ERDC Coastal and Hydraulics Laboratory Researchers Install Additional Sensors ahead of Beneficial Use of Dredged Material Wetlands Project

Impact Statement: Many of our Nation's wetlands are degrading due to a combination of anthropogenic and natural forces and require an influx of sediment to support a robust ecosystem. I n preparation of an upcoming Beneficial Use of Dredged Material (BUDM) placement by the USACE Philadelphia District (NAP), the ERDC Coastal and Hydraulics Laboratory (CHL) deployed pore pressure sensors and pressure cells to understand wetland responses to a BUDM nourishment. In addition, the team collected data from geotechnical and ecological sensors deployed in June 2024.

Large swaths of New Jersey coastal wetlands are on the verge of converting to open water due to lowering elevation that has not been keeping pace with changing sea levels, causing increased durations of inundation. The USACE Philadelphia District (NAP), in collaboration with The Wetland Institute (TWI) and the New Jersey's Department of Environmental Protection (NJDEP), is moving forward with a Beneficial Use of Dredged Material (BUDM) project to bolster a section of degrading wetlands. The wetland elevations at Scotch Bonnet, an area adjacent to The Wetlands Institute, are too low to support optimal function and have been rapidly collapsing and transitioning stable sections into open water due to increased inundation. The site at Scotch Bonnet was completely inundated an unprecedented 21 days this January 2024, so this project seeks to elevate the marsh platform. Dredged material will be extracted from the New Jersey Intracoastal Waterway (NJIWW) and hydraulically dredged onto the marsh this October 2024.

Dr. Brian Harris of ERDC's Coastal and Hydraulics Laboratory (CHL) lead a trip to deploy pore pressure sensors (drive-point piezometers) and pressure cells within a BUDM nourishment area. The pressure-plates were mounted on the wetland surface and will monitor the induced forces on the wetland surface from the dredged material while the pore pressure sensors were installed within the subsurface to monitor the dissipation of generated pore pressures. The combination of these types of sensors will be used in combination with replicate Unmanned Aircraft Systems (UAS-) based lidar surveys and time-lapse cameras to validate USACE's consolidation models for BUDM nourishments. Representative high- and low-marsh plots were targeted across the nourishment area to capture a variation of surface type and dredged material loading conditions. These sensors are part of a larger effort to determine low-cost, robust sensors to monitor wetland BUDM projects and validate geotechnical methods.

While on site, the team extracted data and maintained additional geotechnical and ecological sensors deployed in June 2024 within the placement area. Normalized Difference Vegetation Index (NDVI) sensors successfully monitored vegetation characteristics throughout the summer growing season and will continue to collect data throughout the placement of dredged material and subsequent re-emergence of vegetation post BUDM. In addition, data from the soil extensometers monitoring the longitudinal fissure identified outside of the placement area was collected and is currently being processed.

Figure 1. (Left) Installation of pressure cell and pore pressure sensors at the high-marsh site. From left to right are Dr. Anthony Priestas and Daniel Gallegos, both of CHL. (Right) Daniel Gallegos setting up the data transmitter on The Wetland Institute's tower. Photos collected by Dr. Brian Harris.

Figure 2. (Left) Final installation of the geotechnical sensors co-located with the ecological sensors at the high-marsh site. The low-marsh site can be seen in the background, right-hand side. (Right) Monica Chasten (USACE NAP), Dr. Anthony Priestas (CHL), and Dr. Lenore Tedesco (The Wetland Institute) discussing construction plans for the upcoming BUDM placement. Photos collected by Dr. Brian Harris.

Funding for this effort was provided by the USACE Dredging Operations and Environmental Research (DOER) Program, and aligns with the USACE Engineering With Nature® (EWN®) Program goals.

PoCs: Brian Harris Brian.D.Harris@usace.army.mil