Wetland Sediment Transport Processes Supporting System Resilience

Dredging Operations Environmental Research (DOER) Program

U.S. ARMY CORPS OF ENGINEERS BUILDING STRONG®

Focus Area

Sediment Dredging Processes

Problem

Sediment deposition is critical to sustaining wetland elevation. Many wetlands are subsiding due, in part, to reduced mineral sediment input and/or edge erosion caused be wind wave and vessel wake. Wetland protection and restoration are hindered, in part, by lack of understanding of erosion, transport, and deposition processes in vegetated environments. Navigation dredged sediment that is not beach quality (>15% fines) has been identified as a resource which can support wetland resilience. Numerous wetlands have been constructed using dredged sediment. However, these construction projects are infrequent, costly, and considered 'targets of opportunity' where dredge schedule must align with construction permitting/schedule. Therefore, the majority of dredged sediment which can potentially be applied to support wetland resilience continues to be removed from the regional sediment system. Open-water, wetland adjacent dredged sediment management practices which permit natural processes to either increase sediment input to the wetland or reduce wetland edge erosion caused by waves are hindered because of the lack of understanding of erosion, transport and deposition processes. USACE applies several models to evaluate longterm wetland resilience, but the biological and chemical processes in these models are much more robust than physical transport models. Therefore the models cannot be applied to evalaute cost-effeictive sediment management options which support wetland resilience.

Study Description

The objective of this project is to improve our ability to predict sediment erosion, transport and deposition processes in wetland because these processes are critical to healthy wetland systems. Once predictive models for wetland evolution are improved, these models can be applied to identify open water placement strategies (generally in open water areas that were once wetland) which can reduce wetland loss either by increasing accretion or reducing wave energy which causes edge erosion. Open-water placement of dredged sediment not used for direct wetland construction will increase the volume of dredged sediment applied beneficially to support wetland resilience. These open water placement strategies will reduce wave energy impinging on wetland edge and/or increase sediment accretion in wetlands. The open water placement sites would be managed similar to traditional open water disposal sites and become part of the long-term sediment management strategy. These sites are typically dispersive and therefore available for additional placement during subsequent dredging cycles.

Products

Reports and journal articles providing details on monitoring projects which characterized sediment processes and improvements to models used to evaluate sediment management alternatives are the key deliverables for this RT. For sediment processes, key products will include two or more of the following: 1) spatially variable sediment transport and deposition in marshes during typical (tidal) conditions. 2) Sediment transport into interior marsh area during events, 3) erosion of marsh sediments during events, 3) improved marsh evolution models based on improved physical sediment processes descriptions.

Summary

Wetland acreage must be maintained to support coastal resilience. Placement of dredged sediment in open water to nourish and/or protect marshes will support USACE coastal resilience mission. This research project will improve wetland evolution models that operate on multi-decadal time scales to support evaluation of sediment management alternatives which reduce wetland erosion and/or increase sediment deposition. These models can then be applied to modify long-term dredged sediment management strategies such that the placed sediment supports wetland resilience by reducing subsidence and/or edge erosion. Benefits of this change of parctice may be observable only on the scale of decades. Therefore, robust models that demonstrate benefits (and identify risks) are critical to implementing sustainable, beneficial dredged sediment management practices.An internal USACE team will support application of this system throughout USACE. Using this system, Cost-effective dredged sediment LTMS will be implemented and benefits will be provided across multiple USACE business lines.

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

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