

# Beneficial Use of Dredged Sediments

Productive and positive uses of dredged material.

## Sturgeon Island Habitat Restoration and Marsh Edge Protection, New Jersey

### BU Characterization

Back Bay Island Habitat Restoration, Marsh Edge Protection

### Project Purpose

Sturgeon Island, in Cape May County, NJ, along with adjacent Gull Island, support nesting for 25 percent of the wading birds in New Jersey<sup>1</sup>. Habitat suitability has declined at Sturgeon Island in recent years. Low marsh and pool areas on Sturgeon were selected for **elevation enhancement via dredged material placement** to create suitable nest areas above storm flood elevations. Philadelphia District (NAP) partnered with USACE Engineer Research and Development Center (ERDC), the State of New Jersey and The Wetlands Institute (TWI) to design placement of dredged material from the NJ Intracoastal Waterway (NJIW) on Sturgeon Island as part of this effort. Research, supported through various research programs, including the Dredging Operations and Environmental Research Program (DOER), is being conducted to evaluate the effectiveness of dredged material placement processes aimed toward habitat restoration through elevation enhancement.



### Project Description

- In March 2020 approximately 4,200 cubic yards of dredged sediment was placed on Sturgeon Island prior to interruption due to COVID 19. Material from the NJIW was pumped to a Y-valve on the island which split flow between a pipe with a nozzle and an elevated sediment distribution pipe (see figure above). The distribution pipe was tested by ERDC to evaluate its ability to separate the flow for construction of a sand berm. Partial containment was accomplished using a 14-inch water-filled pipe along the lower side of the island, along with efforts to plug the tidal creek within the placement area.
- An additional 15,000 cubic yards of dredged sediment was placed in Fall 2020. Material was initially placed within the interior of the northern portion of the island using the sediment distribution pipe. Later, the discharge was repositioned to place sediment along the northern edge of the island to protect against marsh edge erosion.
- Elevation monitoring is being conducted to evaluate consolidation of the placed material and the extent to which elevation goals were met by these placements. A mass balance is being performed to quantify sediment volumes contained on the site and within the surrounding mudflats.
- Monitoring around the sediment distribution pipe is being performed to evaluate its effectiveness in separating sand from the dredge slurry.
- Submerged Aquatic Vegetation (SAV) and benthics are being monitored to evaluate benefits from the placements.
- The site will be monitored over time to capture long term consolidation, vegetation establishment and habitat suitability and use.

### Project Benefits

- Federal channels along the New Jersey Intracoastal Waterway near Sturgeon Island required dredging to maintain authorized depths. This project used those channel sediments to increase elevation to offset erosion, subsidence, and sea level rise on Sturgeon Island. Sediments which did not remain on the island were captured on the mudflats. The mudflats not only provide habitat for submerged aquatic vegetation and fish, but also enhance marsh edge protection for the steep scarp which is subject to erosion from storm- and boat-induced waves.
- The project provided excellent opportunities to study the dynamics of unconfined and partially confined dredged material placement and the use of a sediment distribution pipe for building localized elevation.
- Developing a better understanding of sediment transport and consolidation will inform future placements for setting project expectations and determining the need (or lack of) for containment for meeting project goals.
- Evaluation of the sediment distribution pipe will determine its potential effectiveness for future use to build berms for containment or other purposes.

<sup>1</sup> USACE. (n.d.). *Seven Mile Island Living Lab – Sturgeon Island Restoration* [Fact sheet]. US Army Corps of Engineers – Philadelphia 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 Sturgeon Island include the use of a sediment distribution pipe to segregate sand, and use of a water-filled dredge pipe as a containment feature.

Cone penetrometer testing (CPT) was conducted prior to placement; future CPT could be employed to indicate how the site is recovering compared to pre-placement conditions.

### Lessons Learned

Existing topography caused the dredged material slurry to short circuit to the tidal channel and efforts to plug the channel using hay bales, coir logs and marine plywood were largely ineffective. However, sediment losses from the island resulted in useful sediment deposits to the surrounding mudflats.

The water-filled pipe as a simple containment method proved to be reasonably effective. Significant seepage was observed beneath the pipe in areas where the local surface was not smooth and dredged sediment build-up on the discharge side of the pipe exerted enough load to move the pipe laterally in some locations. Both issues can be resolved relatively easily by placing a mat beneath the pipe and providing some lateral support for the pipe. The pipe also remained in place for about five months post-placement. While the presence of the barrier provided continued containment and time for the sediment to stabilize, it also prevented drainage and desiccation of the dredged fill.

Due to difficulties accessing the site immediately post-placement, remote monitoring techniques are needed.

### Partnering

This project represents a collaboration among the consortium of stakeholders within the Seven Mile Island Innovation Laboratory (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, sediment distribution pipe effectiveness, construction-related turbidity, and benthics and SAV.



### Outcomes

Success of the dredged material placements at Sturgeon Island is still being evaluated. Field data collection in July 2021 will inform the mass balance, and consolidation behavior and effectiveness of the sediment distribution pipe. Long-term success will be measured in terms of habitat suitability and future use by wading birds.

### Additional Information?

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

Publications to date:

Fall, K.A., Perkey, D.W., Tyler, Z.J., Welp, T.W., 2021. Field measurement and monitoring of hydrodynamic and suspended sediment within the Seven Mile Island Innovation Laboratory, New Jersey. ERDC/CHL TR-21-9.

<http://dx.doi.org/10.21079/11681/40980>

### What is next?

Additional dredged material placement is planned for Sturgeon Island in Fall 2021. Monitoring habitat and elevation changes will continue as we evaluate the need for additional dredged material and how it should be placed to build elevation to support nesting habitat.



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