lab measurements to match multispectral drone imagery. To validate our models, we conducted quadrat sampling at multiple sites. Our findings reveal a close approximation of predicted biomass to models based on canopy depth. This approximation is facilitated by a linear relationship between weight and depth in the logarithmic scale. Notably, in-situ depth sampling can offer a practical advantage over weights in obtaining accurate biomass estimates of intertidal seaweed. stefan@nearview.net

Cook T.*, L.M. Autery, J.D. Woodruff, B.C. Yellen; *University of Massachusetts Amherst, Department of Earth, Geographic, & Climate Sciences, Amherst, MA*

TIDAL WETLAND ACCRETION AND ELEVATION CHANGE ALONG THE ATLANTIC COASTLINE OF THE NORTHEASTERN UNITED STATES

Vertical accretion and elevation gain are a critical factor in the maintenance and survival of tidal wetlands in the face of rising sea level. This study compiles and reviews published marsh accretion and elevation change data from the northeast US coastline. Data were compiled in a database in a standardized format and tagged with geospatial and physical attributes. We provide an initial overview and interpretation of the regional dataset in addition to releasing the data in the form of an interactive web map (www.marshdata.org). The median value of all accretion and elevation change rates in the database is 2.9 mm/yr. 59 % of accretion and elevation change rates are not presently keeping pace with the regional rate of relative sea-level rise from 1971-2020, 3.2 mm/yr. Comparison of accretion and elevation change rates to the unvegetated to vegetated ratio (UVVR) metric of horizontal marsh integrity shows that regionally, marshes exist in a wide range of apparent vertical and horizontal stability and instability. tlcoo0@umass.edu

Cooper*, S. (1), B. Kahn (2), J. Smith (3), C. Zarnoch (2), M. Alldred (1); *(1) Center for Earth & Environmental Science, SUNY Plattsburgh, Plattsburgh, NY; (2) Department of Natural Sciences, Baruch College CUNY, New York, NY; (3) New York Restoration Project, New York, NY*

RESTORING URBAN TIDAL MARSHES TO ENHANCE COASTAL ECOSYSTEM SERVICES IN NEW YORK CITY

Coastal wetlands provide ecosystem services by helping remove excess nitrogen and other nutrients from waterways and enhancing the stability of the shoreline. Over 85% of these tidal wetlands in New York City have been dredged or filled for urban development, reducing shoreline resiliency and ecosystem services. Considerable resources have been invested in restoring and creating coastal green infrastructure, yet fewer resources have been invested in documenting services they perform within the urban landscape. We contributed to ongoing adaptive management of restored salt marshes by quantifying nitrogen-removal services for the Sherman Creek Park living shoreline project. We collected sediment cores from each of the four major habitat types at the park (restored marsh, existing marsh, rip-rap, and mudflat) and performed flow-through incubations to determine rates of nitrogen removal via denitrification. We found that the newly restored marsh removed nitrogen at rates comparable to the existing marsh and higher than the other two sites scoop012@plattsburgh.edu

Darsan M. A.*, K.R Garces, A. Moulton, A.R. Hughes, J.L. Bowen; *Department of Marine & Environmental Sciences, Marine Science Center, Northeastern University, Nahant, MA*

FUNGAL ENDOPHYTES IN SALT MARSHES: FOUNDATIONAL WORK REGARDING THE INTERACTIONS BETWEEN *SPARTINA ALTERNIFLORA* AND FUNGI IN A CHANGING CLIMATE

The diversity of fungi and their interactions with plants in salt marshes are poorly documented. Salt marshes perform numerous ecosystem services that rely on the productivity of grasses such as <i>Spartina<i>. Fungal endophytes are known to assist in the production of metabolites and secondary compounds and facilitate increased productivity, growth, establishment, and resilience, however their specific role in <i>Spartina<i> productivity is unclear. We sampled *S. alterniflora* from fertilization plots at the Plum Island Ecosystems Long Term Ecological Research Site, to assess what fungal endophytes were present and how communities may change with differing nitrogen treatments. Using a culture-based approach coupled with Sanger sequencing we assessed changes in community composition and diversity. It is crucial to understand how these plant-microbe interactions may be impacted by climate change and alter essential ecosystem services. This work is building foundational knowledge regarding the importance of fungi in salt marshes. darsan.m@northeastern.edu

Davis*, A. (1), J.M. Logan (1), C. McCall (2), T. O'Donnell (2), S. Voss (1), E. Strand (2), D. Comb (2), M. Rousseau (1), S. Wilcox (1), V. Manfredi (1), M. Szymanski (1); *(1) Massachusetts Division of Marine Fisheries, New Bedford, MA; (2) Gloucester Marine Genomics Institute, Gloucester, MA*

LESSONS LEARNED USING ENVIRONMENTAL DNA (EDNA) TO MONITOR MARINE HABITAT USAGE THROUGHOUT MASSACHUSETTS

Environmental DNA (eDNA) is a growing cost-effective approach to monitoring marine habitat use. The Massachusetts Division of Marine Fisheries (MA DMF) is using eDNA to monitor winter flounder (*Pseudopleuronectes americanus*) phenology in Cape Cod embayments, and to complement other fisheries monitoring efforts conducted by the Division and our research partners. In the last two years, water sampling for eDNA analysis has been incorporated into existing monitoring programs to complement baited remote underwater video (BRUVs) monitoring at artificial reefs, bottom trawl surveys in State waters, estuarine seine surveys, acoustic telemetry surveys within Massachusetts offshore wind development areas, coastal sea turtle tagging efforts, and estuarine fyke net surveys. Here, we present some preliminary results from a diversity of spatial scales and habitats, and highlight the lessons we have learned using eDNA to complement traditional survey approaches. amanda.davis@mass.gov

DeIngeniis,V.T.; *Department of Marine Affairs, University of Rhode Island, South Kingstown, RI*

STORMWATER MANAGEMENT WITHIN GREENWICH BAY RHODE ISLAND

Stormwater runoff from municipalities bordering Greenwich Bay degrades the water quality and potentially the health of stakeholders. Monitoring ambient water quality and effluent from sewage treatment plants is used to identify where management efforts need to be directed. Hypoxic water conditions and high concentrations of fecal coliform are the most prevalent issues within Greenwich Bay. Observed concentrations of fecal coliform in shallow embayments within the northern reaches of Greenwich Bay are often unsafe for the consumption of shellfish and unsafe for primary contact through swimming. Regional precipitation and discharge from a major river through statistical analysis suggest that the likelihood of hypoxic conditions in the bay is related to precipitation. These findings indicate that future management efforts should be directed toward incentivizing the tie-in of personal septic systems into municipal wastewater infrastructure, and the management of coastal land to prevent nutrient flux through stormwater runoff. vdeingeniis@uri.edu

DeWater*, K.A. (1), W. Kochtitzky (1), T. Oakley (2).; *(1) University of New England, Biddeford, ME; (2) Cape Elizabeth High School, Cape Elizabeth, ME*

THE GROWTH OF MEGA POOL SYSTEMS IN 12 MAINE SALT MARSHES FROM 2009 TO 2021

Salt marshes are important ecosystems because they provide critical habitat for endangered species, their soils sequester carbon, and they buffer the coastline from intense storms. This study uses geographic information systems (GIS) and National Agriculture Imagery Program air photos to compare the expanses of salt marsh pools between 2009 and 2021 on twelve salt marshes in southern Maine. Pool classifications, such as individual pool, mega pool, and perimeter pool, were established to distinguish between apparent physical characteristics of pools. Preliminary results for 2021 indicate that in some marshes, upwards of 25% of marsh surfaces were covered by standing water. On all marshes, an expansion of water cover was observed between 2009 and 2021. While pools can occur naturally and change over time, results indicate that the pools are continuing to expand, increasing standing water on marsh surfaces. The results of this study support the need for intervention and restoration to help marshes be more resilient to climate change. kdewater@une.edu

Di Domenico, D., *Molloy University, Rockville Centre, NY*

USING eDNA TO ASSESS IMPACTS OF OYSTER RESTORATION ON ECOSYSTEM BIODIVERSITY AT A HEAVILY IMPACTED COASTAL LAGOON

The Great South Bay (GSB), a bar-built, temperate, coastal lagoon on the south shore of Long Island, New York. A highly modified estuary due to heavy urbanization, GSB historically provided 50% of the nation's hard clam (*Mercenaria mercenaria*) harvest, and is the home of "Blue Point" oysters (*Crassostrea virginica*). However, due to overexploitation, excessive nitrogen pollution, and harmful algal blooms; shellfish populations are a fraction of their original abundance. Restoration efforts in GSB rehabilitate these filter feeder's populations

to improve water quality, rebuild reef habitats, provide protection from storm surge, thus positively impacting greater ecosystem stability. Summer 2023, we collected samples from 15 stations to isolate environmental DNA (eDNA) and implement next-generation sequencing to determine how oyster reef habitat impact community biodiversity. This ongoing project will determine the impacts of oyster restoration on resiliency in the GSB, as determined from eDNA-based biodiversity estimates. ddidomenico@lions.molloy.edu

