Research Article Published "Scalable Geomorphic Monitoring for Tidal Wetland Sediment Nourishments"

The beneficial use of dredged material (BUDM) is a technique to raise wetland surface elevations, but much remains unknown about the subsequent geomorphic changes following nourishment. A CHL-led manuscript published in ASCE's Journal of Waterway, Port, Coastal and Ocean Engineering presents a multiplatform approach to monitoring geomorphology of a BUDM nourishment at Maurice River, NJ.

The article titled "Scalable Geomorphic Monitoring for Tidal Wetland Sediment Nourishments" was published in ASCE's Journal of Waterway, Port, Coastal and Ocean Engineering. The manuscript presented a multiplatform approach to monitoring post-nourishment geomorphology and site establishment of a BUDM nourishment.

The USACE Philadelphia District (NAP) beneficially used dredged material from the Maurice River federal navigation channel to nourish degraded wetlands adjacent to the Heislerville Dike in New Jersey's Heislerville Wildlife Management Area (Fig. 2). Prior dredging occurred over 25 years ago. NAP's goal was to enhance the wetlands adjacent to the dike to provide a buffer from wave action and other hydrodynamic forces.

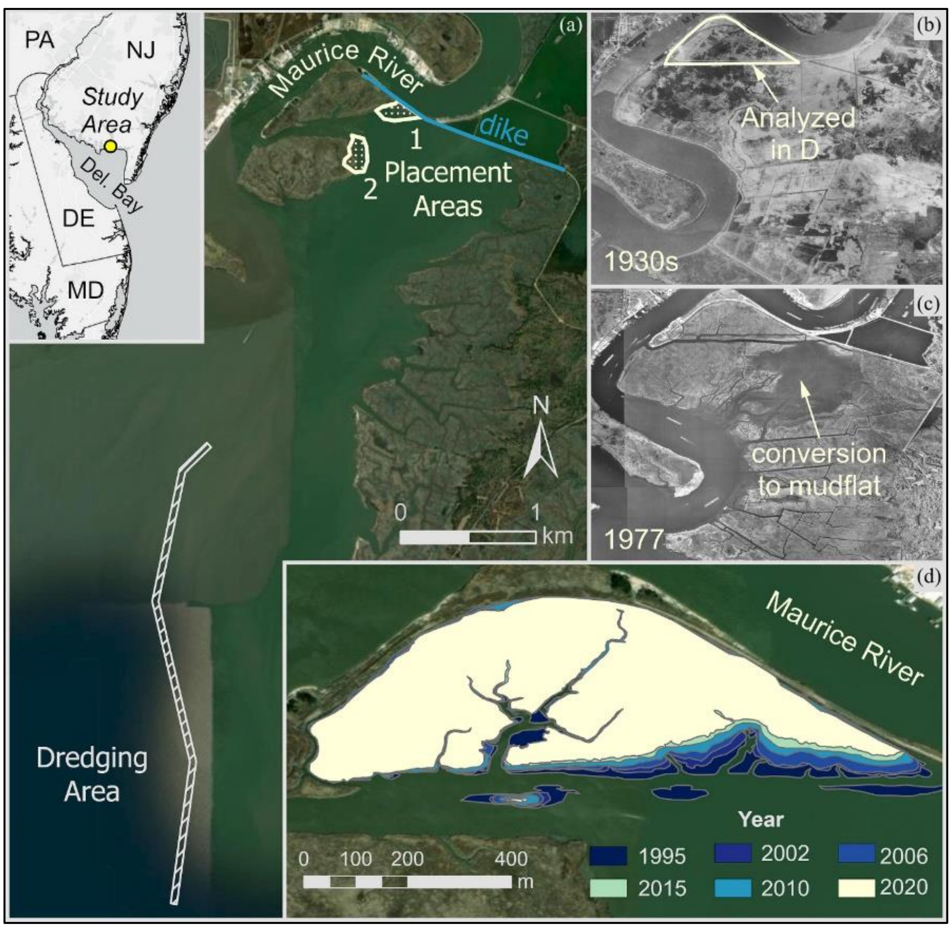

Figure 2. (a) Location of dredged material placement areas 1 and 2 and the dredging area; historic imagery from: (b) the 1930s and (c) 1977; and (d) marsh area change from 1995 to 2020.

In December 2023, Barnegat Bay Dredging, USACE-NAP's contractor, placed ~74,000 cubic yards of dredged material in Placement Area 1 (Figure 2). The site immediately gained significant adjacent to the dredge outfall due to a high presence of coarse sand and oyster shell, while the fine-grained material nourished the adjacent mudflat.

