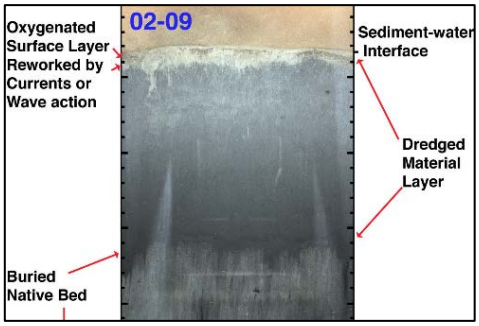
Sediment Profile Imaging to Evaluate Dredged Sediment Placement

Dredging Operations Environmental Research Program (DOER)

U.S. ARMY CORPS OF ENGINEERS BUILDING STRONG®

Problem

Many riverine, estuarine and coastal systems are experiencing sediment budget deficits due to anthropogenic activities such as impoundments, land use change, and channelization. Navigation dredging has beeen identified as a sediment source that can be used to address sediment budget deficits. USACE is therefore expanding beneficial use of dredged sediment to reduce these deficits. However beneficial use often requires placement in shallow water locations with sensitive habitat. Thin-layer placement is one strategy utilized to maintain sediment in the regional system while minimizing risk to habitat at and near the placement site. Sediment Profile Imaging (SPI) has been utilized to monitor thin layer placement (see image below). However, present SPI methods are difficult to deploy, expensive, are only deployed after placement operations, and cannot remain in-situ to evaluate recovery of benthic habitat. Advanced SPI capabilities would permit monitoring during thin layer placement operations and permit adaptive management of the placement operations to assure regulatory compliance. These methods will also permit monitoring of benthic habitat recovery.



Study Description

SPI is a method to insert a window into a sediment bed to capture activity both in the bed and the overlying water column near bed. The high quality images are used to evaluate bed composition and benthic habitat. Present camera-based SPI systems are bulky and require a winch to deloy. Therefore, only single images are collected from each deployment location. This research is developig scanner-based SPI systems which include the following features 1) compact, 2) low cost, 3) deployable for up to 30 days, and 4) remote transmission of images. Low profile systems will permit deployment from small vessels with less staff. These systems will also permit the systems to remain in-situ without being dislodged by currents or waves. Low cost is required so that multiple SPIs can be deployed simultaneously to monitor overall placement performance. Long-term deployment and data transmission will permit evaluation of evolving dredged sediment thickness. These data can be used to adaptively manage placement practices (for example, relocation of pipeline discharge location) to meet regulatory criteria. Long-term deployment will also permit USACE to demonstrate rates at which the benthic habitat recovers post-placement. Data demonstration sites will be used to inform thin-layer design and practice at other locations.

Products

This study will develop seven scanner-based SPIs which are deployed during and after dredging operations to evaluate placement thickness and benthic habitat recovery. Technical notes will describe application at two demonstration sites which can be used to plan and manage thin-layer placement operations at other sites. A user's guide will support application at other sites. In addition, a journal article will document benthic habitat recovery at the demonstration sites as evaluated using the new SPI systems.

Summary

Thin-layer placement of dredged sediment in shallow water can support USACE regional sediment management goals. Sediment can be placed stragically in open water, permitting natural hydrodynamic forces to winnow and transport various sediment grain size classes such that desired sediment classes move toward targeted resources, such as wetlands, mudflats, or beaches. These sediments will then nourish the resources and address sustainability issues related to recession, subsidence, and sea level rise. However, shallow water placement sites often include critical benthic habitat. Therefore, regulatory approval may be difficult to obtain and, once permitted, significant restrictions may be applied to minimize risk to benthic habitat. SPI monitoring systems, placed strategically around a placement site during and after operations can be used to desmonstrate that regulatory criteria are being met. The monitoring systems can also be used to adaptively manage placement operations and assure regulatory compliance. Post-placement, SPI systems will quantify the rate of benthic habitat recovery. Application at multiple sites will permit development of guidance documents to improve thin-lyaer placement approval and management at additional sites.

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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