Louisiana Coastal Area Science and Technology Office

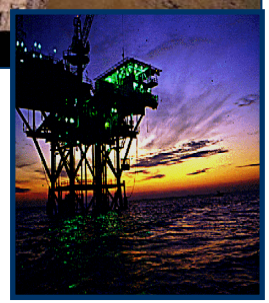
February, 2009

Mississippi River Basin

Basin Facts

- Drains 41% of continental US
- Includes 31 states & 2 Canadian provinces
- Total area drained 3.1 million km^2

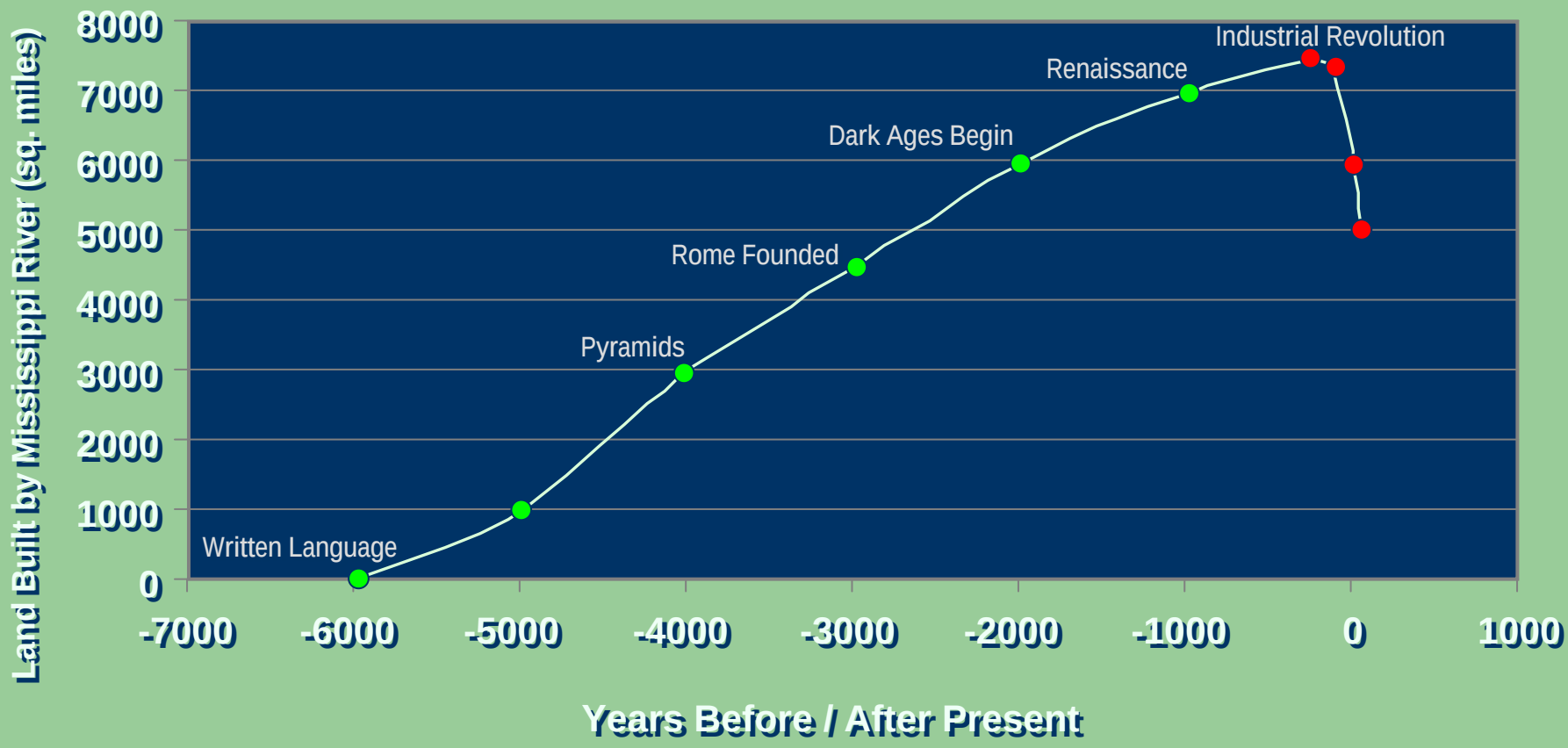
Importance of Coastal Louisiana to the Nation

