Environmental Studies Program: Ongoing Study

Study Area(s):   Western, Central, and Eastern Gulf of Mexico

Administered By: BOEM GOMR

Title: Gulf of Mexico Land Loss Change Assessment and Application to Louisiana Coastal Habitat Loss (NSL #GM-15-10)

BOEM Information Need(s) to be Addressed: BOEM needs up to date information on resources that may be impacted by OCS activity to prepare NEPA documents such as Lease Sale Environmental Impact Statements. Among those resources are wetlands and coastal barrier beaches. To accurately describe the affected environment, and to assess cumulative impacts to wetlands and beaches, knowledge of rates of land loss over time is essential. This study would help to provide this much needed information.

Total BOEM Cost: $378,000   **Period of Performance:** FY 2015–2017

Conducting Organization(s): U.S. Geological Survey

Principal Investigator(s): Stephen B. Hartley, hartleys@usgs.gov

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Description:
Background: Eighty-five percent of the coastal wetland loss in the contiguous United States occurs in the Gulf of Mexico (CCAP, 2006). Documenting and understanding the occurrence of this wetland loss will provide for effective planning, mitigation, and restoration activities. We propose to conduct comprehensive land-water extent change analysis throughout the coastal zone of the Gulf of Mexico. This analysis will expand upon a recent analysis which assessed landloss change in coastal Louisiana detailed in USGS SIM 3164 (http://pubs.usgs.gov/sim/3164/). Wetland areas are highly dynamic, and variability in remotely-sensed land area estimates can often be attributed to temporary wind and water level fluctuations present at the date and time of acquisition of the imagery. As such, an analysis of landloss change cannot simply be based on changes between a pre- and post- set of imagery. Conversely, we propose analyzing landloss change from every cloud-free date of imagery throughout the entire Landsat period of record (1984–2014).   This multi-temporal analysis enables the removal of transient phenomena such as temporary flooding and thereby facilitates the isolation of specific events. This effort will, for the first time ever, provide a high temporal resolution analysis of landloss change rates throughout the Gulf of Mexico, a type of investigation that has only been conducted in coastal Louisiana thus far.

With nearly 400 miles of coastline, barrier islands, bays and estuaries, and coastal wetlands coastal resources are important and valuable natural resource to the State of Louisiana. These resources provide habitat to an immense number of species of plants

and animals. While land conversion to open water has been studied as parts of USGS SIM 3164 mentioned below, and may be further studied as part of Subtask 2 of this effort, habitat changes in coastal Louisiana are not as well understood. The impacts of habitat changes have far reaching impacts on the flora and fauna of the region as well as economic impacts associated with habitat loss. To understand how best to manage and plan for future habitat change, conservation planners need a clear understanding of past and current habitat change rates, not just landloss rates.

Objectives: The objective of this study is two-fold: (1) to evaluate recent (1984–2014) landloss change in the Gulf of Mexico coastal zone, and (2) to evaluate habitat change in the Louisiana coastal zone from 2007–2014. Land/water data from Task 1 of this effort will be used as the base upon which to create a habitat maps. Imagery will be used that closely matches the corresponding coastwide vegetation surveys of 2007 and 2013 (funded under the Coastwide Reference Monitoring System program) to create habitat maps that reflect the landloss. These datasets will then be used in the habitat change analysis. This effort in coastal Louisiana will serve as a pilot, with the potential to expand this subtask into other states of the Gulf of Mexico in future efforts. The habitat change and maps associated with this study will help inform conservation planners on areas to place restoration projects in order to sustain current coastal resources into the future.

Methods: Cloud-free Landsat Thematic Mapper imagery will be collected for Gulf of Mexico coastal zone for the 1984–2014 time period. Imagery will be collected for all 26 of the path/rows intersecting the coastal zone of the Gulf of Mexico as seen in Figure 1. The majority of the data collection for the 7 path/rows which intersect coastal Louisiana has already been conducted and this effort will leverage projects already underway and funded in coastal Louisiana. Data will be collected and processed for the 19 remaining path rows. Processing will begin with the calculation of a modified normalized water index (mNDWI) and other indices leveraging the near-infrared spectrum. These datasets will be used to classify land/water. Upon completion and QA/QC of all land/water classified datasets, change analysis and landloss change rate analysis will be conducted. Spatial datasets detailing landloss change, as well as rates of change by state and hydrologic basin will be provided.   The findings of this analysis will be detailed in a final report to be published in a scientific journal or a USGS publication.

Current Status:

Task 1: Louisiana Coastal Habitat Change (2007–2014)

- Completed methodology and metadata for datasets.

- Report completed:
  USGS Scientific Investigations Report 2017–5044:
  Delineation of Marsh Types and Marsh-Type Change in Coastal Louisiana for 2007 and 2013

- Presented a poster on this work at the 2016 Summit: *Our Coasts, Our Future, Our Choice* December 10–15, 2016, New Orleans, LA

Task 2: Gulf of Mexico Land Change Assessment (1984–2015)

- Conducting change analysis on completed land/water datasets

- Running analyses on change and developing figures to begin write-up of the findings

Final Report Due: September 9, 2017

Publications Completed: N/A

Affiliated WWW Sites: https://marinecadastre.gov/espis/#/search/study/100157

Revised Date: July 5, 2017