Seven Mile Island Innovation Lab

Scotch Bonnet Marsh Enhancement

OVERVIEW

In Spring 2019, the U.S. Army Corps of Engineers (USACE) Philadelphia District partnered with the State of New Jersey, The Wetlands Institute, and the USACE Engineer Research and Development Center to create the Seven Mile Island Innovation Laboratory (SMIIL). The initiative is designed to advance and improve dredging and marsh restoration techniques. Since its inception, SMIIL projects have restored more than 85 acres of marshes and protected two island complexes from future degradation.

The Scotch Bonnet Island project will enhance tidal marshes that are falling behind relative sea level rise rates by adding a supplemental sediment source. Clean NJ Intracoastal Waterway (NJIWW) dredged channel sediments will be used to uplift low marsh areas that have fallen below the suitable ranges for low marsh by infilling expanding pools to strengthen ecosystem resilience. The project builds upon the success of several beneficial use projects in coastal New Jersey.

Low-lying Scotch Bonnet Island is a drowning marsh island with marsh platform elevations that are below stable low marsh elevations with rapid conversion of marsh to mudflat and open water. Sunny-day flooding routinely floods the marsh. Large areas of marsh have converted to open water. Left - Flooding of 2.8'NAVD88 6/2/2023. Image courtesy Ted Kingston. Right - Extensive areas of marsh conversion to open water on the Scotch Bonnet marsh platform.

SITE DESCRIPTION AND PROJECT NEED

Scotch Bonnet Island is located in Cape May County with a portion that is part of the Cape May Coastal Wetlands Wildlife Management Area, managed by the New Jersey Fish and Wildlife, and a portion owned by The Wetlands Institute (TWI), a NJ non-profit. The 86-acre marsh island now lies almost entirely at or below stable low marsh elevation with many areas below mean high water. The marsh complex is dominated by short-form Spartina alterniflora with the marsh platform increasingly dissected by rapidly expanding tidal channels and pool formation and expansion. Notable portions of the platform have recently had pools dissected by tidal channels leading to rapid deepening and formation of unvegetated mudflats. The only remaining high marsh areas on the island are the result of development associated fill or historic dredged material placement.

Scientists at TWI Institute have documented dramatic marsh loss to pool formation and expanding tidal channels. Historical air photo analysis indicates that in 1941 there were approximately 85 acres of vegetated marsh habitat. By 2019, that number had dropped to 56 acres. The Sea Level Affecting Marshes Model (SLAMM) projects that by 2050 only 34 acres will remain as vegetated marsh. This corresponds to a loss of carbon storage of more than 15,000 metric tons of CO2e (using the methodology of Warnell et al., 2022).

The sediment placement area consists of approximately 12 acres with almost 8 acres below 1.8 feet NAVD88, an elevation shown at other SMIIL restoration sites to be below the elevation suitable for Spartina alterniflora growth. Almost 4 acres of the selected site are between 1.8 feet and 2.3 feet NAVD88 and only 1 acre is above 2.3 feet NAVD88. Detailed elevation mapping and corrected LIDAR work being conducted by TWI and University of Pennsylvania researchers have established low marsh elevation ranges at the placement site to currently be between 2.3 feet and 2.9 feet NAVD88, making the entire placement site at or below stable low marsh elevation ranges. SLAMM modeling using 0.8-1.1 feet of Sea Level Rise places low marsh elevations between 2.8 – 3.5 feet NAVD88 by 2030 - further indicating the dire nature of the marsh condition in the placement area.

PROJECT DETAILS

The USACE Philadelphia District awarded a contract to Barnegat Bay Dredging Company of Harvey Cedars, N.J. to dredge approximately 25,000 cubic yards of sediment from a critical shoal in the NJIWW federal channel. The mixed fine sand and muddy sediment will be hydraulically pumped onto the marsh platform to build elevation capital. Materials will be pumped freely onto the main placement area with a goal of providing uplift to a 12-acre area in the first lift. Biodegradable coir logs will be used to direct flows into lower lying areas and prevent sediments from being lost to non-target areas. Tidal flooding will be allowed to naturally distribute sediments across portions of the marsh platform.

MONITORING AND ASSESSMENT

USACE Philadelphia District, USACE ERDC, US Naval Academy, University of Pennsylvania and The Wetlands Institute are involved with site and placement monitoring efforts to document and inform pre-placement conditions and material placement methodologies before and during placement. Outcomes will be monitored for marsh response and recovery, diamondback terrapin and avian usage.

Left - Low lying marsh restoration area (white) showing potential location of biodegradable coir logs (yellow) to direct flows, and possible discharge point (green).

Right – marsh conversion at the project site.