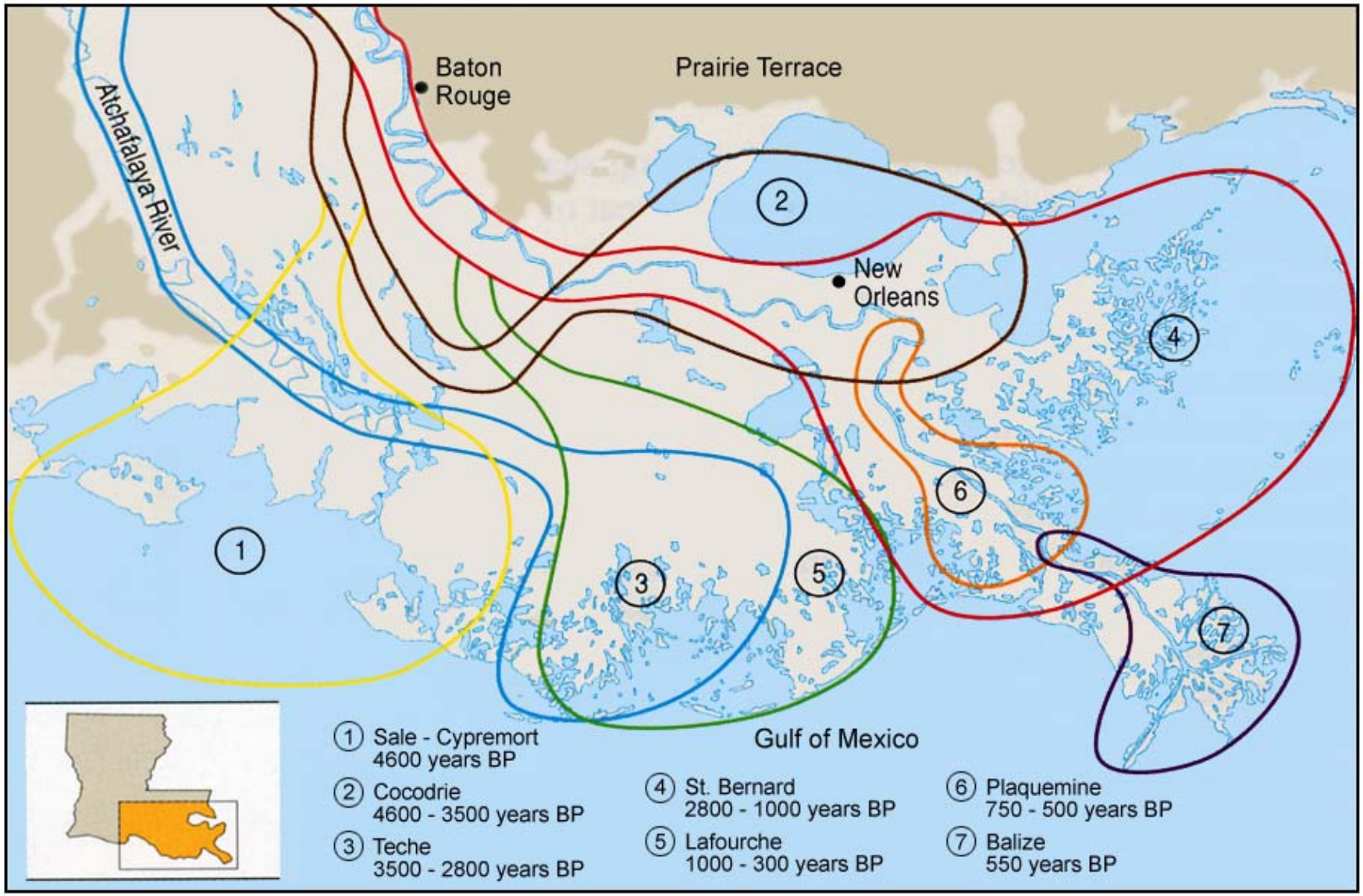


- Supports # 1 Port in Nation--400 Million tons/yr
- 17% Oil and 25% Gas Produced in U.S.
- $Billion/Yr Fisheries--30% of Nation's Production
- Provides Hurricane Protection
- Wintering Habitat for Migratory Waterfowl--50-70% of Mississippi Flyway
- Habitat for Millions of Birds & other Animals

Louisiana Coastal Area Science & Technology Office

Rise and Fall of Coastal LA




Baton Rouge
Prairie Terrace
Atchafalaya River
New Orleans
Gulf of Mexico
1
2
3
4
5
6
7
1 Sale - Cypremort 4600 years BP
2 Cocodrie 4600 - 3500 years BP
3 Teche 3500 - 2800 years BP
4 St. Bernard 2800 - 1000 years BP
5 Lafourche 1000 - 300 years BP
6 Plaquemine 750 - 500 years BP
7 Balize 550 years BP