Ells*, E.E., M.S. Labrie, M.A. Sundermeyer; *UMass Dartmouth School for Marine Science & Technology, New Bedford, MA*

NUTRIENT REMEDIATION THROUGH SHELLFISH AQUACULTURE: EASTERN OYSTER, *CRASSOSTREA VIRGINICA*, AS A SOURCE OF DENITRIFICATION

Oyster aquaculture is a non-traditional nitrogen (N) removal approach being used to restore N degraded estuaries. Oyster aquaculture-mediated N removal pathways include N bioassimilation, enhancement of sediment denitrification, long-term sediment burial of N deposits, and a less studied pathway, denitrification associated with the oyster microbiome. The present study quantified N removal via oyster-associated denitrification of the live oyster and empty shell in three Massachusetts estuaries. Oyster denitrification rates ranged from 9.56-55.4 &mumol N per oyster per day. Cumulative N_2-N production amounted to a 14.3 kg underestimate of N removed annually (20% annual budget) when oyster denitrification was not included in the N removal budget. Live oyster denitrification was equivalent to that of the enhanced sediment denitrification and half the removal via harvest. Quantifying a previously understudied N removal pathway in oyster aquaculture reveals its importance and necessitates inclusion in future N removal budgets. eells@umassd.edu

Ernest-Beck, Abigail; *Narragansett Bay Commission*

EVALUATING THE CHANGING RESPONSE OF BACTERIA LEVELS TO STORM EVENTS IN THE NARRAGANSETT BAY WATERSHED

The Narragansett Bay Commission (NBC) has monitored the upper Narragansett Bay and four main tributaries for fecal coliform and enterococci bacteria since 2004. NBC's Combined Sewer Overflow (CSO) Abatement Project has made massive investments in sewer system improvements to reduce bacterial contamination of the Narragansett Bay watershed since 2001. However, as the impact of climate change intensifies, Rhode Island is experiencing an increase in overall precipitation and in storm intensity. The NBC's two-decade-long bacteria monitoring dataset can be a useful tool in understanding how changes in precipitation patterns, in combination with CSO Abatement Project upgrades and other sewer system improvements, may be affecting bacteria levels throughout the watershed. As a continuation of the evaluation of water quality improvements related to CSO abatement, this talk will explore how bacteria levels in different locations in the watershed respond to rain events of different intensities and how that response has changed over time. aernest-beck@narrabay.com

Fales, C.M. (1); (1) *University of New England, Biddeford, ME*

THE EFFECTS OF MEGA-POOLS ON NEW ENGLAND SALT MARSH VEGETATION

Salt marshes are well-known for protecting coastal areas from sea level rise and coastal erosion. However an issue has surfaced that is threatening marshes along the coast of New England. Mega-pools are unnaturally large, expanding pools of stagnant water on the marsh platform believed to be caused in part by farming infrastructure from the 18th century. We established transects at the edge of mega-pools on the Biddeford Pool salt marsh to study their effects on salt marsh vegetation. The presence of short-form *Spartina alterniflora*, an indication of areas with high water inundation, and species diversity were used as measures of vegetation health. Species diversity of high marsh plants was found to be positively correlated with decreasing proximity to standing water on the marsh surface. This project provides baseline data and an early framework for future study of mega-pools. cfales@une.edu

Flecchia*, N., H. Stoffel, C.A. Oviatt; *Graduate School of Oceanography, University of Rhode Island, Narragansett, RI*

MONITORING HYPOXIC CONDITIONS DURING WET AND DRY YEARS USING THE NARRAGANSETT BAY FIXED SITE MONITORING NETWORK (NBFSMN)

Narragansett Bay experiences intermittent seasonal hypoxia with interannual variability influenced by river flow. In this analysis, two of the NBFSMN locations within Massachusetts waters of Mount Hope Bay, the Taunton River Buoy (TRB) and Cole River Buoy (CRB), were used to examine hypoxia during a wet summer (2021) and a dry summer (2022). The daily averages of temperature and salinity data were used to calculate the difference in densities between the near surface and near bottom water, which was used as a proxy for freshwater input. This was compared to hourly measurements of near bottom dissolved oxygen that were binned into oxic (> 5 mg/l), suboxic (< 5 mg/L and > 2.9 mg/L) and hypoxic (< 2.9 mg/L) condition. There was a 50% increase in the amount of time the waters at TRB had sufficient amounts of oxygen between a wet year and a dry year. During the wet year TRB had less hypoxia than CRB due to its proximity to a riverine input, which allowed for more mixing in that area. nicole_flecchia@uri.edu

Flores*, A. (1), B. Kahn (2), T. Razmadze (1), J. Fong (1), C. Zarnoch (1,2); *(1) Department of Natural Sciences, Baruch College CUNY, New York, NY; (2) CUNY Graduate Center, New York, NY*

EVALUATING ECOSYSTEM STRUCTURE AND FUNCTIONING OF A CREATED TIDAL WETLAND IN HUDSON RIVER PARK

Living shorelines provide key ecosystem services, but the timeline for achieving these services is not well documented, nor are the required environmental drivers. We evaluated the structure and functioning of the newly created living shoreline at Gansevoort Peninsula along the Hudson River. We measured *S. alterniflora* growth, hydrological conditions, and nutrient and gas fluxes within the salt marsh. Initial measurements revealed successful marsh establishment, but plants closest to the landward edge grew less than seaward-facing vegetation. Assessments of water movement suggest this may be due to wave energy. We hypothesized that nutrient and gas fluxes would be influenced by plant biomass but did not observe significant differences. Results indicate that the living shoreline functions as a nitrogen (N) sink given rates of denitrification and net uptake of dissolved inorganic N. These results suggest newly constructed living shorelines in urban eutrophic ecosystems can provide vital ecosystem services such as N removal. amanda.flores1@baruchmail.cuny.edu

Gentile*, O.G., Oakley, B.A.; *Environmental Earth Science Department, Eastern Connecticut State University, Willimantic, CT*

COMPARISON OF MEASURED AND CALCULATED WAVE RUN-UP ELEVATIONS ON A MICROTIDAL PARAGLACIAL COASTLINE USING BEACH PROFILES

Stockdon et al., (2006) outlines an approach to calculate the 2% wave run-up exceedance probability (η_{98}). The original work was developed in a mixture of settings and has been applied on bluffs and barriers to anticipate storm impacts. This study expands the analysis to paraglacial New England coastline using Real-time Kinematic GPS beach profiles collected at 3 sites along the Rhode Island South shore over 10 years to compare predicted and observed wave runup. The field surveys recorded the position and elevation of the last high-tide swash (LHTS). The η_{98} value was calculated using the offshore wave heights at the Block Island Buoy and water levels at the Newport Tide gage. We find that the Stockdon equation overestimates the wave run-up by 0.1 to 0.2 m at two locations while underestimating by 0.2 m at another. These results show how the storm impact regime a shoreline experiences may differ from Stockdon predictions. gentileo@my.easternct.edu

Giakoumis*, M. (1), A. Calderon-Brito (2), S. Pelletier (3), M. Pelletier (4,5), J. Wares (6), A. Miller-Rushing (4); *(1) The American Museum of Natural History, New York City NY; (2) Tulane University, New Orleans LA; (3) University of Maine, Orono ME; (4) The Schoodic Institute at Acadia National Park, Winter Harbor ME; (5) Maine Aquaculture Innovation Center, Walpole ME; (6) Odum School of Ecology, University of Georgia, Athens GA*

HISTORICAL RE-SURVEY OF THE NEW ENGLAND INTERTIDAL REVEALS A MASSIVE DECLINE IN SEA STAR DENSITY

Marine species loss and distributional shifts are rapidly occurring, but the extent of change already underway has not been well-documented. This study quantifies the decline of Asterias sea stars, a keystone taxon in the New England ecosystem. The last census of this region was published in 1979, when both Asterias rubens and A. forbesi were highly abundant across rocky coastlines. Here, I recreate the 1979 survey and find sea star densities have decreased significantly, and that the distribution of these species has qualitatively changed: Asterias occurrence has become more heterogeneous across the landscape. Additionally, I find a shift in preferred habitat with more reliable sightings in the subtidal rather than in the intertidal. Finally, there seems to be a lower proportional presence of recruits than was found in the past, signaling potential difficulty in rebuilding these populations in the future. Reasons for this decline may be attributed to rapid climatic changes, invasive species, and outbreaks of sea star wasting. mgiakoumis@amnh.org

Grady, S.P.; *Mass Audubon, Plymouth, MA*

THE OLDEST BLUE BLOODS - TWO SEA SHANTIES ABOUT HORSESHOE CRAB ECOLOGY AND MANAGEMENT

Horseshoe crabs are unique and prehistoric creatures whose populations have declined in many places due to over-harvest for bait for whelk and increased pressure for their blood, which helps us make sure injectable medications are sterile. They play an important role in the ecology of our coasts, and managing their populations is a long-term task. Their protection is one of three spotlight advocacy issues for Mass Audubon, which is hoping to encourage everyone to support improved regulations recently proposed by Mass. Division of Marine Fisheries. This talk/song (yes song!) covers their natural history, conservation and management, and what makes them so amazing, from their ten eyes to that pointy (and not venomous!) tail. sgrady@massaudubon.org

