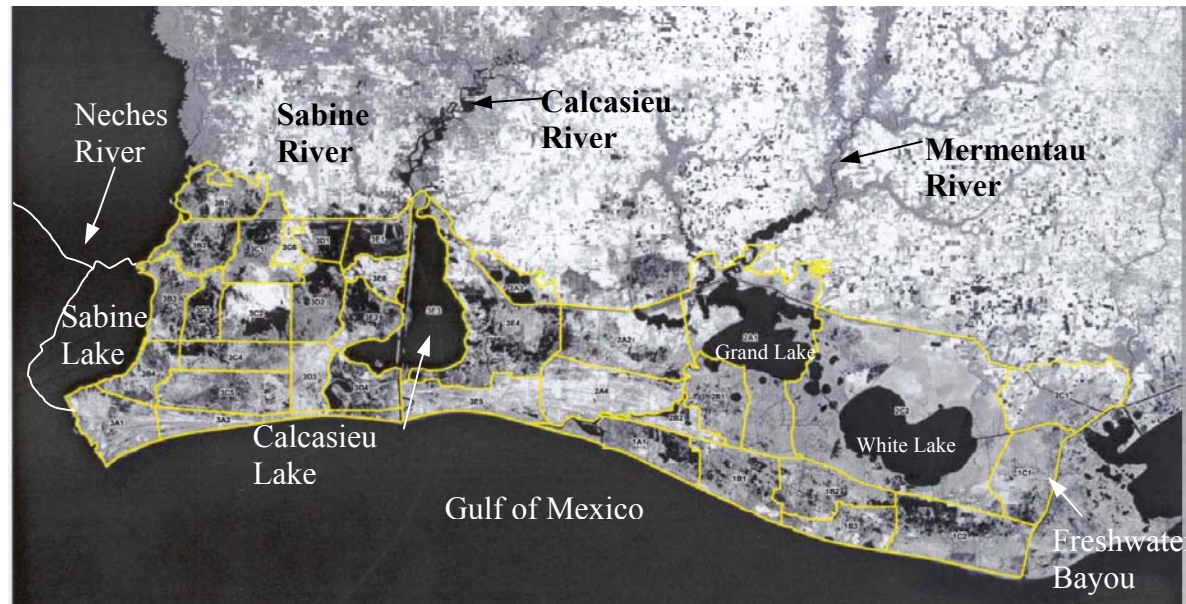


Comprehensive Water and Sediment Budget Analyses for the Chenier Plain

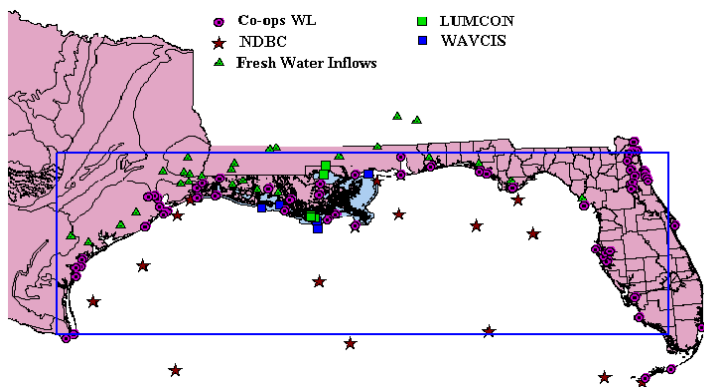
Sponsor: Coastal Restoration and Enhancement through Science and Technology, Collaborative program between National Oceanic and Atmospheric Administration (NOAA) and the U.S. Geological Survey (USGS)

Brief Description:

The Chenier Plain extends from Freshwater Bayou west of Vermilion Bay to Sabine Lake (see figure to the right). It is the western most region of Louisiana's coast and extends across the border to the State of Texas. The hydrologic and ecologic characteristics of this region are unique and quite challenging to fully understand. Therefore, a better understanding of the hydrology (water and sediment) and ecology of the region is essential to a successful implementation of an ecosystem-scale wetland restoration plan. However, an accurate accounting of water and sediment volumes in the region has always been lacking. Such information is critically needed for the success of future sound modeling efforts that can be used to assess a region-wide restoration plans and strategies. Therefore, it is proposed herein to develop comprehensive regional-scale water and sediment budget analyses for the entire Chenier Plain. The funding from this program has been supplemented by a significant financial support from Louisiana Department of Natural Resources (LDNR).

