Beneficial Use of Dredged Sediments

Productive and postive uses of dredged material.

Gull Island Habitat Restoration and Marsh Protection, New Jersey

BU Characterization

Back Bay Island Restoration, Marsh edge protection

Project Purpose

Gull Island, in Cape May County, NJ, along with adjacent Sturgeon Island, supports nesting for 25 percent of the wading birds in New Jersey[1]. Habitat suitability has **declined** at Gull Island in recent years, with remnants of historical dredge placements supporting the only remaining suitable habitat. Low marsh and inland tidal flats along the southern portion of the island were selected for dredged material placement to **build elevation** on the marsh platform, as well as along the subtidal flats that **protect** the marsh edge from erosion and support habitat. Philadephia District (NAP) partnered with USACE Engineer Research and Development Center (ERDC), the State of New Jersey and The Wetlands Institute (TWI) to place dredged material from the NJ Intracoastal Waterway through the Seven Mile Island Innovation Laboratory (SMIIL) and evaluate beneficial use of dredge material management practices for marsh restoration and marsh edge protection. Research, supported through various research programs, including the Dredging Operations and Environmental Research Program (DOER) and Regional Sediment Management program (RSM), is being conducted to evaluate the effectiveness of dredged material placement processes.

Project Description

In the Fall of 2020, approximately 40,000 cubic yards were dreged from the NJ Intracoastal Waterway (NJIW) and placed on Gull Island. Material was pumped to a Y-valve which directed flow to two separate placement locations:

1. Dredged slurry was pumped to an interior location on the southern portion of the island. A sandy mound was created near the discharge with the fines distributing farther covering about 20 acres of the marsh platform.
2. Mateiral was directed to pipeline attached to a floating platform along the southern edge of Gull Island, discharging material in open water to create a sandy marsh-edge bar which will serve as edge protection from storm- and boat-induced waves.

- Elevation monitoring is being conducted to evaluate consolidation of the placed material and the extent to which elevation goals have been met. A mass balance is also being perfomed to qualitatively evaluate how sediment was transported and contained across the site and within the surrounding mudflats.
- Submerged Aquatic Vegetation (SAV) and benthics are being monitored to evaluate benefits from the dredged material placements.
- The site will be monitored over time to capture long-term consolidation, vegetation establishment and habitat suitability and use.

Project Benefits

Productive and positive uses of dredged material for this project include (1) raising marsh elevation to create high marsh areas for salt marsh sparrow and wading birds, (2) restoration of unvegetated interior mud flats, (3) enhancing tidal flats for SAV and fish habitat and reducing marsh edge erosion. Additionally, results from the mass balance approach will help in developing a better understanding of sediment transport and consolidation, that will inform future placements for setting project expectations and determining the need (or lack of) for containment for meeting project goals.

[1] USACE. (n.d.). *Seven Mile Island Living Lab – Sturgeon Island Restoration* [Fact sheet]. US Army Corps of Engineers – Philadephia District. https://www.nap.usace.army.mil/Portals/39/docs/Civil/Coastal/Sturgeon-Island-Factsheet-Final.pdf

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Innovations and Advancements

Innovative practices implemented at Gull Island include **unconfined placement**, which is not typical for fine-grained dredged slurries. The decision to forego confinement techniques reduces costs and limits disturbance to the marsh for installation and removal of containment features, and promoted benefits across multiple island regimes including mounding near the discharge, elevation enhancement of interior tidal flats, and slurry transport through tidal channels and direct placement to build tidal flats. Unconfined placement also allows for creation of natural slopes. **Demonstration of the benefits of unconfined placement and a lack of ecological impacts could result in cost savings and more efficient dredged material placement for future projects.** Additionally, a newly developed tool, the Sediment Profile Imaging (SPI) scanner, was employed for real-time monitoring of placement in subtidal areas. The SPI scanner is inserted into the sediment bed and captures high quality images of the seabed and the overlying water column. The images are used to evaluate bed composition and benthic habitat recovery. It was found to be a useful tool for monitoring placements.

Lessons Learned

From the slurry placed on the marsh platform, much of the sand appears to have deposited within a mound near the pipe discharge, while the fines slurry spread over a larger area with some material making its way to tidal outlets, intentially creating tidal deltas that have persisted. Both indirect placement through tidal channels and direct placement along the flats appear to be effective strategies to shallow the flats above MLLW into a zone more suitable for SAV. While additional monitoring is needed to determine the project's success, early observations indicate successful elevation enhancement and creation of a marsh-edge bar, and did not reveal significant ecological impacts as a result of unconfined placement.

Due to difficulties accessing the site immediately post-placement, remote monitoring techniques are needed. There are also challenges associated with obtaining accurate survey data, such as inability to access the site via ground-based techniques, and interference from vegetation and water coverage for lidar based methodologies.

Partnering

This project represents a collaboration among the consortium of stakeholders within the SMIIL, which includes NAP, TWI, ERDC, the State of New Jersey, academic institutions, and private parties. The SMIIL stakeholders worked together to design and vet placement strategies, and monitor sediment placement and subsequent changes over time. Multiple ERDC teams contributed to the overall success and lessons learned through a range of research and monitoring objectives, evaluating evolution of the mudflats and marsh platform, turbidity and sediment transport, wave and current dynamics, and benthics and SAV.

Outcomes

Success of the dredged material placements at Gull Island is still being evaluated. Field data collection in July 2021 will inform the mass balance, and consolidation behavior as well as stability of the marsh platform. *Spartina* has begun to reestablish on the interior flat suggesting sufficient elevation was attained to support vegetation. The placement area was previously very low and converting from marsh to mud flat; reversal of that trend will be evaluated as an outcome. Long-term success will be measured in terms of habitat suitability and use by wading birds, SAV establishment, and marsh edge stability.

Additional Information?

Additional information on SMIIL and marsh restoration can be found at: https://wetlandsinstitute.org/smiil/ and https://www.nap.usace.army.mil/Missions/Civil-Works/Coastal-Dredging-Beneficial-Use/.

What is next?

Monitoring elevation of Gull Island will be continued and will be used to determine whether additional dredged material is needed and how it should be placed to build elevation to support nesting habitat and a sustainable marsh. Demonstrated success may allow elevation enhancements at other locations across the 287-acre island.

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