Major Causes Of Wetland Loss

Barrier Island Degradation

Subsidence

Storms

Sea Level Rise

Salt Water Intrusion

Sediment Reduction

Canals

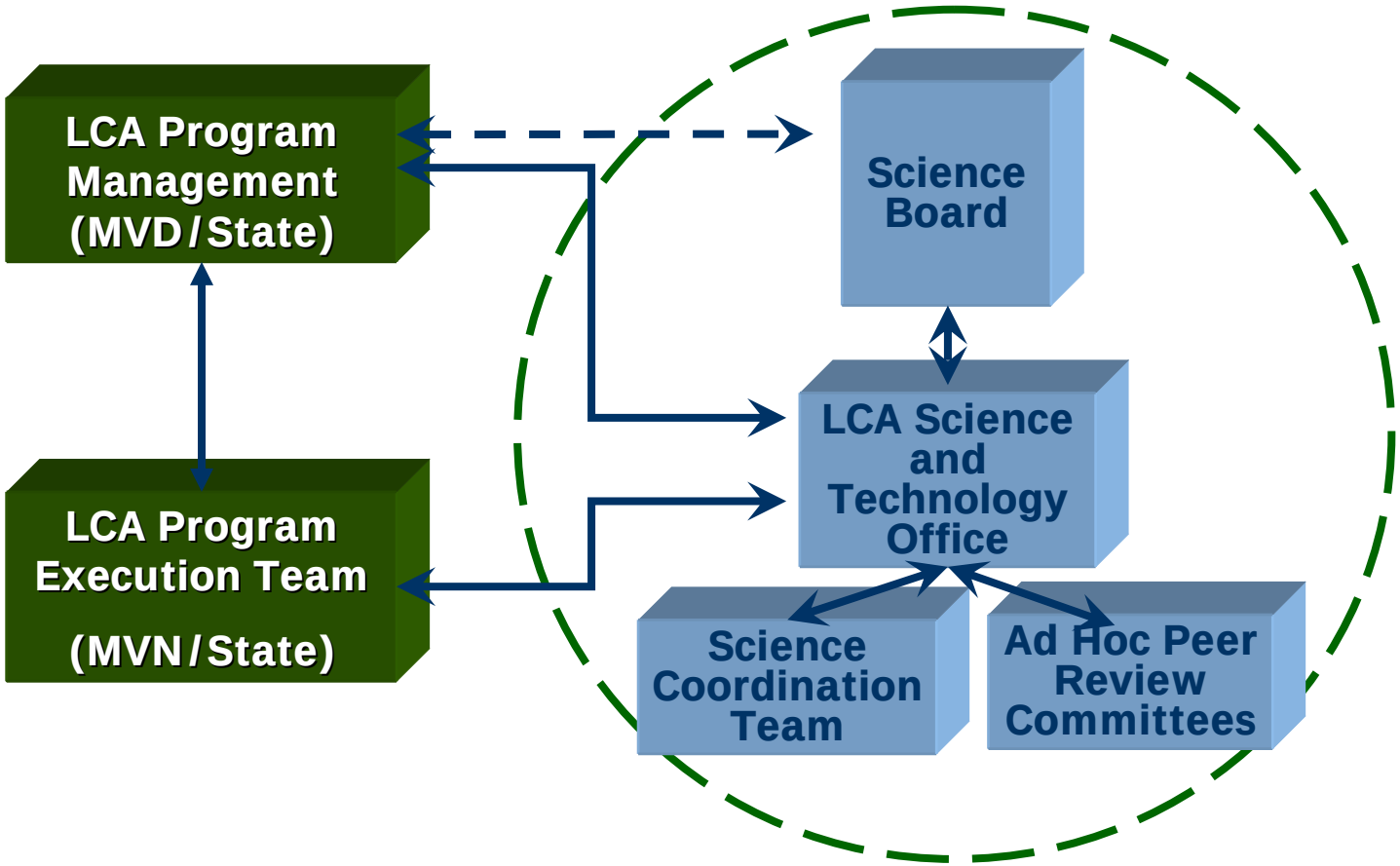
Oil & Gas Development

Levee System

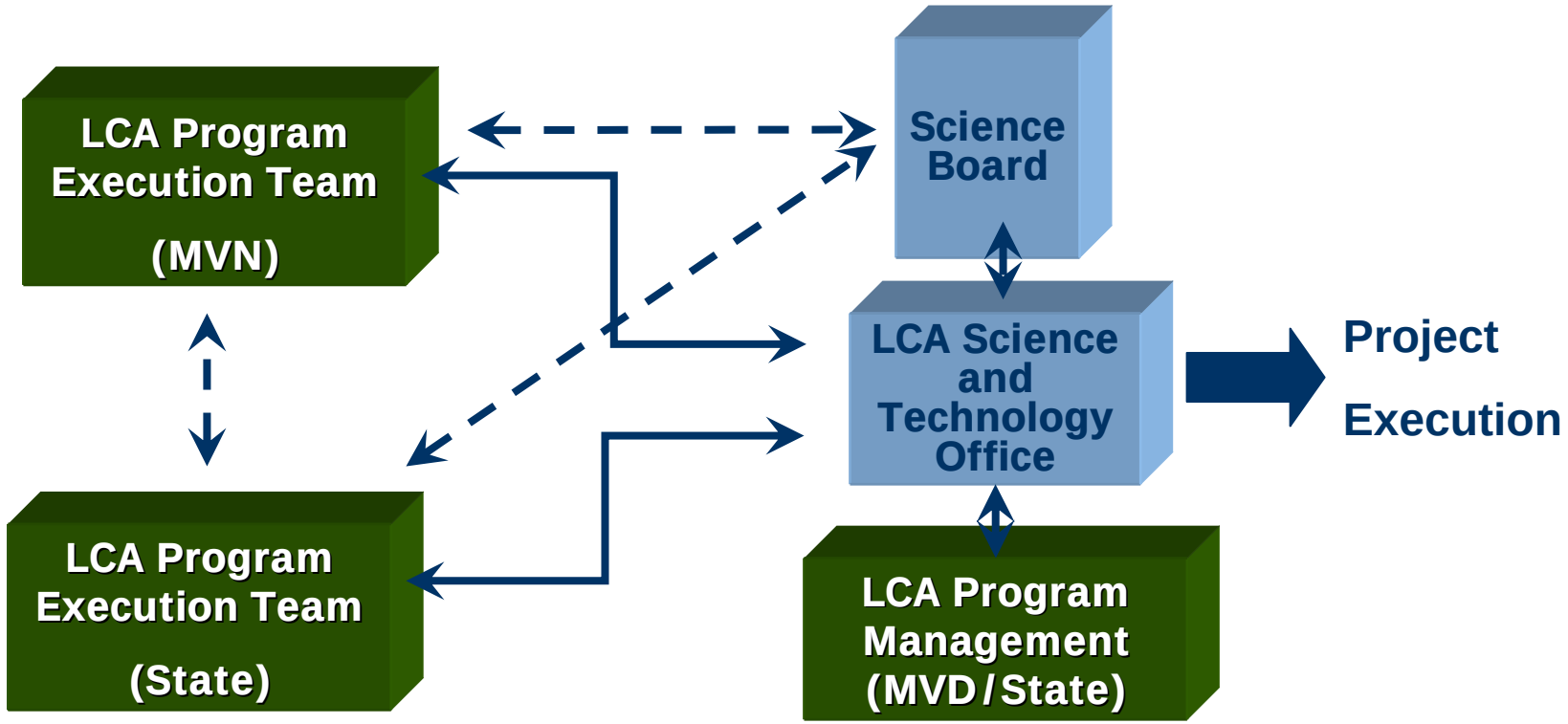
LCA S&T Program Goals

- **The goal of the LCA Science and Technology Office is to provide project managers and execution teams the best available science and technology support in order to plan, design, construct, and operate coastal restoration projects.**
  - Provide **analytical tools, assemble baseline data and generate recommendations** to reduce scientific uncertainties.
  - **Integrate the roles and resources** of other agencies and partners.
  - Provide for **internal and external technical review** and a systematic approach for coordination with other ongoing and planned related research activities.