Hayes*, J.S. (1), Y. Chen (2), H. Chang, (2), A. Costigan (2), P. Woodruff (2), and C. Roble (1); *(1) Hudson River Park, New York, NY; (2) Stony Brook University, Stony Brook, NY*

CORROBORATING LONG-TERM DATASETS TO ELUCIDATE SHIFTS IN LOCAL FISH POPULATIONS WITHIN THE LOWER HUDSON RIVER ESTUARY, NYC

Hudson River Park leads an ongoing fish abundance and diversity survey, started over 35 years ago, between Piers 25 and 40 in the Park's Estuarine Sanctuary. This is one of the longest-running monitoring efforts in NYC and the data collected on over 14,000 fishes of 45 species could prove instrumental in demonstrating shifts in local fish populations. Analyses found generally that species richness and evenness is decreasing as the community composition shifts to be dominated by a few, highly prevalent species such as oyster toadfish (*O. tau*), tautog (*T. onitis*), and black sea bass (*C. striata*). In 2022, these three species comprised 91% of all fishes caught (n=435). Historically prolific species like cunner (*T. adspersus*) and tomcod (*M. tomcod*) have declined significantly since the 1990s. These decreases in overall diversity were not found to be associated with environmental factors and, conversely, overall catch per unit effort has been steadily increasing in the last decade. shayes@hrpt.ny.gov

Ikeh*, R (1)., F. Echiejile (2), A. Chatman (2), C. Freyland (2), H. Sylla (2), and E. Watson (1).; *(1) Stony Brook University, Stony Brook, NY; (2) Drexel University, Philadelphia, PA*

SPATIAL PATTERNS IN SALT MARSH PLANT STRESS DERIVED FROM PHOTOSYNTHESIS MEASURES AND SATELLITE IMAGERY ANALYSIS.

In the Northeastern US, tidal salt marshes are diminishing at a rate of 5-10% per decade, attributed to symptoms of sea-level rise such as fragmentation, edge erosion, and tidal channel expansion. Unexpectedly, high-elevation plants are experiencing mortality, contrary to conceptual models predicting stress in low marsh plants with excessive inundation. Our study, conducted across three locations in Massachusetts, New York, and New Jersey, employed satellite imagery and various stress indicators. Results reveal significant spatial patterns in plant stress, challenging the assumption that low marsh elevations are most vulnerable. These findings suggest a complex relationship between tidal flooding, soil saturation, and plant health, emphasizing the need for nuanced models to accurately capture the dynamics of marsh disintegration. ikehrupert@gmail.com

Kahn, B.C.M.* (1,2), M. Alldred (3), A. Flores (2), and C. Zarnoch (1,2); *(1) Department of Biology, The Graduate Center, City University of New York (CUNY), New York, NY; (2) Department of Natural Sciences, Baruch College CUNY, New York, NY; (3) Center for Earth and Environmental Science, SUNY Plattsburgh, Plattsburgh, NY*

DE-VEGETATED MARSHES MAY CONTRIBUTE REACTIVE NITROGEN TO URBAN ESTUARIES

Nitrogen (N) loading in estuaries leads to coastal habitat decline such as salt marsh loss, which may result in loss of ecosystem services such as N removal through denitrification. We compared denitrification, nutrient fluxes, and dissimilatory nitrate reduction to ammonium (DNRA) between two vegetated and de-vegetated (degraded) marsh areas in Jamaica Bay, NY. We hypothesized that de-vegetated sites would have lower denitrification/higher DNRA relative to intact areas due to low coupled nitrification-denitrification and higher sulfide. Denitrification and DNRA did not differ between vegetated and de-vegetated marsh sediments, but de-vegetated areas showed net positive dissolved inorganic N fluxes that outpaced denitrification. N effluxes in de-vegetated sediments correlated with low belowground biomass in decomposing marshes. Thus, loss in belowground structure may shift marshes from net sinks to net sources of reactive N due to loss of assimilation/uptake, with consequences for coastal water quality and marsh stability.

bkahn@gradcenter.cuny.edu

Kochtitzky*, W., M. Pittsely, R. Ellis, R., K. DeWater, P. Merrill, Q. Thayer; *University of New England, Biddeford, ME*

RECORD BREAKING STORM: WHAT HAPPENED TO MAINE'S COAST DURING THE HIGHEST TIDE IN RECORDED HISTORY

At 12:06 pm on January 13, 2024 the NOAA tide gauge in Portland observed a record high of 14.57 ft above MLLW, breaking the previous record from 1978. The impacts of this storm, and another one just three days earlier, were felt up and down Maine's coast. Piers were lifted off their pilings and lighthouses, roads, and buildings were heavily damaged, destroyed, or swept out to sea. Maine's dunes suffered devasting blows with large losses of sand and vegetation and many beaches were overtopped. We collected data from news media and built a story map to show the impact of the January 13th storm along Maine's coast. We specifically highlight the impacts to beaches in Saco, Biddeford, and Kennebunkport where we have been conducting drone surveys to monitor changes on these beaches, including the evolution in months following the storm. With multiple feet of sea level rise expected by the end of the century, Maine needs to prepare for more storms like this, and even larger ones, in the future. wkochtitzky@une.edu

Kopelman, A.H. (1), M. McNamara* (1,2); (1) Coastal Research and Education Society of Long Island (CRESLI), West Sayville, NY; (2) Life Sciences Department, Suffolk County Community College, Selden, NY

MONTAUK FOR RENT: PHOTO-IDENTIFICATION OF HUMPBACK WHALES (*MEGAPTERA NOVAEANGLIAE*) REVEALS USE OF LONG ISLAND WATERS AS FORAGING HABITAT FOR WELL-DOCUMENTED AND NEWLY-IDENTIFIED INDIVIDUALS

The number of humpback whales (*Megaptera novaeangliae*) have increased steadily off eastern Long Island since 2013. Photo-identification of individuals encountered during seasonal whale watches out of Montauk, NY, corroborates this trend and documents the use of nearshore waters by various age classes of the population. Sharing of images with other scientists, and the global identification platform HappyWhale, demonstrates that humpbacks found off Long Island occur throughout the Gulf of Maine and New York Bight regions and as far away as the Gulf of Saint Lawrence, Canada, and Puerto Rico. During the 2023 season, CRESLI encountered a record 61 individuals, of which 29 were previously documented, including several 'matriarchs' of the Gulf of Maine stock. The remaining 32, including five calves, are new to science. While juveniles continue to forage in NY waters, this habitat is shown to be of significant use to mature individuals, contributing to our understanding of *M. Novaeangliae* population dynamics and habitat use. mcnamam@sunysuffolk.edu

Lakmali*, E. N. (1), K. Huguenard (2).; *(1) Department of Civil and Environmental Engineering, University of Maine, Orono, ME; (2) Department of Civil and Environmental Engineering, University of Maine, Orono, ME*
PROPAGATION OF A HURRICANE FROM COAST UP TO HEAD OF A TIDAL ESTUARY: A CASE STUDY IN PENOBSCOT ESTUARY DURING HURRICANE LEE

Storms surges change their behavior when travel from coastal area to farther up into tidal estuaries. Funneled estuaries tend to create higher storm surges as it propagates along the narrowing estuary. Penobscot estuary is narrowing from 3km to 250m from Penobscot bay to Bangor (45km upstream). In present study, individual tidal constituents were computed at three different locations in the river stretch during hurricane Lee and examined their evolution from coast to head. The amplitude of principal lunar tidal constituent M2 remain consistent throughout the storm from bay to Bangor, while the amplitude of shallow water overtide constituents M4 and M6 increases from 69% and 16% respectively when storm propagates inland. New England coast experienced 0.91m surge during hurricane lee and it amplified into 0.99m when it travels head of the Penobscot estuary. It is a 10% increase compared to Lee's coastal surge. engiliyage.nalika.lakmali@maine.edu

Larubina*, S.L. (1,2), Krumholz, J.S. (1,2), Vaudrey, J.M.P. (1,2), Chadwick, C. (3); *(1) Connecticut National Estuarine Research Reserve, University of Connecticut, Groton, CT; (2) Department of Marine Sciences, University of Connecticut, Groton, CT; (3) Center for Land Use Education and Research, University of Connecticut, Groton, CT*
MAPPING INVASIVES IN A COASTAL FOREST

The newly designated Connecticut National Estuarine Research Reserve encompasses ~52,000 acres of upland, marsh, sandy beach, rocky shoreline and open water habitats in Southeastern CT. One of our first efforts in habitat mapping aimed to quantify the spatial distribution and variety of invasive plants in our upland properties and initiate planning for an ongoing program of invasives removal and habitat restoration. With the support of a GIS specialist and experienced botanist, students and staff new to plant identification utilized a mobile mapping app to record data and photographs in the field. This rapid assessment approach effectively sampled approximately 200 sites across two state parks over two months, indicating the presence of invasives at 90% of sampled locations. Results reveal patterns of invasion and inform priorities for future eradication or control, with an eye toward the broader use of the approach as a rapid survey protocol of terrestrial invasive plants. shelby.larubina@uconn.edu

