

Benthic Response to Nonlinear Sedimentation Events in a Filled Dredge Area

Jill Tupitza

Louisiana State University

September 12, 2022

Abstract

A major component of the State of Louisiana's effort to manage coastal land loss is to restore degraded barrier shorelines and beaches by introducing new sand to the coastal system from borrow areas. BOEM has devoted funding toward better understanding how dredge pits evolve and the potential impacts to infrastructure and/or resources of concern located adjacent to the dredge areas. Recent BOEM-supported observational studies of infilling rates in shallow shelf environments offshore of Louisiana revealed the possibility of contributions from non-linear sedimentation processes to dredge pit filling, such as those introduced by energetic events and/or fluid-mud transport. This study focused on Raccoon Island pit and its surrounding waters to capture the wave-supported fluid-mud events and the benthic ecosystem's response in spring, summer, fall, and winter when cold fronts prevail.

New geological, biogeochemical, and benthic ecological data were collected at Raccoon Island dredge pit. This pit was dredged in 2013 and filled up in or before 2018. Data were collected seasonally and included sediment grain size, sediment oxygen consumption, radioisotope geochronological analyses using Be^7 , and benthic community composition. Samples were taken both inside and outside the filled dredge pit at Raccoon Island, as well as in two control locations: one in an area with high probability of fluid mud and one in an area with low probability of fluid mud, from model predictions. The geochronology of the dredge pit site indicated rapid sedimentation between March and July 2021. A permanova of benthic community composition was used to identify a, interaction between sampling site and season, driven by the samples collected in fall 2021. The community at the dredge pit site was altered during the fall, after the rapid sedimentation event, and species present were indicative of high nutrient loading and/or early colonizers. The evidence from this interdisciplinary study indicates that benthic macroinfauna are excellent indicators of nonlinear sedimentation events in this filled dredge pit. Continued sedimentation, settlement, and resuspension likely results in significant disturbance to ecological communities associated with dredge pits, even years after the pits are filled.