



Improving Nearshore Nourishment Practices via Dynamic Sediment Structures

Dredging Operations Environmental Research (DOER) Program

U.S. ARMY CORPS OF ENGINEERS

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Focus Area

Sediment and Dredging Processes

Problem

Nearshore placement of dredged sediment on the open coast is increasingly becoming the preferred option to other placement alternatives in the Great Lakes (confined disposal or open water placement) due to changes in policy or other factors. Nearshore placement offers a myriad of benefits which could be enhanced with dynamic containment structures including shoreline protection, habitat restoration opportunities, and social benefits; however, numerous design and engineering challenges remain to successfully achieve these outcomes in the face of climate change and data gaps. USACE currently lacks the data, tools, approaches, and guidelines for achieving these desired engineering goals (i.e., slope and dimensions) and environmental management objectives during and after nearshore placement (i.e., achieving desired turbidity goals, elevation profiles, and plant communities), particularly in the Great Lakes. Therefore, there is a critical need to identify proof-of-principle designs for sediment containment structures that are engineered as nature-based solutions to support nearshore placement of dredged sediment to enhance future opportunities. Past Great Lakes projects have considered including fallen trees into gravel nearshore berms and using inverted anchored root wads as wave breaks and fish habitat.

Study Description

The primary objective is to develop innovative engineering designs and features for dynamic structures to support nearshore placement operations. This research task will build on lessons learned from other pertinent USACE nearshore placement projects (e.g., 21st Avenue West, Duluth-Superior Harbor, Illinois Beach State Park). These projects will inform the design concepts for innovative nearshore structures engineered from dredged sediments relocated from nearby navigation channels. Structures will be evaluated based on numerous performance criteria, including scalability, efficacy, and cost. Demonstration of one or more of the design concepts will be deployed either at the mesocosm or field scale to evaluate the performance in practice. This research will make a clear connection between dredged sediment placement in nearshore environments as a key element of nature-based solutions.

Products

- Technical Note surveying existing dredged material management structures, identifying opportunities and limitations associated with engineered vs. natural and nature based features (NNBF)
- Technical Report and/or Journal Manuscript detailing design concepts for dynamic structures, presenting application of numeric models to support proof-of-principle design options in various nearshore freshwater environments in Great Lakes and elsewhere
- Pilot project to provide field scale demonstration of design concepts, including creation of a video to document progress.

Summary

This research would aid USACE by removing the ambiguity and uncertainty regarding nearshore placement opportunities and approaches in freshwater systems. It would complement and build upon recently completed USACE-ERDC research exploring nearshore placement techniques. By leveraging prior Great Lakes ecosystem restoration projects and supporting future projects, the outcomes of this research task would have wide-reaching benefits not only to the USACE but also numerous state and federal resource management agencies and stakeholders.



Balancing operational and environmental initiatives and meeting complex challenges of dredging and dredged material placement in support of the navigation mission.