Lepire*, J.L, B.O. Oakley; *Eastern Connecticut State University, Willimantic, CT*
EVOLUTION OF A DYNAMIC COASTAL LAGOON SYSTEM NAPATREE POINT, RHODE ISLAND

The focus of this study is a 9.9-acre back barrier lagoon at the western end of the Napatree Point barrier spit, Little Narragansett Bay (LNB),Watch Hill Rhode Island. Vertical aerial photographs and RTK-GPS field surveys show the spit lengthened between 2017 and 2024, shifting the position of the inlet east >100 m. The channel cross-sectional area and tidal current velocities decreased between 2019 and 2022. Coupled with net sediment deposition on the flood-tidal delta indicate this is a flood-dominate system. Water levels measured in the lagoon show that the tidal range and tidal prism decreased between 2017 and 2024 and some neap high tides in LNB not reaching the threshold elevation to allow water to enter the lagoon resulting in periods of no tidal flow into the lagoon. The inlet appears to be closing, although it remains unclear how long this will take to close and if a second inlet will open (and when/where). Inlet closure will likely alter the lagoon ecosystem and possibly have a negative impact on the surrounding environment. lepirej@my.easternct.edu

L'Heureux*, J.P., J. Feldman, J. Bowen; *Department of Marine & Environmental Sciences, Northeastern University, Boston, MA*
APPLYING $^{13}CO_2$ LABELING IN THE FIELD TO INVESTIGATE INUNDATION AND FERTILIZER EFFECTS ON SALT MARSH PLANT-MICROBE INTERACTIONS

To better understand how salt marsh carbon dynamics will respond to environmental change, we must look to the communities of microbes within marsh sediments that are known to regulate biogeochemical reactions. One way to assess how plants exhibit control on microbes within the rhizosphere is through the application of stable isotope probing (SIP), which allows for labelled photosynthate to be traced into the microbes that consume the rhizodeposits. To understand the effects of sea level rise and nutrient enrichment on Spartina alterniflora rhizodeposit production and microbial community composition, I performed a 13CO2 labeling experiment using marsh organs - platforms in the field containing planters at different elevations. Preliminary analyses reveal that leaf, root, and sediment samples from labeled pots are significantly enriched with 13C. By combining metagenomics with protein-SIP, we will gain a better understanding of how sea level rise and fertilizer runoff are affecting microbial community functioning in salt marshes. lheureux.j@northeastern.edu

Lynch*, C. (1,2), Dos Santos, S. M. (1,2), Gaston-Greenberg, C. (1,2), Branco, B. (1,2), and Zarnoch, C. (1,3); *(1) Science and Resilience Institute at Jamaica Bay, New York, NY; (2) Department of Earth and Environmental Sciences, Brooklyn College, City University of New York, New York, NY; (3) Department of Natural Sciences, Baruch College, City University of New York, New York, NY*

LONG TERM MONITORING UPDATES AND BEST PRACTICES FROM THE WEST POND LIVING SHORELINE RESTORATION SITE IN JAMAICA BAY, NY

The West Pond Living Shoreline is a 14-acre restoration site completed in 2021 that utilizes Natural and Nature Based Features to stabilize the shoreline, limit erosion, and create habitat. The Science and Resilience Institute at Jamaica Bay recently completed year 2 of a five-year post construction monitoring program. Here we describe the monitoring approach and compare data from 2022 and 2023 on ecological, morphological, and structural conditions. Our results show no net-loss/gain of sediment site-wide; greater vegetative cover, stem density, height, and diameter; and no significant difference in macroalgae cover or vegetation characteristics among different planting techniques. As monitoring and marsh development continues, data collected should provide a robust basis for evaluating nature-based designs, informing adaptive management, and guiding future efforts to create urban tidal marshes. caitlinlynch1@gmail.com

Macfarlane, S.; *Coastal Resource Specialists*

WHEN VICTORY COMES – OBSERVATIONS ON THE LONG GAME 1970-2023

In 1970, Orleans, Cape Cod, did not comply with new wastewater regulations. Septic effluent was periodically collected and dumped into open lagoons. Between 1978-88, consultants were hired, official meetings were held, citizen committees formed, alternatives were presented and acrimoniously debated in public and the press. A tri-town septage-only treatment plant was eventually approved through Town Meetings in 1988 and constructed. In 2000, a Wastewater Management Steering Committee reviewed newer alternatives presenting three proposals including sewers. In 2013, two town meetings failed to reach 2/3 majority to fund construction. The process repeated with a Water Quality Advisory Panel. Construction commenced in 2018. In 1982-83 Meetinghouse Pond and Nauset estuary were closed to shellfishing for bacterial contamination from surface road drainage. After 12 years, shellfishing resumed and 10 drainage systems were retrofitted. This paper tracks biological, social, political and economic factors involved in land-sea interface projects. sandymac@capecod.net

McKown*, J.G. (1), D. Burdick (1), G. Moore (2), J. Gibson (2), W. Ferguson (3); *(1) Jackson Estuarine Laboratory, Institute for Study of Earth, Oceans, and Space, University of New Hampshire, Durham, NH; (2) Jackson Estuarine Laboratory, Department of Natural Resources, University of New Hampshire, Durham, NH; (3) Jackson Estuarine Laboratory, Department of Biological Sciences, University of New Hampshire, Durham, NH; (4) Save The Bay, Providence, RI*

EVALUATION OF DRAINAGE ENHANCEMENT FOR VEGETATION RECOVERY IN SALT MARSHES IN NEW ENGLAND USING PUBLIC AERIAL IMAGERY

Restoration of single-channel hydrology, through ditch plug removal, ditch maintenance, and runnel creation, has been carried out to restore and conserve valuable marsh platform habitat. Public aerial imagery of the marsh surface at 19 salt marshes across New England was classified from 2010 – 2021 as unvegetated or vegetated to

estimate the percent vegetated area (PVA) and the unvegetated – vegetated ratio (UVVR). The PVA and UVVR for manually delineated sub-tidesheds (size = 2.1 + 0.2 ha) were compared before and after restoration in a BACI design (n = 1043). Drainage enhancement tidesheds reversed the expansion of pools and pannes with annual declines of -0.037 UVVR and gains of 1.55 % PVA, while reference and no action tidesheds remained relatively stable. Tidesheds which were severely degraded immediately prior to restoration had UVVR and PVA recovery rates 8 times and 4 times greater, respectively, than well-vegetated tidesheds. Drainage tidesheds gained a net 2.08 ha of vegetation post-restoration across New England. james.mckown@unh.edu

McNamara*, M.E (1,2), Kopelman, A.H. (1); *(1) Coastal Research and Education Society of Long Island (CRESLI), West Sayville, NY; (2) Life Sciences Department, Suffolk County Community College, Selden, NY*

DOCUMENTING A NEW, YET FAMILIAR SPECIES: ENCOUNTERS WITH TAMANEND'S AND COMMON BOTTLENOSE DOLPHINS REVEAL NOTABLE DIFFERENCES IN DISTRIBUTION AND MORPHOLOGY OFF EASTERN LONG ISLAND

Common bottlenose dolphins, *Tursiops truncatus*, were divided into two morphotypes in the Eastern New York Bight: the inshore (Western North Atlantic Northern Migratory Coastal Stock) and offshore (Western North Atlantic Offshore) forms. In 2023, the coastal morphotype was recognized as a new species, Tamanend's Bottlenose Dolphin, *T. erebennus*. CRESLI has encountered both species during seasonal whale watches off Montauk, NY, documenting differences in water depth and distance-from-shore parameters between them over a fifteen-year period. *T. erebennus* first appeared off Long Island in 2009, and since 2014, has become the most commonly-observed bottlenose dolphin in nearshore, shallow waters of Long Island. Occasional encounters with *T. truncatus* continue, but only in deeper, offshore waters. Using ArcGIS, we document differences in distribution, while photographic analyses reveal consistent morphological discrepancies between the two species, adding to and supporting previously-documented distinctions. mcnamam@sunysuffolk.edu

Morin, G.M., J. Urban-Rich; *School for the Environment, University of Massachusetts Boston, Boston, MA*

INPUT OF MICROPLASTICS INTO THE NEPONSET RIVER FROM STORM-WATER DRAINS

The Neponset River is 29-miles long, beginning in Foxborough, and going through multiple municipalities to Boston Harbor. Plastics are able to enter the coastal waters from rivers. This study is focused at looking at the amount and type of plastics coming in through storm-water drains. As the climate changes in New England, storms are expected to increase. Samples in the river and from two storms drains were monitored for 5 weeks and additional samples during storms were collected. Results from this study will be reported and discussed in the context of microplastic inputs from urban areas into local waterways. It is hypothesized that the input of microplastics will increase during the storms, compared to the baseline. gena.morin001@umb.edu