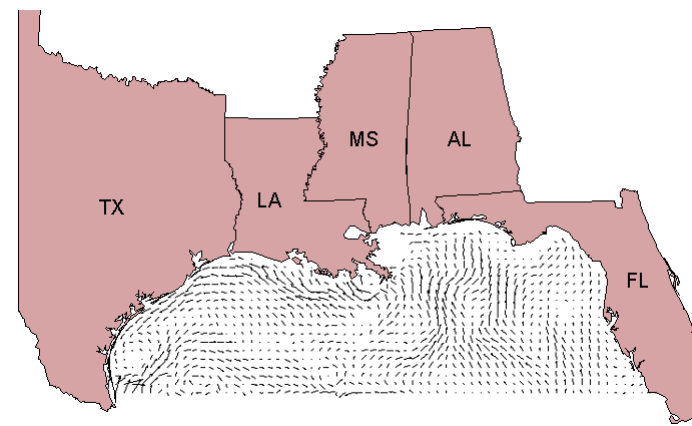


The research effort performed in this study will include an elaborate and effective monitoring program, followed by a thorough and rigorous analysis of the water and sediment budgets. Since a comprehensive monitoring program for the entire region is cost prohibitive, the field measurements will be coupled with a detailed numerical model. The analysis will then be based on the field measurements and the numerical model results. This project will also include a numerical model for the northern Gulf of Mexico to quantify the sediment input from the Mississippi and Atchafalaya Rivers to the Chenier Plain. The model domain is shown in the figure to the left and below.



The budget analyses will include river fresh water inflows, water and salt exchange through the openings of the Chenier Plain to the Gulf of Mexico, evaporation, evapotranspiration, precipitation, and sediment transport. Such analysis will be an excellent foundation for future region-wide ecological studies. The research team strongly believes that fully understanding the hydrodynamic and sediment transport, and consequently the ecology, is essential for designing a comprehensive restoration plan for this region.

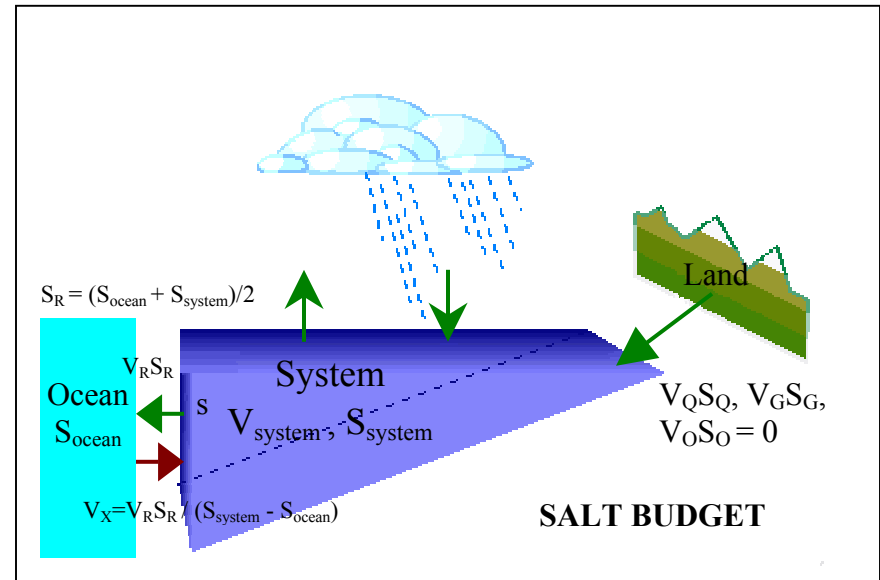
This proposal is a multi-institutional effort, where the research team includes experts from three universities in the areas of hydrology, sediment transport, geomorphology, and ecology. The diverse background of the team is necessary for this comprehensive inter-disciplinary study. The research team with assistance from field crews from the private industry will perform the proposed fieldwork (surveying, installation and maintenance of monitoring stations, sediment grab samples, etc).



Objectives of Research

The objective of this study is to develop a region-wide understanding of the hydrology, sediment distribution, and ecology. This understanding is crucial in order to develop viable large-scale restoration or rehabilitation strategies. The regional understanding will be gained through:

- Performing a thorough water budget analysis (as shown in the illustration to the right) to account for fresh water inflows to the system, water volume leaving/entering the system through openings to the gulf, evaporation, evapotranspiration, and precipitation.
- Performing a thorough budget analysis for the sediment distribution (as shown in the figure in the next page).
- Observing the impact of the historical changes in the hydrology of the area on the ecology of this system.



This study will serve as the foundation for the eventual development of an integrated large-scale hydro-ecological numerical model. This computer model is intended for use as an efficient tool to evaluate large-scale rehabilitation strategies. This computer modeling system will include hydrodynamic, salinity, sediment, water quality, and ecological modules. It will provide quantitative measures based on which a rehabilitation alternative can be evaluated. The model will be developed such that observed system responses to certain stressors may be used to refine the formulation of the ecological modules. Such continuous enhancement of the formulation of these physical processes would reduce the uncertainty of the computer model predictions.

Although this study focuses on the Chenier Plain, however, the methodology developed herein will be generic for applications elsewhere in the Louisiana and Mississippi coastal area.

Deliverables

The deliveries of this proposed research work include:

- Field measurements dataset; including the water level, discharge, salinity, and turbidity, precipitation, and evapotranspiration.
- Field study for estimating the long-shore sediment transport.
- A validated computer model for the Chenier Plain.
- A report detailing the methodology adopted, and the research findings of the study.

