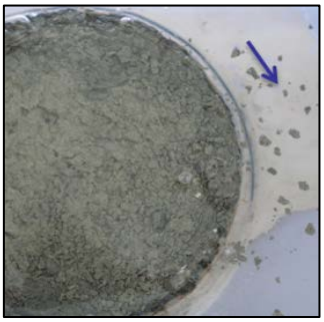
US Army Corps of Engineers®
Engineer Research and Development Center

Coastal Inlets Research Program

Coastal Modeling System:

Disaggregation of mixed sediment in near-bed transport

Need



The outcomes of sustainable uses of dredged material, such as nearshore placement, strategic placement, and thin-layer placement, rely in part on the sediment transport characteristics of the dredged material to be placed. Physical transport processes of muddy sediments (such as thresholds of motion, settling velocity, and transport modes) govern the geomorphological evolution of many dredged material placements and are critical components in engineering studies of transport at wetlands, mud flats, nearshore regions, and other locations where beneficial use of dredged material is proposed to mitigate land loss and create or enhance habitat. Aggregation (the clumping together of fine sediments) significantly alters the transport characteristics of fine sediments, and particularly influences the modes of transport and conditions under which the particles will deposit on the bed. Evidence from field studies has shown that dredged and eroded aggregates can be relatively robust, remaining intact for transport over tens of kilometers and enduring high stresses of dredge pipelines, flooding rivers, and breaking waves. Presently, little is known of the durability of fine sediment aggregates that are either eroded from the bed, or placed onto the bed in the form of dredged material. Consequently, numerical sediment transport models inadequately represent the physical processes associated with aggregated dredged material. Laboratory testing is required to develop a fundamental understanding of the properties and processes influencing the rate at which fine-sediment aggregates breakup and decrease in size.

Approach

Laboratory experiments will be performed to determine the dependency of aggregate durability to sediment characteristics. Sediment mixtures with known composition will be prepared and eroded to generate mud aggregates. The size distributions of these exposures will be measured over the duration of the experiment to determine the associated weathering rates of the source aggregates. A numerical, aggregate-transport modeling framework will be tested and validated with the data obtained from the experiments.

Technical Advancements

This research will produce a new capability in understanding and ultimately predicting the disaggregation of mixed sediments and will lead to new algorithms for use in CHL's suite of morphological modeling systems. The research will ultimately lead to new tools to examine the role of mixed sediments in dredging, wetland restoration, sediment budgets, bed stability (erosion), and water quality.

Leveraging Opportunities

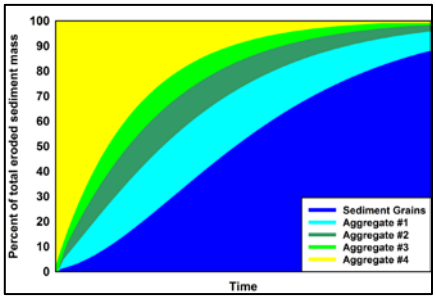
This research is leveraged with the Regional Sediment Management Program.

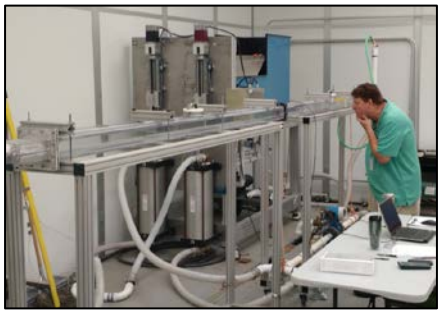
Point of Contact

Richard Styles, Richard.styles@usace.army.mil, 601-634-4065

Community of Practice (CoP)

Kevin Hodgens, Kelly Legault CESAJ; Rod Moritz CENWP





U.S. Army Engineer Research and Development Center
October 2018

Coastal Inlets Research Program – Navigation RDT&E
http://cirp.usace.army.mil