Environmental Studies Program: Ongoing Study

Field	Study Information
Title	Ecological Function and Recovery of Biological Communities within Sand Shoal Habitats within the Gulf of Mexico (MM-19-01)
Administered by	Marine Minerals Program
BOEM Contact(s)	Barton Rogers (barton.rogers@boem.gov)
Procurement Type(s)	Cooperative Agreement
Conducting Organization(s)	University of Louisiana Lafayette
Total BOEM Cost	$4,336,067
Performance Period	FY 2019–2027
Final Report Due	September 30, 2027
Date Revised	October 20, 2023
Problem	BOEM needs to observe prolonged biological, physical and chemical recovery of borrow areas located within Ship Shoal in order to understand the importance of dredged habitats to benthos, fish, and trophic structure/ bioenergetics. Existing project-specific, post-construction monitoring is not of sufficient duration or temporal resolution to fully understand these sand complexes.
Intervention	This study proposes a collaborative effort to investigate the long-term recovery of benthic and fish communities following dredging sand resources within Ship Shoal in the Gulf of Mexico and allow BOEM to identify the potential impacts of multiple sediment removal activities at Ship Shoal and determine the extent, nature, and process of disturbance and recovery.
Comparison	The study is similar to the BOEM-funded Canaveral Shoals study (conducted in 2013-2019) and will expand our understanding of the recovery of sand shoals in different physical and biological environments. The study will include pre-disturbance and post-disturbance physical and biological sampling which will occur following a Before-After-Control-Impact (BACI) methodology.
Outcome	This study will increase our understanding of the relationship of human disturbance to ecosystem services in offshore sand shoal habitats. Further, to determine if there are functional differences in borrow sites pre- and post-dredging by examining species distribution, diversity, habitat use, and population dynamics.
Context	Central GOM planning area.

BOEM Information Need(s): This study proposes a new collaborative effort to investigate the long-term recovery of benthic and fish communities following dredging sand resources within Ship Shoal in the Gulf of Mexico. BOEM needs to observe prolonged biological, physical and chemical recovery of borrow areas located within Ship Shoal to understand the importance of dredged habitats to benthos, fish, and trophic structure/bioenergetics. Observations over an extended time frame will allow for BOEM to identify the potential impacts of multiple sediment removal activities at Ship Shoal and determine the

extent, nature, and process of disturbance and recovery. This knowledge will improve effects analyses in National Environmental Policy Act (NEPA) documents and greatly focus and improve the outcomes of EFH consultations.

Background: The BOEM Marine Minerals Program is often involved with coastal restoration and construction projects that follow severe storms and accidental events such as Hurricane Katrina and Deepwater Horizon. Environmental monitoring may be a requirement for project proponents to access and use sand resources. However, because of the relative expense, monitoring is generally limited in scope and concluded within a year of project completion. Previous studies have indicated that the recovery time may be greater than 3 years particularly in borrow areas that are repetitively used, such as Ship Shoal (Byrnes et al. 1999). In one of only two previous long term (5–10 years) studies, species composition in the borrow area still differed after 5 years (Turbeville & Marsh 1982). The benthic communities may exhibit biomass recovery within 3 months to 2.5 years, however their taxonomic composition can remain different for more than 3–5 years (Michel et al. 2013). This information is also critical for habitats dredged in regions such as the Gulf of Mexico. The duplication of the Canaveral Shoals study at Ship Shoal will expand our understanding of the recovery of sand shoals in different physical and biological environments.

Objectives: The objective of this study is to examine the relationship of human disturbance to ecosystem services in offshore sand shoal habitats.

Methods: The proposed study sites include the Ship Shoal borrow area and nearby control sites off Louisiana. Pre-disturbance and post-disturbance physical and biological sampling will occur following a Before-After-Control-Impact (BACI) methodology. A suite of data from previous monitoring is available including bathymetry, geological and geophysical data, fish and benthic assemblage data. Additional sampling regimes will include multibeam sonar, Acoustic Doppler Current Profiler (ADCP) wave/current measurements, sediment cores, benthic grabs, benthic community analysis, trawls, acoustic telemetry, seasonal and diel observations, gut content analysis, stable isotope analysis, etc. A telemetry array and electronic tagging will be conducted to add effort to an existing ongoing USGS telemetry project.

Specific Research Question(s):

1. Are there functional differences between the borrow sites and control sites?
2. If so, do these differences correlate with biophysical differences (grain size, flow characteristics)?
3. What is the rate of recovery of benthic habitats and habitat use in a previously dredged borrow site on the OCS (to be examined through subsequent phases over a 7–10 year period)? And is this rate of recovery tied to any physical factors?
4. Do the reestablished sites fill the same trophic function as the original communities?
5. Are there regional differences in recovery (Gulf of Mexico vs Atlantic) and, if so, what is driving these differences?

Current Status: All planned cruises were completed as of November 2022 and funding has been awarded for three additional cruises in 2024. Evaluation of the existing data suggests that there are differences in the communities and environmental conditions between the dredged and control areas. Also, there appears to be some differences between newer and older dredged areas, as well as differences between shallow and deeper dredged areas. These data, and relevant literature, suggest

that dredged areas may take two to five years to reach some sort of new equilibrium, particularly with grain size, benthic communities, and subsequent nekton communities (Newell & Seiderer 2003). The dredged areas are initially in a colonization phase, which will be followed by a transitional phase, and finally an equilibrium phase. The new equilibrium may be different in the dredged areas when compared to before dredging.

Publications Completed: None

Affiliated WWW Sites: None

References:

Byrnes MR, Hammer RM, Vittor BA, Ramsey JS, Snyder DB, Bosma KF, Wood JD, Thibaut TD, Phillips NW. 1999. Environmental survey of identified sand resource areas offshore Alabama. Herndon (VA): U.S. Department of Interior, Minerals Management Service. 326 p + appendices. Report No.: OCS Report MMS 99-0052.

Michel J, Bejarano AC, Peterson CH, Voss C. 2013. Review of biological and biophysical impacts from dredging and handling of offshore sand. Herndon (VA): U.S. Department of Interior, Bureau of Ocean Energy Management. 261 p. Report No.: OCS Report BOEM 2013-0119.

Newell RC, Seiderer LJ. 2003. Ecological impacts of marine aggregate dredging on seabed: appendix A. Herndon (VA): U.S. Department of Interior, Minerals Management Service. 68 p. Report No.: OCS Report MMS 2004-076.

Turbeville DB, Marsh GA. 1982. Benthic fauna of an offshore borrow area in Broward County, Florida. U.S. Army Corps of Engineers Coastal Engineering Research Center. 42 p. Miscellaneous Report No. 82-1.