

Environmental Studies Program: Ongoing Studies

Region: Headquarters, Marine Minerals Program

PlanningArea(s): Atlantic OCS

Title: Ecological Function and Recovery of Biological Communities within Dredged Ridge-Swale Habitats in the South-Atlantic Bight

BOEM Information Need(s) to be Addressed: This study proposes to continue an existing two year collaborative effort between BOEM, Navy, NASA, UF, and USACE to investigate the long-term recovery of benthic and fish communities following dredging of a borrow area offshore central Florida. BOEM needs to observe prolonged biological, physical and chemical recovery of borrow areas 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 cape-associated shoal complexes. In the absence of extended and temporally-resolved monitoring data, short-term perturbations cannot be differentiated from natural disturbances and seasonal changes, or longer-term trends, such as climatic oscillations. Observations over an extended time frame will allow for BOEM to more fully identify the potential impacts of sediment removal activities and determine the true extent, nature, and process of disturbance and recovery. Information on recovery is necessary for improved regional management of offshore habitat availability for prey and fish species. This knowledge will improve effects analyses in National Environmental Policy Act (NEPA) documents and greatly focus and improve the outcomes of EFH consultations.

Approximate Cost: (in thousands) \$1,200 **Period of Performance:** FY 2015-2016

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Description:

Background: The MMP is often involved with coastal restoration and construction projects that follow severe storms such as Hurricane Sandy. 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. Using approximately \$2 million of Disaster Relief Appropriations Act funds, the MMP initiated a comprehensive borrow area recovery study in Fall 2013 on Canaveral Shoals located off Cape Canaveral, Florida (currently funded until Fall 2015). Dredging began in November 2013 and will continue until late Spring 2014. Two years of information cannot be used to effectively determine the nature of the impact, let alone examine ecosystem recovery and/or resiliency especially in physically dominated systems. Previous studies have indicated that the recovery time may be greater than 3 years particularly in borrow areas that are repetitively used, such as Canaveral Shoals II (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 and Marsh 1982). The benthic communities may exhibit biomass recovery within 3 months to 2.5 years, however their taxonomic composition can remain different from pre-dredging to post-dredging for more than 3-5 years (Michel, et al. 2013). The impact of the change of this prey base to higher trophic levels has not been determined. Therefore, further observations of borrow and control sites over a longer time period (7-10 years) from completion of the sediment removal process will allow for BOEM to further understand the extent and nature of both disturbance and recovery.

Pre-disturbance and post-disturbance physical and biological sampling followed a Before-After-Control-Impact (BACI) methodology. The same sampling protocol is being used in two nearby control sites at the Chester Shoal complex. Present sampling regimes include multibeam sonar, Acoustic Doppler Current Profiler (ADCP) wave/current measurements, sediment cores and benthic grabs, benthic community analysis, demersal and pelagic trawls, acoustic telemetry, seasonal and diel observations, gut content analysis, stable isotope analysis, etc. Data is being collected from four different habitat settings at each site (offshore ridge slope, ridge crest, shoreward ridge slope, and swale bottom) over multiple seasons following a random stratified methodology. This data is critical baseline data for future long-term efforts examining the resiliency of these habitats. Observations will be analyzed via basic statistical procedures (e.g. determination of mean values, standard deviations, transformations of data, comparisons of means) along with more complex statistical analyses and comparisons of community structure. These observations will also be integrated into an Ecopath model to assess the perturbation to the system due to dredging.

Objectives: The objectives of this study are to examine the relationship of disturbance to ecosystem services in ridge-swale 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.

Questions BOEM would like to address include:

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)?
4. Is this rate of recovery tied to any physical factors?
5. Do the reestablished sites fill the same trophic function as the original communities?

Methods: The proposed study sites include the Canaveral Shoals II borrow area and Chester Shoals control sites located off Cape Canaveral, Florida. This site is the location

of the FACT array. A partnership with the Navy and NASA has provided leveraging for this project. This allows for data sharing, use of the existing 200+ FACT array receivers and additional information on large-bodied predatory fish (NASA-funded work) within our study area. The methodological approach will match, as closely as possible, the sampling and analytical methods used in the present study for an additional two years. The present methodology includes sampling chemical (chlorophyll, N, etc.), biological (phytoplankton, zooplankton, meroplankton, benthic invertebrates, macroinvertebrates and fishes, stable isotope analyses, fish acoustic tagging), and physical parameters (ADCP and multibeam surveys), along with Ecopath modeling.

Revised Date: April 2, 2014