LCA S&T Management Structure



LCA S&T Research Thrust Area Solicitation and Prioritization



LCA S&T Science Board

- **Science Board Members**
  - Dr. Donald Boesch – University of Maryland (chair)
  - Dr. Conner Bailey – Auburn University
  - Dr. Stephen Brandt – Great Lakes Environmental Research Lab
  - Dr. Robert Dean – University of Florida
  - Dr. Harindra Joseph Shermal Fernando – Arizona State Univ.
  - Dr. Peter Goodwin – University of Idaho
  - Dr. George Tanner – University of Florida
  - Dr. John Teal – Woods Hole Oceanographic Institute
  - Dr. John Wells – Virginia Institute of Marine Science
- **Tri-annual meetings, concentrate on coordination of efforts, innovations in science and technical project review**
- **Next meeting is on April 8-9, 2009 in Vicksburg**

Science Coordination Team

- Open participation
- Three meetings with the group have been held
- Participate in the Science Board meetings, invited to workshops
- Maintain email group

Status of the Office

- Semi-operational for about 2.5 years
- Authorized in WRDA
- FY07 and FY08 budgets at about $5 million/yr, LCA requested $10 million/yr for ten years (State and Federal funds combined, FY06 and 07 appropriations)

"System-wide" Issues

- Effect of potential diversions on the Mississippi River
- Effect of potential diversions on the receiving estuary
- Role of coastal features in wave and storm surge attenuation
- The effect of sea-level rise on coastal restoration ????

Current Research Program

- An Analysis of the Role of Coastal Landscape Features in Storm Surge and Wave Reduction
- Application of Long Distance Conveyance of Dredged Material to Habitat Restoration
- Barrier Island Comprehensive Monitoring (BICM)
- Breton Sound Estuary Post-Hurricane Characterization & Recovery Assessment
- Chenier Plain Water and Sediment Model Development
- Coastwide Conceptual Ecological Model Development
- Baseline water quality sampling at the MRGO

Current Research Program

- Refinement of the Coastal Louisiana Ecosystem Assessment and Restoration (CLEAR) Framework
- Develop LCA Data Management Strategies
- Louisiana Coastal Subsidence Workshop
- Louisiana Coastwide Hurricane Impact Assessment
- Modeling Land Building and Delta Formation
- Support the Regional Sediment Management program

Current Research Program

- Synthesis Report: Potential for Introduction of Invasive Plant Species from Illinois River Dredged Material
- Synthesis Report: Thin Layer Disposal of Dredged Sediment
- Synthesis Report: River Induced Shoaling
- Synthesis Report: The Interpretation of Sea Level Rise Information in Coastal Restoration Projects
- Development of the LCA Technical Support Program

Modeling Storm Surge Propagation over Vegetated Landscape Features

ERDC Coastal and Hydraulics Laboratory
University of Notre Dame
Louisiana State University
University of Texas

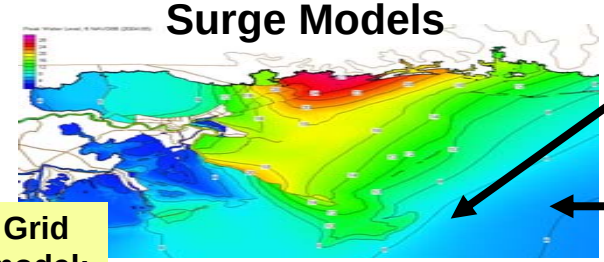
Storm Surge and Vegetation

- Complicated Dynamics preclude application of simple "rules of thumb" (i.e. X miles of marsh reduces surge by Y feet)
  - Storm track
  - Storm intensity
  - Surrounding topography/bathymetry
  - Vegetation type

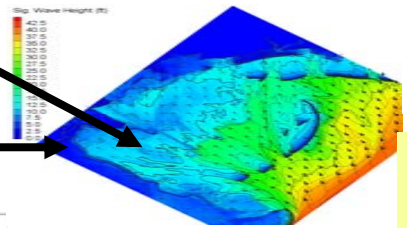
- Modeling is a tool for qualitative or semi-quantitative evaluation of the surge and wave reduction potential of vegetated coastal features, to determine trends and relative performance.

