BOEM ENVIRONMENTAL STUDIES PROGRAM: ONGOING STUDIES

BOEM OCS Region:	Gulf of Mexico
Planning Area:	Western and Central
Title:	Response of Late Quaternary Stream and Estuarine Systems to Holocene Sea Level Rise on the Outer Continental Shelf Offshore Louisiana and Mississippi: Preservation Potential of Paleolandscapes and Identification of Sand Resources for Coastal Restoration (GM-09-01-10)

Total Cost: $450,669 **Period of Performance:** FY 2012-2015

Conducting Organization:	Louisiana Geological Survey (LGS), Louisiana State University
BOEM Contact:	Dr. Michael Miner

Description:

Background: An understanding of the complex response of coastal landforms to sea level rise is important for evaluating preservation potential of paleolandscapes and identifying sand resources on the Outer Continental Shelf (OCS). During the last glacial maximum, which ended approximately 18,000 years before present, sea level in the northern Gulf of Mexico (GOM) was approximately 120 m lower than today and the lowstand shoreline was positioned approximately coincident with the shelf edge. As a result, intrabasinal coastal streams extended across the shelf within deep incised valleys separated by interfluves. As sea-level rose, the incised valleys were infilled and coastal systems migrated landward across the shelf. Valley infilling consisted of both aggrading fluvial deposits and backstepping (migrating landward with sea-level rise) estuarine systems that developed within the flooded river valleys. As sea level rose, the retreat of coastal and bay shorefaces ultimately encountered and significantly eroded valley fill deposits and flanking interfluve surfaces producing regionally persistent ravinement surfaces. Also, the surfaces and sediments of any attendant deltaic systems were significantly affected by shoreface retreat and erosion. Typically, the complex erosional and depositional responses to sea level rise associated with shoreface retreat resulted in all but the basal portions of coastal and estuarine deposits being truncated and reworked by wave and tidal currents. It has been demonstrated that there is little to no preservation potential of coastal lithosomes seaward of the modern shoreface. However, there might be unique situations associated with fluvial aggradation and subsequent estuarine deposition within paleovalleys that could potentially provide an opportunity for preservation of buried geomorphic surfaces and intact prehistoric landscapes. The potential for preserved fluvial and estuarine sediments as part of paleovalley fills on the OCS are important

because they present rare opportunities for preservation of paleolandscapes and associated cultural sites that survived sea level rise because they accumulated at elevations below the depths of shoreface ravinement. Moreover, the fluvial sediments underlying these terraces are inferred to be locally sand-prone channel bed and point bar deposits, a potential sand source for coastal restoration projects.

Objectives: This study will provide a better understanding of the erosional-depositional response to sea-level rise on the northern GOM continental shelf and develop a regionally specific conceptual model that will aid in prediction of regional late Quaternary paleolandscape preservation potential and identify potential OCS sand resources.

Methods: Existing high-resolution seismic and/or subbottom profiler and shallow sediment core data from various sources will be acquired and put into similar, comparable formats and used to construct a single GIS database for the study areas. These data will then be interpreted and applied to develop regional stratigraphic models and interpretation of sedimentary response to sea-level rise (a proxy for paleolandscape preservation potential).

Products: 1) database of seismic data for study areas, 2) geologic/stratigraphic models (stack-unit geologic maps) based on seismic data interpretations, 3) predictive model for paleo-landscape preservation potential for specific areas in northern Gulf (this will be a tool that can be used for future site-specific evaluations of potential pre-historic cultural resource occurrence), and 4) evaluation of sand resources in paleo-fluvial channels.

Importance to BOEM: This study is addressing unanswered questions that are highly relevant to the BOEM mission in two, somewhat unrelated ways: 1) stewardship of cultural resources and 2) stewardship of OCS mineral resources. This study will provide an important tool for concentrating industry surveys in areas where they would be most effective allowing for a more sophisticated NEPA and NHPA analyses and review of offshore oil and gas development and sand extraction projects.

Current Status: This study was awarded in August 2012 and a post-award meeting was held in September 2012. LGS in cooperation with BOEM GOM Marine Minerals Program is conducting an extensive data mining and literature review exercise. LGS is producing a framework geographic information system to manage data.

Final Report Due:	November 2014
Publications:	None
Affiliated WWW Sites:	None
Revised date:	October 2012
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