Mittermayr*, A. (1), J. Gaeckle (2), J. Lefcheck (3), A. Novak (4), H. Plaisted (5), F. Short (6); *(1) Center for Coastal Studies, Provincetown, MA; (2) Nearshore Habitat Program, Washington State Department of Natural Resources, Olympia, WA; (3) University of Maryland Center for Environmental Science, Cambridge, MD; (4) Earth & Environment, Boston University, Boston, MA; (5) Northeast Coastal and Barrier Network, National Park Service; (6) Professor Emeritus, College of Life Sciences and Agriculture, Jackson Lab, Durham, NH*

RE-CASTING THE SEAGRASSNET

Established by Drs. Fred Fred Short, Rob Coles, Evamarie Koch and Miguel Fortes in 2000, SeagrassNet is now the oldest continually running monitoring program for seagrasses worldwide. Its partners have generated over 100,000 on-the-ground observations at 136 locations in 35 countries and established an unparalleled global baseline for seagrass ecosystems. SeagrassNet is an important first step in assessing the state of the world's seagrass resources and how they might be changing. With Dr. Short's retirement, we aim to re- invigorate ongoing global monitoring efforts and will bring SeagrassNet into its next phase of life. We will initially focus on (1) building a free, reliable and easy-to-use data portal to host and provide existing data on seagrass health in

a changing climate, (2) supporting existing partners and recruiting new teams, who will be supported through training, equipment donations, and regular check-ins, and (3) increasing education, inclusivity, and awareness around seagrass ecosystems. amittermayr@coastalstudies.org

Oakley, B.A. *Environmental Earth Science Department, Eastern Connecticut State University*

THE BLOCK ISLAND BEACH PROFILE PROJECT 10-YEARS IN; OBSERVATIONS AND LESSONS LEARNED

Beach profiles on Block Island, RI have been measured by residents using the modified Emery Method over the last decade (monthly 2013 –2017; quarterly 2018 – Present). Profiles begin at a known elevation (surveyed using RTK-GPS) and extend across the subaerial profile and are measured at spring low tide to maximize exposed beach. Profile sites balance accessibility and geographic spread on the island. The volunteers conduct field surveys, and data is plotted and interpretated by the author The Emery method is an ideal technique for non-geologists; however, this project has benefitted immensely from prior scientific training of the community scientists involved. This talk will outline the structure and workflow of the project, some tips, advice as well as some results of the project to date. The eastern profiles increase in volume through 2023 as the dunes recovered following Superstorm Sandy. Profiles north of the inlet on the west side have retreated considerably. The hypothesized driver for this is the lack of inlet bypassing. oakleyb@easternct.edu

Payne*, A.R. (1), E.B. Watson (2); *(1) Drexel University, Philadelphia, PA; (2) Stony Brook University, Stony Brook, NY*

ENVIRONMENTAL DETERMINANTS OF PLANT SPECIES COMPOSITION ALONG THE MARSH-FOREST ECOTONE

As low-lying uplands are flooded more frequently due to sea level rise, terrestrial plants are replaced by salt-tolerant plants, potentially forming novel plant communities. Elevation and salinity are well-known predictors of marsh plant cover, but the effects of other variables such as light availability and soil bulk density are less understood. To better predict and understand species composition of salt marshes migrating into forests, we measured plant cover and environmental variables at three marsh-forest transitional areas in the northeast. Using redundancy analysis (RDA), we found that a combination of salinity, flooding duration, bulk density, and redox explain more variance in plant cover than elevation or salinity alone. These results indicate there are multiple gradients affecting the distribution of plant taxa along the marsh-forest ecotone, and models examining only one variable may be oversimplifying. Our results elucidate the intricate dynamics governing shifts in plant communities in response to rising sea levels. ap3752@drexel.edu

Peck*, E.K. (1,2), J.E. Walker (1,2), K. Ackerman (3), A. Besterman (4), J. Carr (5), T. Cook (1), M. Correll (6), L. Deegan(4), Z. Defne (3), M. Eaton (8), M. Eagle (3), N. Ganju (3), M. Hartley (6), S. Jackson (1), R. Jakuba (7), J. Mercer (3), B. Wilson (6), J. Woodruff (1,2), B. Yellen (1,2); *(1) University of Massachusetts Amherst, Amherst, MA; (2) Northeast Climate Adaptation Science Center, Amherst, MA; (3) USGS Woods Hole Coastal and Marine Science Center, Woods Hole, MA; (4) Woodwell Climate Research Center, Woods Hole, MA; (5) USGS Eastern Ecological Science Center, Kearneysville, WV; (6) USFWS, Atlantic Coast Joint Venture, Hadley, MA; (7) Buzzards Bay Coalition, New Bedford, MA; (8) Southeast Climate Adaptation Science Center, Raleigh, NC*

PART I: ABUNDANCE AND DISTRIBUTION OF DITCHES ACROSS SALT MARSHES IN THE NORTHEASTERN US

Coastal ditching for mosquito control or agriculture has resulted in widespread degradation and loss of NE salt marshes. A continuous geospatial dataset will improve understanding of ditch influence on marsh function and longevity. We digitized ditches from ME to VA and quantified the spatial distribution and percentage of marsh area ditched on multiple spatial scales. At a coarse spatial scale, the percent area of ditched salt marshes is akin to previous studies (~90%); however, at finer resolutions a lower area percent is ditched. We will develop a more appropriate indicator of ditching influence by determining the area affected by ditches as indicated by the

vulnerability metric UVVR (unvegetated to vegetated marsh ratio). We hypothesize that UVVR will indicate greater unvegetated marsh close to ditches and as distance from ditches increases UVVR will approach a threshold indicating more resilient salt marshes less affected by ditching. Results will provide evidence-based science to inform salt marsh restoration decision making. ekpeck@umass.edu

Perry*, D.C. (1), J. Loffredo (2), N. Bartolucci (3,6), W. Ferguson (4), K. Raposa (5), R. Fulweiler (3), C. Wigand (6); *(1) NOAA Restoration Center, Narragansett, RI; (2) USDA Agricultural Research Service, East Wareham, MA; (3) Boston University, Boston, MA; (4) Save The Bay, Providence, RI; (5) Narragansett Bay Research Reserve, Prudence Island, RI; (6) US EPA ACESD, Narragansett, RI*

ASSESSING SALT MARSH RECOVERY OF RHODE ISLAND SEDIMENT ENHANCEMENT SITES

Rhode Island (RI) coastal managers are implementing the climate adaptation strategy, sediment enhancement, to offset sea level rise effects within salt marshes. Sediment enhancement involves the use of dredge material to increase salt marsh surface elevation. In this RI study, we are evaluating salt marsh recovery after sediment enhancement through assessing greenhouse gas fluxes, plant cover, elevation, and soil characteristics overtime. Our findings suggest that sediment enhancement sites are still recovering six years post sediment placement. After six years, the organic matter and belowground biomass of sediment enhancement sites are still significantly lower than control sites (no sediment added) and bulk density is significantly higher than the control. There is also a pattern of higher carbon dioxide fluxes at sediment enhancement sites. Through the study results, we gain a better understanding of salt marsh recovery trajectory of Rhode Island sediment enhancement sites to help inform future management. dperry@uri.edu

Peter*, C.R (1), Burdick, D.M. (2), Raposa, K.B. (3), Tyrrell, M. (4), Goldstein, J. (5) Cressman, K. (6), Shull, S. (7), Fuert, C. (5), McGovern, K. (1), Corsetti, T. (1), McKown, J.G. (2); *(1) Great Bay National Estuarine Research Reserve, Greenland, NH; (2) Jackson Estuarine Laboratory, University of New Hampshire, Durham, NH; (3) Narragansett Bay National Estuarine Research Reserve, Prudence Island, RI; (4) Waquoit Bay National Estuarine Research Reserve, East Falmouth, MA; (5) Wells National Estuarine Research Reserve, Wells, ME; (6) Catbird Stats, Gautier, MS; (7) Padilla Bay National Estuarine Research Reserve, Mount Vernon, WA*

USING NATIONAL ESTUARINE RESEARCH RESERVES TO UNDERSTAND HOW CLIMATE CHANGE IS IMPACTING TIDAL MARSHES ACROSS NEW ENGLAND AND THE NATION.