Modeling Methodology

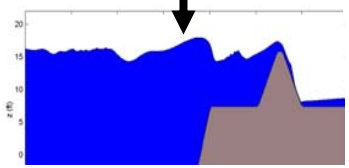
Surge Models



Wave Models



Coupling



Unified Grid Surge model: ADCIRC with wave set-up

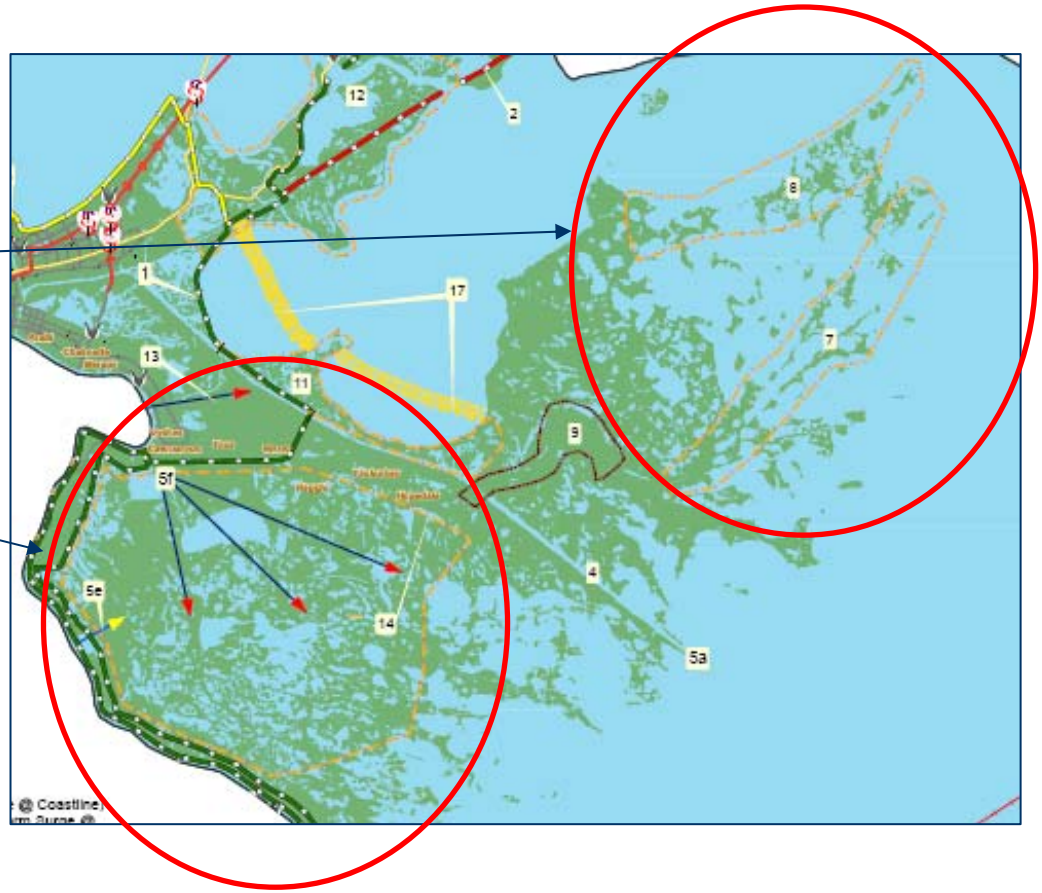
Offcoast Waves: WAM
Nearshore Waves: STWAVE

Local Scale Waves: Boussinesq - Parametric

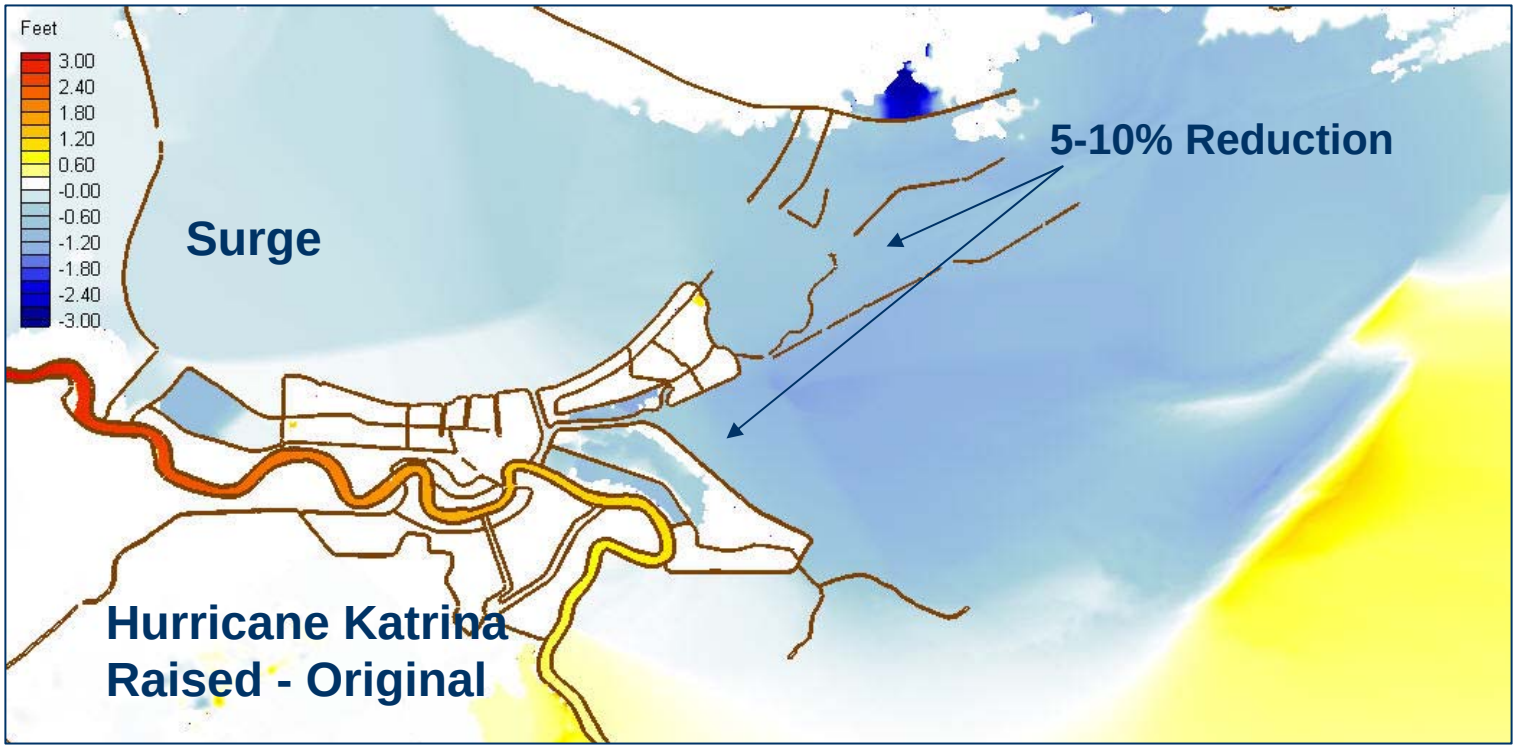
Sensitivity Analysis
Bathy/topo & Manning-n

