



Development of a Dredged Material Color Change Propensity Index to Promote Beneficial Use

Dredging Operations Environmental Research (DOER) Program

U.S. ARMY CORPS OF ENGINEERS

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Problem

This project addresses the needs of coastal districts with environmental concerns regarding the color compatibility of dredged sediment placed on or near beaches. Many of the concerns result from regulations related to turtle nesting activities as State and Federal agencies often utilize the color of sediment as justification to disallow the beneficial reuse of these sediments primarily in coastal systems. Sediments placed on beaches has been documented to undergo color change; however, the dominant mechanisms involved (winnowing, bleaching, etc.) are not well understood. As a result, this project seeks to investigate the capacity of sediments to change color following placement.

Study Description

Dredged sediment samples were collected from projects throughout the United States, including locations in Florida, Texas, California, Alabama, California, Hawaii, and other locations. Sediment color measurements of the bulk sediments and each size fraction were determined using a digital colorimeter. The chemistry and mineralogy of the sediment, which determines coloration, and what processes result in the removal of this coloration is being determined using laboratory techniques. Additionally, effects of photolytic bleaching and sediment mixing are being investigated. This results in a mechanistic approach demonstrating the potential for sediment bleaching processes. Dredged sediment mineralogy is determined using microscopic and x-ray diffraction techniques. The combination of chemically induced color change and mineralogy allows development of predictive capabilities to determine the degree to which materials will change color following beach nourishment projects. Additional work will examine the color change dynamics associated with a basic mixing model, and color change associated with exposure to light under controlled environmental conditions.



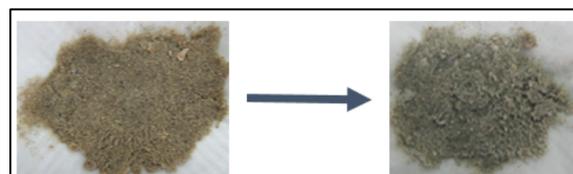
Preliminary study conducted near Mobile Bay, AL in which color changes were observed following placement of dredged materials

Products

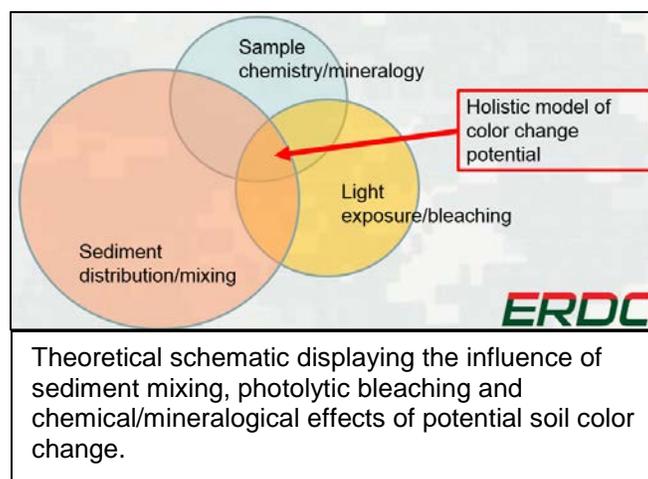
A sequential laboratory extraction technique has been developed to investigate the color change capacity of dredged sediments. A journal article entitled "Potential color change dynamics of beneficial use sediments" is under review at the Journal of Coastal Research. Additionally, webinars have been provided during both Dredging Operations Technical Support and Regional Sediment Management webinar series. A Technical Report communicating all work unit findings will be developed during the FY18, including guidance for applying the methodology using standardized methods that would allow stakeholders to contract this type of analysis.

Summary

Development of a standardized protocol for evaluating dredged sediments considered for beneficial use placement will encourage further usage of sediments associated with navigation dredging efforts. Additionally, our approach will provide a template to develop predictive capabilities regarding the capacity of dredges sediments to change color following placement.



Example of observed color change following sequential laboratory treatment of dredged materials.



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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