Sea level rise and climate change present major threats to tidal marshes nationwide. In an effort to better track and understand their impacts on marshes, our project team has synthesized plant community and sediment accretion data at eight marshes within the New England National Estuarine Research Reserves (NERRs) to conduct a regional trend analysis in response to sea level rise. Three tiers of increasing complexity (graphical, univariate, and multivariate statistics) were used to analyze changes in vegetation from 2010-2017. In all cases, significant trends found marshes are becoming wetter, with lower elevations losing plant cover and higher elevations becoming more dominated by Spartina alterniflora over time. The most dramatic vegetation changes were found in Rhode Island and Cape Cod, MA, co-occurring with relatively small tidal ranges. These results have highlighted the vulnerability of salt marshes to sea level rise and have stimulated a new nationwide synthesis at over 20 NERRs and 80 marshes. christopher.r.peter@wildlife.nh.gov

Reiss, K.C.; *Environmental Science, Policy, and Management Program, School of Science, Technology, Engineering, and Math, American Public University System, Charlestown, WV*

TOO LITTLE, TOO MUCH, OR JUST RIGHT? EXPLORING FIELD SAMPLING EFFORT IN THE CONTEXT OF BIOTIC INTEGRITY

Methods of vegetation sampling are adopted based on field logistics, best professional judgment, statistical constraints, and/or published studies. Designing projects to minimize the hours in wetland field conditions can be informed by evaluating completed projects, such as the US Environmental Protection Agency National

Wetland Condition Assessment 2011 that offers vegetation data for ~1,000 wetlands, with presence/absence and cover estimates in five 100m^2 quadrats, in the assessment area (AA) center (1) and on transects to the south (2), west (3), north (4), and east (5). Vegetation community data were evaluated through abundance matrices, species accumulation curves, dissimilarity analysis, and non-metric multi-dimensional scaling for each quadrat and by combining data in pairs, groups of three, groups of four, and all five quadrats. The primary research question is 'what level of sampling effort returns the same outcome in determining biotic integrity using the vegetation multi-metric index.' ailuropoda8@gmail.com

Reves-Sohn*, S. (1), W. Teng (1), E. Peck (1), J. Walker (1), B. Yellen (1); *University of Massachusetts Amherst*

USING MARSH SUBSIDENCE TO PREDICT VEGETATION RESPONSES TO TIDAL FLOW RESTORATION

Tidal flow restoration is the most widespread and cost-effective tidal marsh restoration practice. But these restoration projects can have unintended consequences. Salt marshes that "freshen" and subside when tidally restricted are more prone to flooding and devegetation after tidal flow restoration. Some projects designed to improve marsh health may actually cause vegetation dieback. We used multispectral satellite imagery from 1985 to present to evaluate revegetation at completed MA tidal restoration sites. We assessed vegetation outcomes by comparing the normalized difference vegetation index (NDVI) metric pre- and post-restoration. We paired NDVI trends with LiDAR elevation data to evaluate to what extent historical subsidence and the resulting distribution of marsh elevations determine marsh vegetation response to tidal flow restoration. By identifying subsidence thresholds for restoration success, we hope to make recommendations that can improve the outcomes of the important and widespread practice of tidal marsh restoration. srevessohn@umass.edu

Sachs*, M. (1), S. Moseman-Valtierra (1), J. McNamee (2); *(1) College of the Environment and Life Sciences, The University of Rhode Island; (2) State of Rhode Island Department of Environmental Management*

ATLANTIC BLUE CRAB CALLINECTES SAPIDUS ABUNDANCE AND HABITAT SELECTION IN ANTHROPOGENICALLY ALTERED ESTUARINE SYSTEM IN THE FACE OF NORTHWARD RANGE EXPANSION

The blue crab range is extending northward into New England where it will encounter anthropogenically impacted estuaries. We monitored blue crab abundance and habitat use to understand habitat preference and physiological tolerance in dammed and contaminated Kickemuit River, RI. We compared crab abundance, size, maturation, and sex between two sites (one upstream and one downstream the dam) by deploying crab pots monthly from May to October 2023. We tested for relationships between crab population, season, and benthic habitat characteristics (substrate and water quality). Logistic regressions analyzed crab size at maturity. A zero-inflated negative binomial GLM analyzed crab abundance based on spatiotemporal and environmental parameters. Their abundance between the two sites was not significantly different, despite the presence of a physical blockade of a dam. Therefore, blue crabs are a resilient species to levels of anthropogenic impact in estuarine habitats which may not be a barrier to their continued northward range expansion. msachs98@uri.edu

Sangani*, I. (1), Champlin, L. K. (2), R. W. Fulweiler (2).; *(1) Department of Organismic and Evolutionary Biology, Harvard University, Cambridge, MA; (2) Department of Earth & Environment, Boston University, Boston, MA*

SPATIAL HETEROGENEITY OF CARBON DIOXIDE FLUXES IN AN URBAN SALT MARSH

Salt marshes are notoriously heterogeneous ecosystems and current sampling strategies of greenhouse gas fluxes may not capture differences across fine spatial scales. Spatial sampling is especially underrepresented in small, urban systems and during fall and winter seasons. The aim of this study is to quantify spatial heterogeneity of CO_2 fluxes at high resolution across an urban marsh during vegetation senescence and dormancy. We used new, portable gas sensors to measure fluxes at Belle Isle Marsh Reservation in Boston, MA, on more than five occasions from October to February. We tested multiple spatial sampling strategies including transects, random paired sampling, and a triangle layout. Not only did we observe varied fluxes of CO_2 during this period, but we

also demonstrate that different sampling strategies highlight spatial differences in marsh CO_2 fluxes. The results of this study have important implications for designing future sampling and carbon budgeting efforts. isha.sangani@outlook.com

Schmidt, C.E.; *Narragansett Bay Estuary Program, Providence, RI*
SOLAR FIELDS IN THE FOREST
Solar energy reduces greenhouse gases, improves energy independence, and can be mounted on rooftops or placed in fields as ground-mounted arrays. The Narragansett Bay Region (Connecticut, Rhode Island, and Massachusetts) set a goal to be 100% net zero by 2050. Net-zero is an understanding that energy needs cannot be met by renewable energy sources alone, and greenhouse gases will still be emitted. Net-zero requires the transition to renewable sources while removing carbon from the atmosphere. The best carbon removal technology we have is our forests, which support key species and habitats, provide recreation and economic opportunities, filter drinking water, and provide resilience from flooding and extreme heat. Yet, we are now facing the loss of our forests to ground-mounted solar array development. The loss has accelerated in the last decade with the announcement of renewable energy targets and incentives for developers. Here we present the first ever look at solar field development in the Narragansett Bay Region. courtney.schmidt@nbep.org

Shah*, M. (1,2), J.M.P. Vaudrey (1,2); *(1) Department of Marine Sciences, University of Connecticut, Groton, CT; (2) Connecticut National Estuarine Research Reserve, University of Connecticut, Groton, CT*
HISTORICAL CONSTRUCTION OF EELGRASS IN THE NORTHEAST AND MID-ATLANTIC
Eelgrass (*Zostera marina*), a keystone species, has faced significant global decline over the last 50 years. Recognizing its importance, the Long Island Sound Study identified a need to construct the historical distribution of eelgrass. This project investigated historical literature and herbaria records to create a map of eelgrass sightings in the Northeast and Mid-Atlantic before and during the mass mortality event in the early 1930s. The herbaria records cataloged 340 specimens, spanning from 1800 to the present, with notable concentrations in Maine and New Hampshire. Over 2 months of searching the records, the literature investigation yielded 249 eelgrass sightings, 115 of which were located in Massachusetts. Investigating historical literature, although time-consuming, provided a clear description of where, and often when, eelgrass was encountered, even when eelgrass was not the focal subject of discussion. As such, this project emphasizes the potential of using anecdotal accounts in describing historical eelgrass distribution. meg.shah@uconn.edu

Smith, Stephen; *National Park Service, Cape Cod National Seashore*
THE EFFECTS OF *SESARMA RETICULATUM* (L.) HERBIVORY AND SEA LEVEL RISE ON CREEK EXPANSION IN CAPE COD SALT MARSHES
High densities of herbivorous purple marsh crabs (S*esarma reticulatum*) have caused major vegetation loss in salt marshes across Cape Cod (Massachusetts, USA). As creekbanks are a preferred habitat for this species, much of the damage is concentrated along these edges, resulting in creek widening through erosion. The presence and/or spatial distribution of *S. reticulatum* is highly variable with their impacts ranging from minor to severe, which provides an opportunity to distinguish between background creek widening from sea level rise (SLR) vs. the combined effects of *S. reticulatum* and SLR. GIS tools were used to delineate subsets of tidal creek systems in 18 marshes, half of which have experienced substantial vegetation loss from crab-driven herbivory. Between 2010 and 2021, creek expansion averaged 37% in marshes with abundant *S. reticulatum*, which was threefold higher than reference marshes, where widening averaged 12%. While all marshes are under threat from SLR, crab-impacted marshes may have a greatly shortened lifespan. stephen_m_smith@nps.gov

Spencer, Larry; *Dept. of Biology, Plymouth State University, Plymouth, NH*
THE HMS ENDEAVOUR, CAPTAIN JAMES COOK AND NEWPORT, RHODE ISLAND?
The Endeavour was a modified coal collier used by James Cook to navigate the world and particularly to sail to the South Pacific to view the transit of Venus. Coal colliers were the ubiquitous vessels that hauled coal from the midlands of England to London. They were essentially round bottom boats with a large storage capacity. When

the Royal Society decided to host a voyage to the southern Pacific, they chose to refit an existing boat for that purpose. James Cook grew up on a farm in the midlands but then spent his youth as a sailor on a coal collier. He quickly moved from deckhand to captain. He then signed into the Admiralty as a deckhand and quickly moved up the ranks showing his expertise on a voyage to Nova Scotia and Newfoundland. When the Royal Society looked around for a captain of the Endeavour, Cook was chosen because of his expertise in coastal surveying. The Endeavor left England in 1768 and arrived in time to perform the duties related to the transit of Venus.
lts@plymouth.edu