Marsh Restoration/Deterioration

- **Biloxi**
- **Caenarvon**



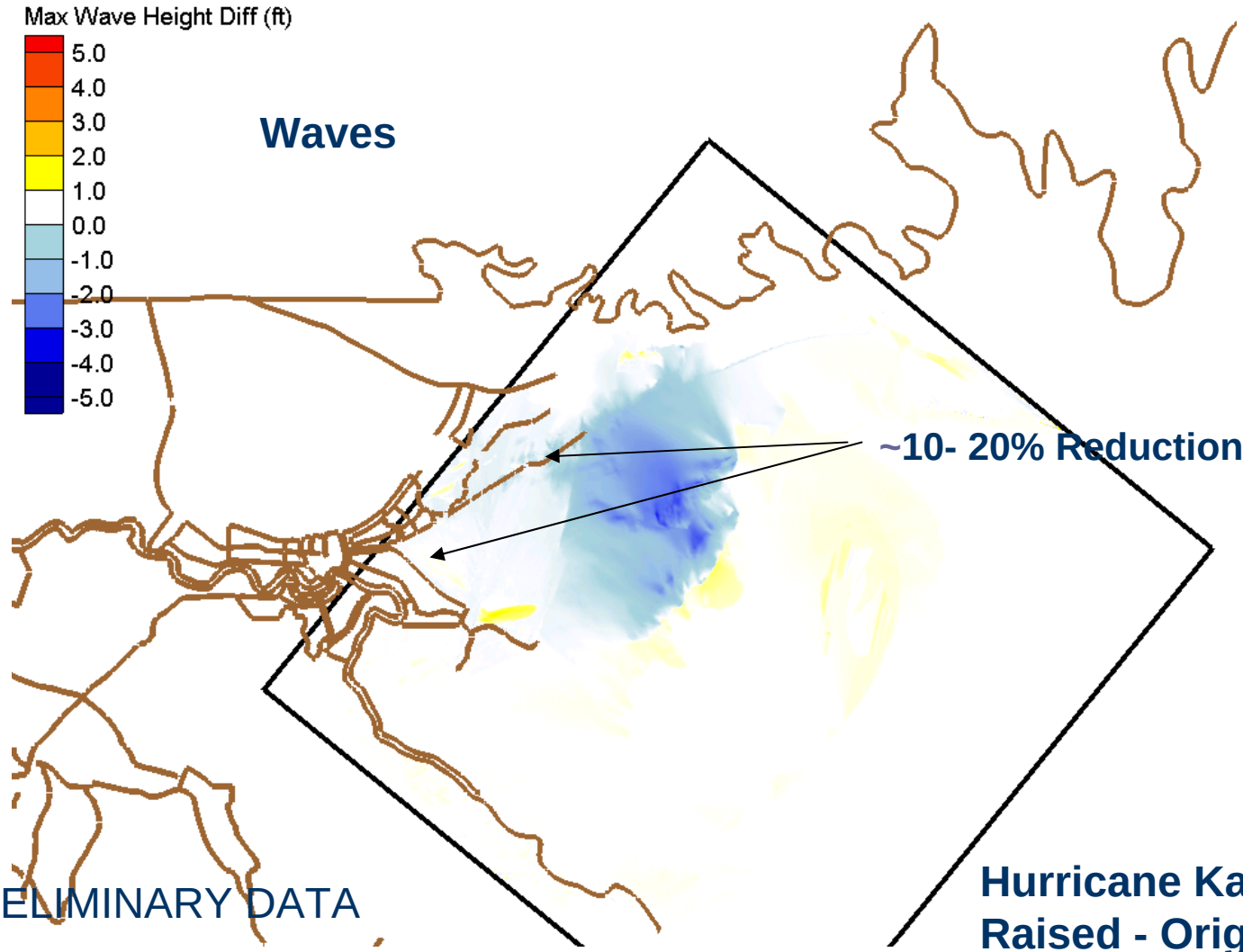
Biloxi Marsh Restoration



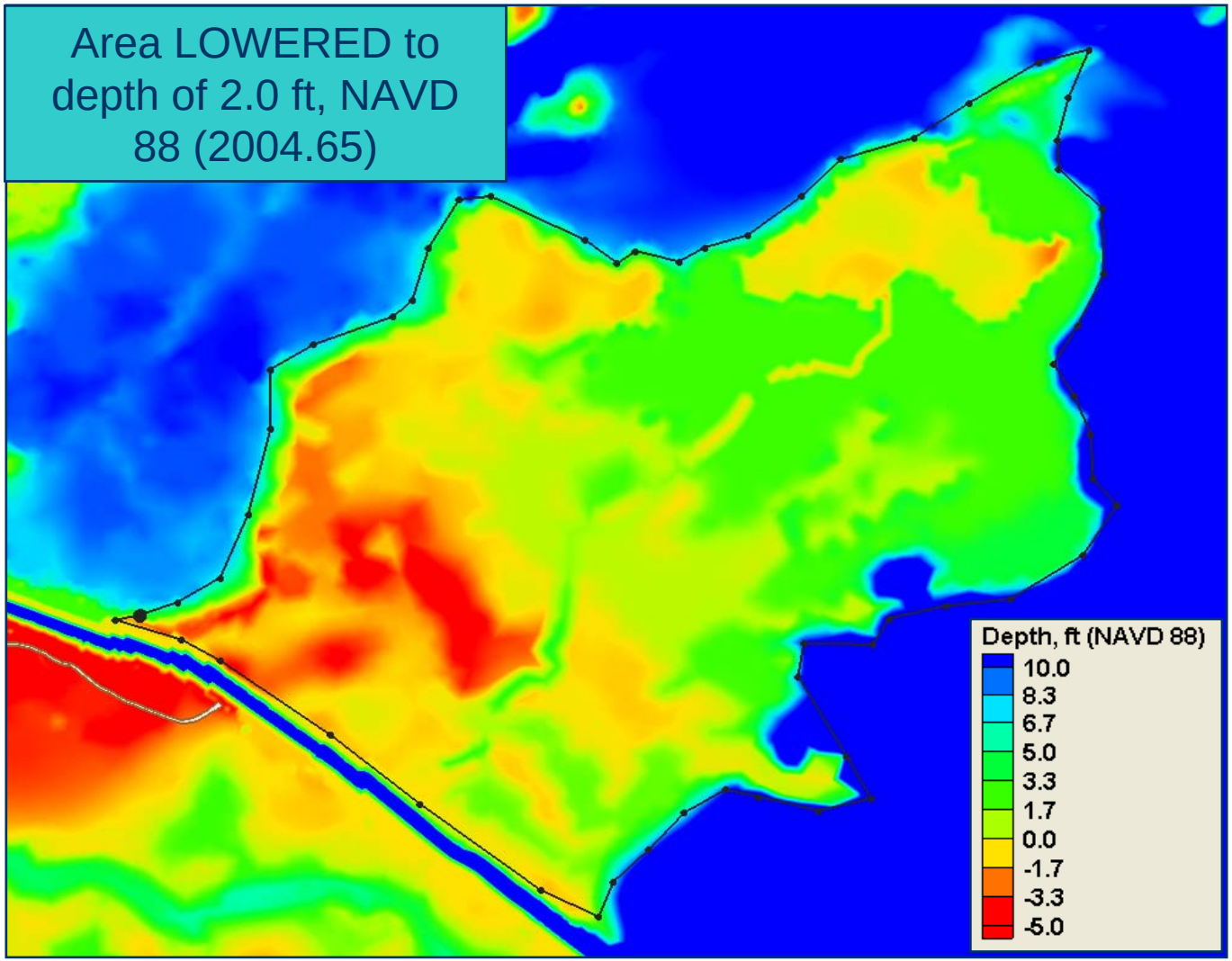
Similar % reduction for storm with half the surge potential of Katrina

