Approaches for baseline data collection to guide tidal marsh restorations across coastal NY, CT, RI - Samantha Apgar

Tidal marshes are being lost at an alarming rate. Within marshes, the high marsh zone, characterized by monthly tidal inundation during high spring tides, is being lost the fastest. This talk will showcase the approaches the USFWS Southern New England Coastal Program is undertaking to understand conditions at sites across New York, Connecticut, and Rhode Island to guide restoration decisions. Using the MarshRAM protocol (Kutcher et al. 2022) paired with RTK elevation and HOBO water level logger data collection, we show limited high marsh extent and elevation profiles that indicate high marsh plants are sitting well below necessary elevations relative to daily and monthly water levels to sustain the species. Using monitoring guidance from the Atlantic Coast Joint Venture and Tidal Marsh Bird Rapid Assessment protocol from the Saltmarsh Habitat and Avian Research Program, we show limited saltmarsh sparrow breeding at sites that likely negatively responded to this decline in prime nesting habitat. We intend to show how these monitoring datasets paired with historical aerial imagery or other available longer-term datasets show a large-scale change in microhabitat availability and how baseline data collection can inform restoration decisions.

Protecting and Restoring Salt Marsh Migration Corridors through NRCS' Wetlands Reserve Program - Wenley Ferguson

The Natural Resources Conservation Services (NRCS) Wetlands Reserve Easement Program is a useful tool to protect salt marsh migration corridors and adjacent uplands. In Narragansett Bay, the Rhode Island NRCS has partnered with Save The Bay and a local land trust to work with property owners to secure easements on marsh migration corridors that are currently agricultural lands or forested wetlands. Eligible properties are identified using Sea Level Rise Affecting Marsh Migration Models and property owners are contacted to assess interest. Once the easements are secured, the Wetlands Reserve Easement program can fund restoration activities in the salt marsh to address legacy agricultural impacts to marsh hydrology and marsh migration facilitation by removing barriers to migration including invasive plants and human features such as agricultural berms or walls. The U.S Fish and Wildlife Service's Atlantic Coast Joint Venture Program is highlighting this land protection tool throughout the Atlantic coast region as a restoration tool to restore saltmarsh sparrow habitat and to make salt marshes more resilient to future sea level rise scenarios.

An assessment of salt marsh vulnerability; restoration potential in the Northeastern United States using physical and ecological indicators - Julie Walker

With climate change and increased coastal land alteration, salt marshes globally are becoming increasingly degraded. Salt marshes of the Northeastern United States (Maine to Virginia) are particularly vulnerable given the history of intensive alteration such as ditching and tidal restrictions
since European colonization. Such alterations reduce the accretionary potential of salt marshes in this region, in turn reducing their ability to keep up with accelerating relative sea level rise. This ultimately
leads to reductions in marsh area and loss of ecosystem function, including flood protection,

carbon burial, habitat provision, and nutrient filtration. Through collaboration between multiple government,
academic, and non-profit organizations, we investigate the following questions: (1) What are the spatial patterns of salt marsh vulnerability to relative sea level rise across the Northeast United States? (2)
Additionally, how is this vulnerability linked to specific salt marsh modifications? We hypothesize that estimated salt marsh vulnerability will be shortened where salt marsh modifications are most intense. Results will be used to drive science-based decision-making through
prioritization of salt marsh restoration.

Assessing salt marsh recovery: Tracking greenhouse gas fluxes, soil characteristics, and plant colonization at sediment enhancement sites - Danielle Perry

Sea level rise within New England is accelerating at a rate faster than the global average, leaving salt marshes particularly susceptible to degradation. Due to low elevations and limited sediment supplies, New England salt marsh accretion rates often cannot keep up with sea level rise rates leading to drowning salt marshes. Rhode Island coastal managers are implementing the climate adaptation strategy, sediment enhancement, to offset the effects of sea level rise within salt marshes. Sediment enhancement is a restoration technique that uses dredge material to increase salt marsh surface elevation. Monitoring is essential to understand the short and long-term impacts of these techniques as well as the recovery of essential ecosystem function such as carbon dioxide uptake and carbon storage.

In this Rhode Island 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 addition) 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 sediment enhancement sites to help inform future management.

Optimizing hummock design for salt marsh restoration: managing tradeoffs between planting density and revegetation - Nicolette Nelson

Uniform sediment addition increases elevation capital and allows salt marshes to persist in the face of sea-level rise, but increasing elevation heterogeneity through a patch-work application of sediment has great potential to enhance ecological function in degraded marshes and hasten recovery of marsh dependent species. Building mounds of sediment (“hummocks”) can create new high-elevation marsh habitat while minimizing disruption to existing habitat. It is unclear how vegetative regrowth through applied sediment, seed rain, and planted plugs contribute to vegetation recovery along elevation and flooding gradients. In spring 2022, a portion of Great Meadows Marsh in Stratford, Connecticut (USA) was restored by applying sediment in 14

hummocks (mean area: 272 m2, maximum elevation mean: 1.70 m). Hummocks were experimentally planted with native marsh vegetation plugs that varied in density (30 or 60 cm spacing) and species composition (Juncus gerardii, Spartina patens only, or Spartina patens with Distichlis spicata). We measured how revegetation on the hummocks varied with planting treatment, salinity, and elevation. Planted plugs established successfully, and in 2023 vegetative cover did not differ among planting treatments. Vegetation cover and species diversity increased with increasing elevation and decreasing soil salinity. Invasive Phragmites australis spread into the restored marsh from nearby preexisting stands and was most prevalent at high elevations. We are collaborating with managers to develop adaptive management strategies to prevent dominance by P.australis. Ultimately, our investigations will shed light on potential tradeoffs between salt marsh restoration costs and desired management outcomes associated with heterogeneous sediment depth manipulations.