Stacey, P.E.; *Footprints In The Water LLC, Moodus, CT*
LIFE ON THE NUTRIENT PLATEAU – IMPLICATIONS FOR ESTUARINE MANAGEMENT
The Clean Water Act's vision to protect and preserve chemical, physical, and biological integrity is fundamental to successful Integrated Watershed Resource Management (IWRM). Regulations and single pollutant management practices eschew intertwined landscape degradation and climate change drivers responsible for increased nutrient loading and ecosystem disruption. IWRM sustainably balances human and ecosystem needs towards resiliency that attains equitable human health and welfare outcomes. Natural and Nature-based practices that conserve and recover ecosystem health offer a more productive path forward, but insidious threats from landscape degradation and pervasive climate change remain a challenge. We may have reached a nutrient reduction plateau for estuaries utilizing sewage treatment upgrades with limited prospects for additional watershed and estuarine recovery. I will explore a new Decision Support Framework that targets overarching biointegrity outcomes using examples for CT embayments, Long Island Sound, and its watershed.
footprintsinthewater@outlook.com

Sullivan*, H.L. (1,2), J.L. Bowen (2), L.A. Deegan (1), W. Ferguson (3), M. Tyrrell (4); *(1) Woodwell Climate Research Center; (2) Northeastern University; (3) Save the Bay; (4) Waquoit Bay National Estuarine Research Reserve*
THE IMPACT OF ALTERED AND RESTORED HYDROLOGY ON SALT MARSH BIOGEOCHEMISTRY
Marshes are experiencing areas of vegetation loss, forming areas of shallow standing water. A positive feedback loop will accelerate habitat loss, especially in the face of SLR. Runnels are a restoration technique designed to return hydrology to reference conditions by draining standing water, increasing tidal flow, and encouraging revegetation. The success of runnels is documented, but the changes to N cycling has not been examined. At 11 sites across RI and MA, we measured edaphic characteristics and rates of N cycling in: areas with vegetation loss + runnels, degraded areas with no intervention, and stable areas with no vegetation loss. Runnels improved sediment characteristics, but rates of N cycling were reduced, lagging recovery of vegetation. In a new restoration project in Waquoit Bay, MA, we found that areas of shallow standing water have lower rates of N cycling and decomposition. We will track newly installed runnels to assess changes to decomposition, edaphic characteristics, and N cycling that result from restoration. hsullivan@woodwellclimate.org

Taveras Lopez*, S. (1), E. Watson (1), Franco Montalto (2), and F. Echiejile(2); *(1) Stony Brook University, Stony Brook, NY; (2) Drexel University, Philadelphia, PA*
EVALUATING ECOSYSTEM SERVICES OF COASTAL MARSH RESTORATION IN BARNEGAT BAY, NEW JERSEY
Coastal wetlands, such as salt marshes, provide many ecosystem services such as carbon sequestration, ecotourism, habitats for wildlife and fisheries, and mitigation of storm surge, which can help reduce coastal flood damages. Wetland restoration is one type of Nature-based solution (NBS) being employed to adapt coastal areas to climate change, and reduce flood risk. Our research seeks to quantify benefits of restoration projects funded under the Natural Climate Solutions Grant Program in NJ, specifically focused on flood mitigation and other benefits in Barnegat Bay, New Jersey. We used a hydraulic and hydrologic modeling approach to quantify flood mitigation and other ecosystem service benefits under various restoration designs. Our research suggested flood mitigation and carbon sequestration benefits resulting from restoration would be modest, but highlighted

valuable potential water quality benefits. Research is needed to quantify the potential
sixto.taveraslopez@stonybrook.edu

Tigges*, S. E., D. FitzGerald, Z. Hughes, A. Novak; *Boston University, Boston, MA*
EXAMINING SALTMARSH POND DYNAMICS THROUGH SEMANTIC IMAGE SEGMENTATION
Saltmarshes are dynamic coastal environments that supply essential ecosystem services by providing habitat, filtering runoff, buffering the mainland from storms, and sequestering carbon. While marsh ponds are natural features, increased ponding has raised concerns of interior marsh loss through sea level rise-induced pond expansion, though the relationship between pond dynamics and sea level rise is poorly understood. In New England's Great Marsh, previous field and remote sensing studies of ponds are limited in their spatial and temporal extents, while modeling studies provide insights into expansion mechanisms but require further validation. This study uses aerial imagery and semantic image segmentation to measure changes in Great Marsh pond area since 1938 to quantify the rate of pond expansion and characterize the associated marsh loss. Furthermore, we explore the relationship between pond expansion and factors such as elevation and local sea level rise rate to better understand potential the climate-driven feedbacks. stigges@bu.edu

Vaudrey*, J.M.P. (1,2), A. Hamilton (2), M. Leason (1), J.S. Krumholz (2); *(1) Department of Marine Sciences, University of Connecticut, Groton, CT; (2) Connecticut National Estuarine Research Reserve, University of Connecticut, Groton, CT*
METHODS FOR MONITORING MACROALGAE BLOOMS IN SHALLOW ESTUARINE EMBAYMENTS
Small embayments constitute a distinct zone of transition, with nutrient-rich freshwater entering estuarine systems shallow enough that light reaches the bottom. Macroalgae blooms are common occurrences in these embayments, but the reports of blooms are often anecdotal rather than documented as part of a standardized monitoring program. Data from the last ten years will be used to characterize the state of monoculture seaweed blooms in Long Island Sound embayments, highlighting the many incidences of increasing frequency and area of blooms. The varying methods of monitoring used in Long Island Sound are assessed in terms of effort versus goal of sampling, ranging from intensive estimates of area and biomass to qualitative assessments by citizen scientists to identify trouble areas. Understanding the interactions between nutrient loading and bloom conditions is key to modeling and managing water quality in shallow estuarine waters. A recent approach developed for Connecticut embayments highlights these considerations. jamie.vaudrey@uconn.edu

Venezia, R.E. (1), C. Thornber (1), G. Pantoni (2), L. Green-Gavrielidis (3), N. Hobbs (1), G. Cicchetti (4), D. Taylor (5) A. Geisser (6), R.W. Fulweiler (6); *(1) University of Rhode Island, Kingston, RI; (2) Florida Atlantic University, Boca Raton, FL; (3) Salve Regina University, Newport, RI; (4) US Environmental Protection Agency, Narragansett, RI; (5) Roger Williams University, Bristol, RI; (6) Boston University, Boston, MA*
ECOLOGICAL STORYTELLING WITH ArcGIS StoryMap: AN APPLICATION FOR ECOSYSTEM ENGINEERS IN NARRAGANSETT BAY
Science storytelling is a form of science communication that is important to consider when conducting research where the findings impact local communities directly. One storytelling tool is the program ArcGIS StoryMap, which incorporates interactive maps, photographs, videos, graphs, and tables to guide the viewers through the topic in an organized manner via a slide show or map with guided points. I have developed an ArcGIS StoryMap to share the story of how ecosystems engineers in Narragansett Bay have changed from the 1960s to today. Rockweed, *Ascophyllum* and *Fucus* and kelp, *Saccharina*, are ecosystems engineers that provide the foundation of benthic habitats and many essential ecosystem services in the subtidal and rocky intertidal. The StoryMap incorporates important aspects of the study from underwater videos to maps and figures, which show species

distribution and percent cover. This provides information in an interactive format that visually conveys how these species have changed from the 1960s to today. rebecca_venezia@uri.edu

Walker J.E.*(1,2), Peck E.K. (1,2), Kate Ackerman (3), Alice Besterman (4), Joel Carr (5), Tim Cook (1), Maureen Correll (6), Linda Deegan (4), Zafer Defne (3), Mitchell Eaton (8), Meagan Eagle (3), Neil Ganju (3), Mitch Hartley (6), Scott Jackson (1), Rachel Jakuba (7), Jason Mercer (3), Bartholomew Wilson (6), Jonathan Woodruff (1,2), Brian Yellen(1,2); *(1) University of Massachusetts Amherst; (2) Northeast Climate Adaptation Science Center; (3) USGS Woods Hole Coastal and Marine Science Center; (4) Woodwell Climate Research Center; (5) USGS Eastern Ecological Science Center; (6) USFWS, Atlantic Coast Joint Venture; (7) Buzzards Bay Coalition; (8) Southeast Climate Adaptation Science Center*

