



## Barataria Bay Multiple Stressors

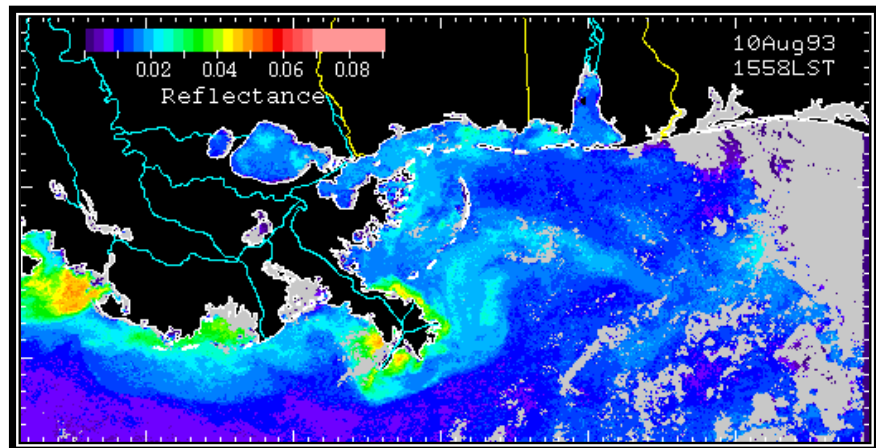
### ISSUE

Most, if not all, coastal ecosystems are exposed to multiple stressors resulting from human activities. These human-mediated stressors are expressed within a larger context of natural variability due to extraneous factors such as climate variability, which are also partly human-mediated. The development of management policies of a coastal ecosystem resource often focuses on a single stressor, such as eutrophication or fishing pressure, among others. Ecosystems are affected by a broad array of multiple stressors manifesting in a direct, indirect and interactive way at the individual, population or ecosystem level. Understanding how multiple stressors affect natural systems will improve our ability to manage and protect these systems.

### APPROACH

The Barataria Bay watershed, a significant, large estuary in the Gulf of Mexico, experiences large habitat changes, anticipates a doubled nitrogen loading, and has a significantly large fisheries yield. The watershed is located next to, and exchanges water with, the Mississippi

River - the largest river in North America - whose watershed is shifting to a new management regime to reduce its nitrogen load. Long-term data sets, opportunistic and designed experiments, and an experienced team of scientists from Louisiana State University, Louisiana Universities Marine Consortium, and the University of Pittsburgh were assembled for this project. This project:



- Quantified the effects of eutrophication, land use, habitat change, toxins, and other natural and anthropogenic stressors using a variety of overlapping approaches for emergent marshes, algae and pelagic food webs;
- Constructed a hierarchical suite of indicators of estuarine habitat health and sustainability over various temporal and spatial scales;

- Conducted uncertainty analysis of indicators, by implicitly inducing environmental variability and uncertainty in model parameters;
- Evaluated the effectiveness of various estuarine mitigation strategies in terms of the whole ecosystem and of component parts, through ecological and economic criteria;
- Extended field approaches to three other Northern Gulf of Mexico estuaries, primarily using dated sediment cores; and
- Completed a synthesis of results from this project and from other projects for other estuaries.

## ACCOMPLISHMENTS

From FY 2003 through FY 2010, this project quantified real and anticipated ecosystem responses to multiple stressors to assess ecosystem vigor, organization and resilience. Several indicators of multiple stressors were developed to assess the health and sustainability of coastal wetlands when subject to varying degrees of eutrophication. This



knowledge is essential to establish cost-effective restoration programs. This research addressed ecological questions relating to controls on ecosystem stability and resilience and the role of disturbance intensity in determining the resulting structural and functional ecosystem responses.

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