

Regional Sediment Management Informed by Geochemical Fingerprinting: Calcasieu Ship Channel, USA

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Abstract

One principle of Regional Sediment Management (RSM) is focused on using system- or regional-scale approaches to maximize benefits and minimize negative consequences of project-scale sediment management (Figure 1).



Figure 1. The Regional Sediment Management (RSM) Process (National Regional Sediment Management Program).

Often multiple sources of sediment could potentially be responsible for increasing maintenance dredging of a given project. Identification of the afflicting source or sources may allow for targeted remediation or prevention strategies such as sediment retention or flow modification structures at a lesser cost or greater benefit than traditional dredged material management.

One such case is the Calcasieu Ship Channel (CSC), a Federal deep-draft navigation channel servicing the Port of Lake Charles in Southwest Louisiana, USA (Figure 2).

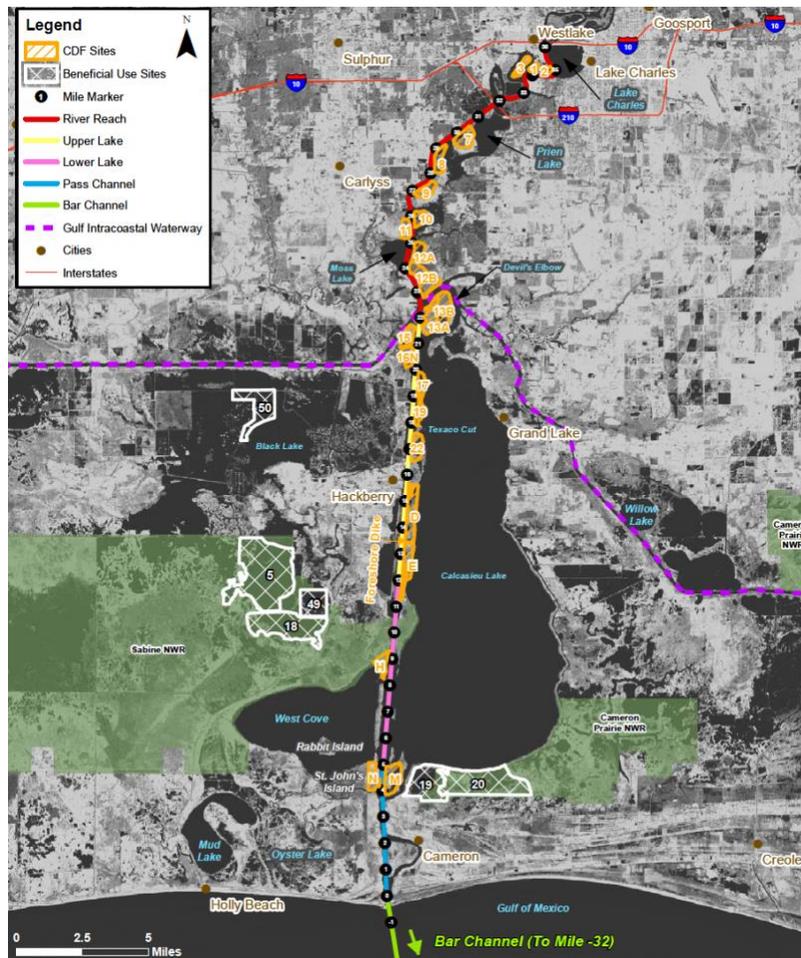


Figure 2. Map of the Calcasieu Ship Channel and surrounding area (USACE, 2010).

High rates of shoaling in the inland portion of this waterway impacts navigation to this strategic port, requiring 3 million m³ (4 million yd³) of maintenance dredging annually at a cost of about \$20M per year. Multiple sources could be contributing sediments to the CSC: Flanking wetlands, riverine, offshore, and adjacent banks. Previous sediment transport simulations by Brown (in preparation) estimated the contribution of these sources but have not been verified. Based on modeled sediment transport, this study was derived using a combination of field- and laboratory-based approaches to verify the shoaling due to these sediment sources. A reconnaissance-type sampling approach will first utilize a suite of geochemical assays to identify robust and cost-effective tracers, followed by more intensive analysis of channel shoal material for the presence of these tracers. The characteristics of sediment sources and channel shoals will be evaluated with principle component analysis (PCA) to examine the distribution of unique tracers and identify shoaling patterns. A mixing model will then be used to determine the relative contributions of the source materials. The results of this study may highlight an alternate approach to management of sediment at the source or at least before deposition in the CSC. This geochemically informed mitigation approach could then be applied to other projects in the Gulf of Mexico region and, additionally, the framework of that approach used in other systems where the contributions of multiple sediment sources to maintenance dredging are

unknown. We present the project motivation, the methodological approach to geochemical fingerprinting used in this work, preliminary results, and hypothetical conclusions.

References

- Brown, Gary (in preparation). Investigation of Sources of Sediment Associated with Deposition in the Calcasieu Ship Channel. FY18 RSM project report prepared for US Army Engineer District, New Orleans.
- US Army Corps of Engineers New Orleans District (USACE). 2010. Calcasieu River and Pass, Louisiana Dredged Material Management Plan and Supplemental Environmental Impact Statement.