This paper highlights four key takeaways of interest to District practitioners:

1. Multiplatform monitoring integrating unoccupied aerial systems imagery and lidar, single beam hydrographic surveying, free fall penetrometer tests, and fixed-place and roving photography allowed us to capture the spatial and temporal geomorphic changes and support adaptive management decisions throughout the dredging process.
2. Pre-dredging sediment cores were insufficient to capture dredged material heterogeneity (i.e. unpredicted pockets of sand and shell), which underscores the need to use improved seafloor and sub-bottom sediment characterization methods to highlight layering and debris in navigation channels which impacts dredging and BUDM.
3. Despite the negative perception of fine-grained material among many coastal engineers, our data, and other research from NJ, indicate that fine sediment can build elevation and withstand scour within 3-months post placement (Figs 3 and 4).
4. BUDM sites provide numerous intermediate benefits. While most BUDM sites require a minimum of 3 to 4 full growing cycles before significant revegetation occurs, we documented multiple faunal species utilizing the site in this "intermediate" time between sediment placement and "full" vegetation establishment.

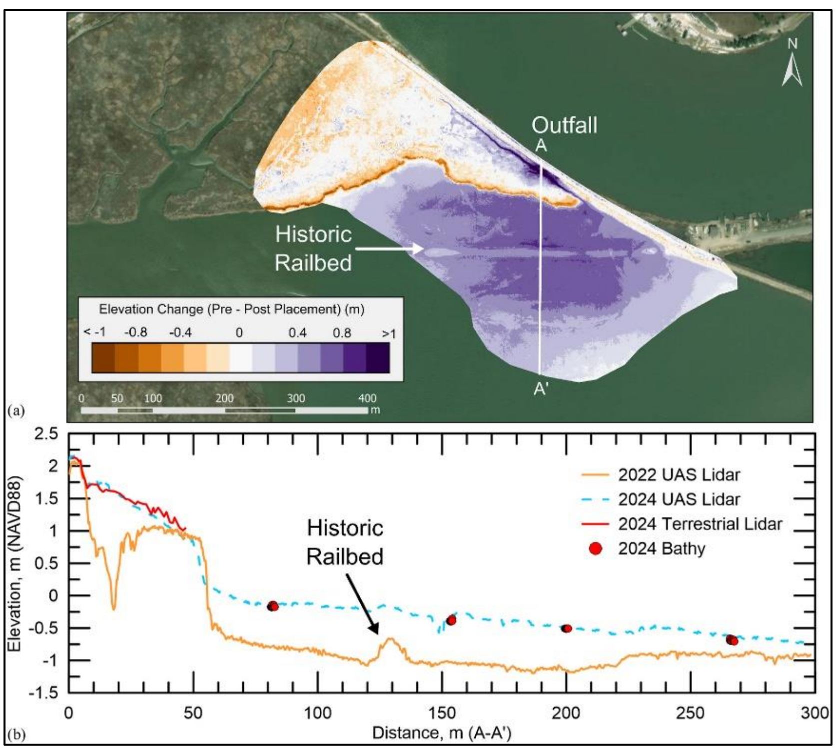

Figure 3. (a) Elevation difference between the preplacement 2022 UAS lidar and postplacement 2024 UAS lidar surveys; and (b) elevation transect spanning from the dredge outfall across the marsh platform and nourished mudflat.

Figure 4. Roving camera images of (a–d) hay bale containment at the mouth of the tidal creek; and (e–h) coir logs within the tidal creek. Arrows denote scour.

This was a collaboration among ERDC's federal, state, non-profit, and university partners including: USACE-NAP (Monica Chasten), the Joint Airborne Lidar Bathymetry Technical Center of Expertise (David White), NJ's Department of Environmental Protection (Tyler Kinney), The Wetlands Institute (Dr. Lenore Tedesco), University of Florida (Dr. Nina Stark), Virginia Tech (Freddie Falcone), and the University of Washington NSF Natural Hazards Engineering Research Infrastructure (NHERI) Reconnaissance Experimental Facility (RAPID) (Dr. Michael Grilliot).

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Full article citation: Harris, B., J. Shawler, A. Ostojic, M. Chasten, S. McGill, D. White, L. Tedesco, B. Bruder, F. Falcone, D. Gallegos, N. Stark, M. Grilliot, and T. Kinney. 2026. "Scalable Geomorphic Monitoring for Tidal Wetland Sediment Nourishments." *Journal of*

Waterway, Port, Coastal, and Ocean Engineering, 152 (1): 04025037. https://doi.org/10.1061/JWPED5.WWENG-2347.

Funding for this effort was provided by the USACE's the Innovations in Sediment Management (I-SM) Strategic Focus Area and the Dredging Operation and Environmental Research (DOER) Program.

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