PART II: EFFECTS OF DITCHING ON SALT MARSH VULNERABILITY IN THE NORTHEASTERN US

In the US Northeast, salt marshes have been altered by ditching, impacting crucial environmental processes. Ditches modify drainage, lower water tables, and enhance sediment oxygenation and organic matter decomposition. These changes may lead to reduced marsh elevation and longevity as sea levels rise. Part I assessed the extent of ditching across the Northeast. In Part II, we'll examine how ditching patterns influence salt marsh vulnerability to loss amid climatic changes. Using the USGS vulnerability metric UVVR (unvegetated to vegetated marsh ratio) compared to ditch densities, we control environmental factors by grouping marsh complexes by geomorphic typologies. Our focus is on understanding how Northeast salt marsh vulnerability correlates with ditching. We hypothesize that marshes with higher ditch density, will exhibit higher UVVR, indicating increased vulnerability. Quantifying the impact of ditches' on salt marsh vulnerability contributes insights for coastal restoration decisions to preserve ecosystem functions. julie.emily.walker@gmail.com

Walsh*, S. *University of New England*

ESTABLISHING PRE-RESTORATION SITES OF *AGALINIS MARITIMA* ON THE BIDDEFORD POOL SALT MARSH

Agalinis maritima is a species of special concern, as stated by the state of Maine. It grows primarily in small, highly diverse sections of the salt marsh known as pannes, which are characterized by poorly draining soils. These areas of the salt marsh are important for maintaining the biodiversity of the Biddeford Pool salt marsh ecosystem. A future salt marsh enhancement project, proposed by the Rachel Carson National Wildlife Refuge, seeks to remedy the impacts of this infrastructure, restoring proper hydrology to the salt marsh, and potentially shifting established *Agalinis maritima* populations. This project was meant to establish ten sentinel sites to act as a baseline for future vegetation monitoring, both so that the existing populations of *Agalinis maritima* and the average size of the pannes can be monitored. swalsh10@une.edu

Watling*, E., J.M.P. Vaudrey, K. Lund; *Connecticut National Estuarine Research Reserve and Department of Marine Sciences, University of Connecticut, Groton, CT*

FORMING A LONG ISLAND SOUND EELGRASS COLLABORATIVE

The Long Island Sound (LIS) Eelgrass Collaborative formed in 2023 as a CT-NY initiative to implement elements of the 2022 Eelgrass Management and Restoration Strategy, which offers guidance on short- and long-term actions for the management and restoration of eelgrass, *Zostera marina*, meadows in Long Island Sound. The Collaborative improves bi-state coordination through quarterly meetings of agency and NGO staff as well as academics. These participants gather to network, identify research gaps and funding opportunities, and share information. In addition, the Collaborative is working to assess regulatory and nonregulatory barriers to eelgrass restoration, better understand the interactions between eelgrass and aquaculture, and provide input on other LIS Study funded eelgrass projects. Methods and preliminary findings of the ongoing eelgrass management assessment will be presented, including a review of existing federal and state regulations as well as recommendations for advancing eelgrass management and restoration in LIS. emily.watling@uconn.edu

Wigand*, C. (1), S. Ayvazian (1), P. Colarusso (2), D. Cobb (1), A. Beardwood (1), S. Miller (1), N. Schafer (2); *(1) US EPA, Atlantic Coastal Environmental Sciences Division, Narragansett, RI; (2) US EPA, Region 1, Boston, MA*

GREENHOUSE GAS FLUXES ASSOCIATED WITH EELGRASS BEDS AND NEARBY OYSTER FARMS IN COASTAL LAGOONS IN RI

Seagrass meadows and oyster beds are important systems that provide many benefits. When these habitats are located near each other, benefits may include improved water quality and increased carbon storage. In two RI salt ponds, habitat zones sampled included eelgrass located near oyster aquaculture, eelgrass beds distal to oysters, bare sediments, and inside the oyster farm. Greenhouse gas (GHG) fluxes of CO2, CH4, and N2O at the air-water interface were measured monthly (April–October) and sediment carbon in the fall. Monthly gas flux means indicated that the eelgrass zones are net heterotrophic, with CO2 emissions often dominating the total emissions. In most months, the GHG emissions associated with the eelgrass zones were significantly greater than the bare or oyster zones. Preliminary results indicate mean net GHG emissions reduced the carbon storage benefit by 45–73% GWP100, 73–87% GWP20. This study emphasizes how eelgrass organic carbon is an important offset of GHG emissions associated with heterotrophic coastal lagoons. wigand.cathleen@epa.gov

Wilson*, E.M. (1), L.K. Champlin (1), R.W. Fulweiler (1,2).; *(1) Department of Earth and Environment, Boston University, Boston, MA; (2) Department of Biology, Boston University, Boston, MA*

PLANT SPECIES IMPACT SALT MARSH CARBON DIOXIDE FLUXES EVEN IN WINTER

Vegetation communities in salt marshes impact greenhouse gas (GHG) fluxes. However, the mechanisms by which plant species influence GHG fluxes remain unclear. Potential mechanisms include photosynthesis, provision of substrate for microbial respiration, and plant-mediated gas exchange. An outstanding question is whether these mechanisms persist during vegetation dormancy. Winter GHG fluxes have historically not been collected due to presumed inactivity, but recent studies suggest marshes are net GHG sources in the winter. Here, we examine if vegetation still regulates GHG fluxes during the winter by measuring fluxes during dormancy at five New England National Estuarine Research Reserves. Initial results of our pilot study suggest persistent differences in carbon dioxide fluxes between the high and low marsh during winter. Quantifying the impact of plants on GHG fluxes is especially important because sea level rise is changing vegetation zonation and climate change is altering the timing of dormancy. wilson47@bu.edu

Wilson,* G.M. (1), S.C. Adamowicz (2), Burdick D.M. (3), W. Ferguson (4), N. Maher (5); *(1) Bear Creek Wildlife Sanctuary, Saugus, MA; (2) Rachel Carson NWR, USF&WS, Wells, ME; (3) Jackson Estuarine Laboratory, University of New Hampshire, Durham, NH; (4) Save The Bay, Providence, RI; (5) The Nature Conservancy, Cold Spring Harbor, NY*

EVERY MARSH WAS A FARM: UNCOVERING THE THREE CENTURIES OF HIDDEN AGRICULTURAL INFRASTRUCTURE STILL DRIVING MARSH SURFACE HYDROLOGY

In the spring 2018 NEERS meeting, Adamowicz, S.C. and Wilson, G.M. first presented FARMERS IN THE MARSH. In response, during the seasons that followed, an informal collaborative of tidal marsh professionals came together to form the Salt Marsh Adaptation and Resiliency Teams (SMARTeams) network to further understand and address these former land use impacts. In this update, we will provide compelling evidence to further demonstrate that Reclamation Embankment practices used for salt marsh agriculture are widespread along the Atlantic Coast. As part of our case study, the recent completion of 8,000 acres of restoration designs in the Massachusetts Great Marsh has brought concerns to our team of underlying agricultural infrastructure components that can pose resource degradation for both restoration and no-action management strategies alike. s2ary@comcast.net

Xochipiltecatl, B.*, Roberts, S.* Mulligan, C.; *Sound School*

POTENTIAL IMPACTS OF ANTHROPOGENIC RUNOFF ON COASTAL WATERWAYS: A REGIONAL COLLABORATION (UWR) TO UNDERSTAND OUR CONNECTION TO WATER CHEMISTRY IN A COASTAL WATERSHED

The Mill River faces a visible decline in water quality and runoff is thought to play a major role. In late 2020, MRWA along with Southwest Conservation District, Sound School, and Save the Sound among others composed what eventually became the Urban Waters Initiative. This program aimed to catalyze a community-level assessment, fostering environmental awareness and stewardship, thought to be crucial for communities relying on the river. For its part, Sound School students devised a long-term study with sites from the lower Mill out to Morris Cove. This revealed impactful relationships between short-term (24-hour) rainfall and bottom dissolved oxygen levels (R2 = 0.594). Long-term (48-hour) rainfall correlated with bottom ammonia build-up (R2 = 0.601) and surface water clarity (R2 = 0.507). This began to shed light on our connection to these waterways considering these relationships fall off dramatically in the absence of rainfall. Subsequent conversations identified the need for more spatial data and frequent temporal scales. charles.mulligan@new-haven.k12.ct.us

Zhu, J.; *Billion Oyster Project, New York, NY*

LESSONS LEARNED WHILE RESTORING OYSTERS TO NEW YORK HARBOR AND APPLIED TO BROOKLYN BRIDGE PARK

Billion Oyster Project (BOP) aims to restore oyster reefs to New York Harbor through public education initiatives and engage one million New Yorkers in the process. Native to New York, the Eastern oyster provides crucial ecosystem services, yet its population has suffered depletion due to overharvesting, pollution, and habitat loss. This presentation explores insights from BOP's research and hands-on experience in oyster restoration, focusing on practical applications at the Brooklyn Bridge Park site. In 2020, SEAPA cages were installed off a floating dock and data indicate consistent oyster growth, low mortality rates, and high recruitment of wild oysters. Diverse restoration techniques, including cabinet reefs and subtidal gabions in 2021, showcased parallel trends in oyster growth and wild recruitment. Cabinet reef oysters had higher mortality rates, potentially due to predation and frequent human interaction. BOP continues to explore eco-friendly designs for estuary restoration, enhance marine ecosystems, and benefit New Yorkers. jzhu@billionoysterproject.org