PRELIMINARY DATA

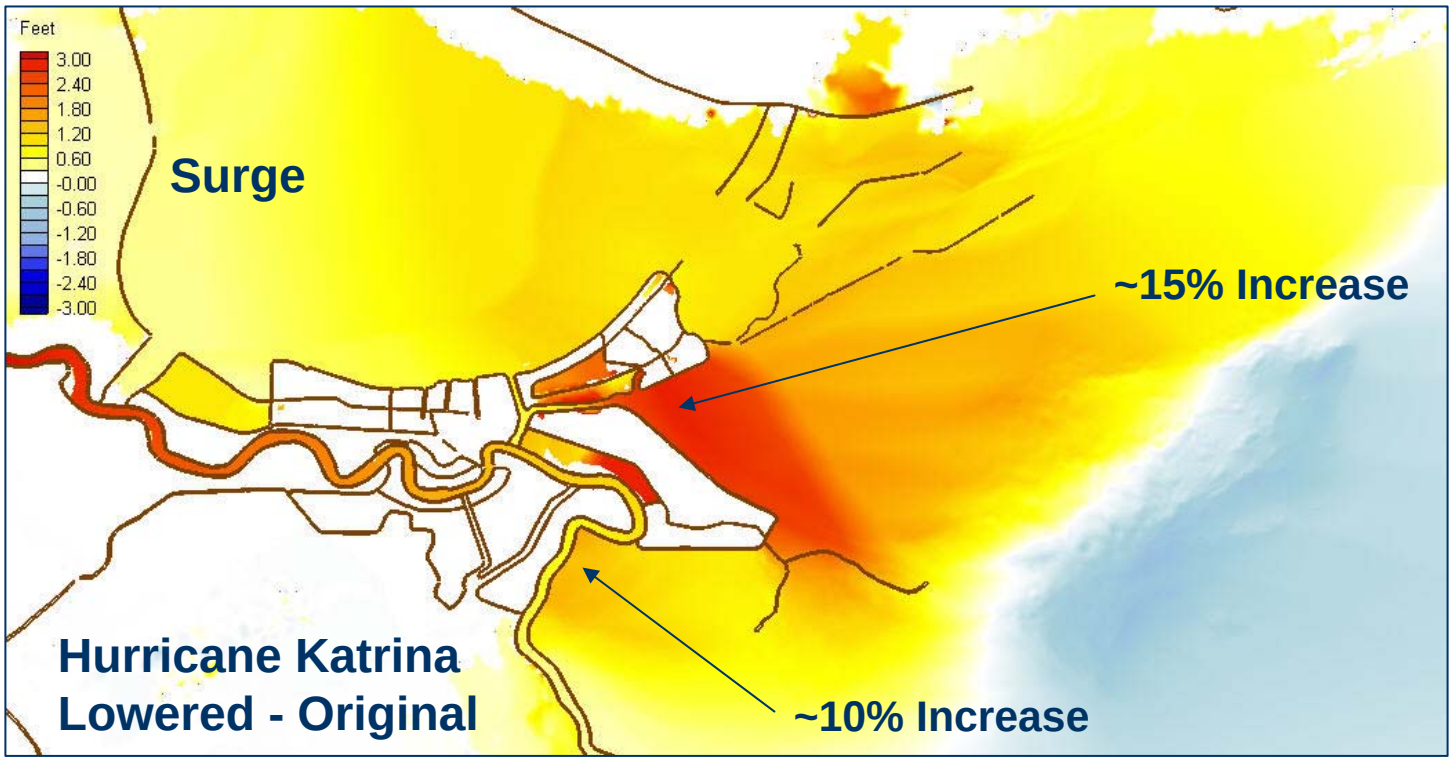
Biloxi Marsh Restoration



Biloxi Marsh Deterioration



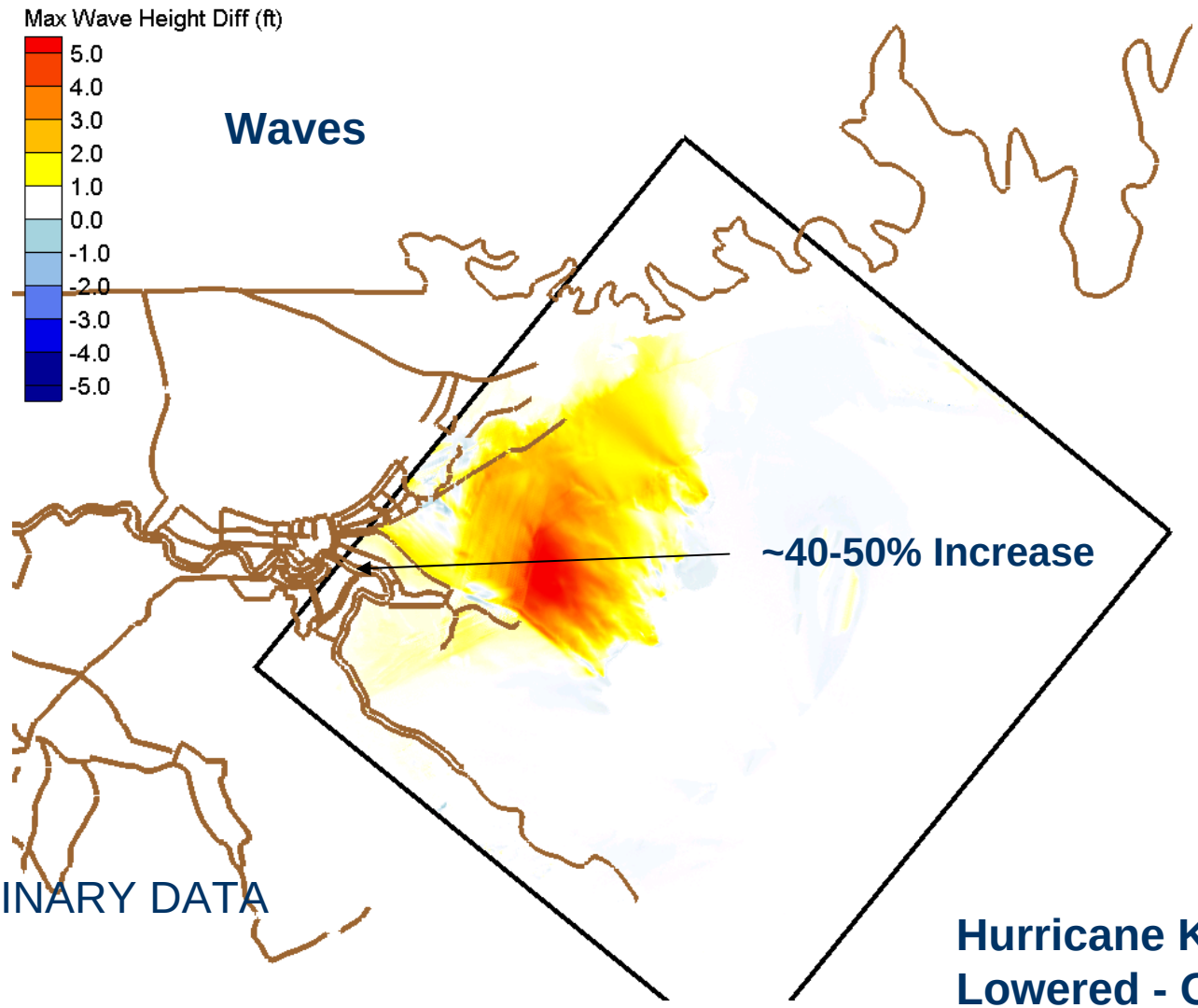
Biloxi Marsh Deterioration



Similar % increase for storm with half the surge potential of Katrina

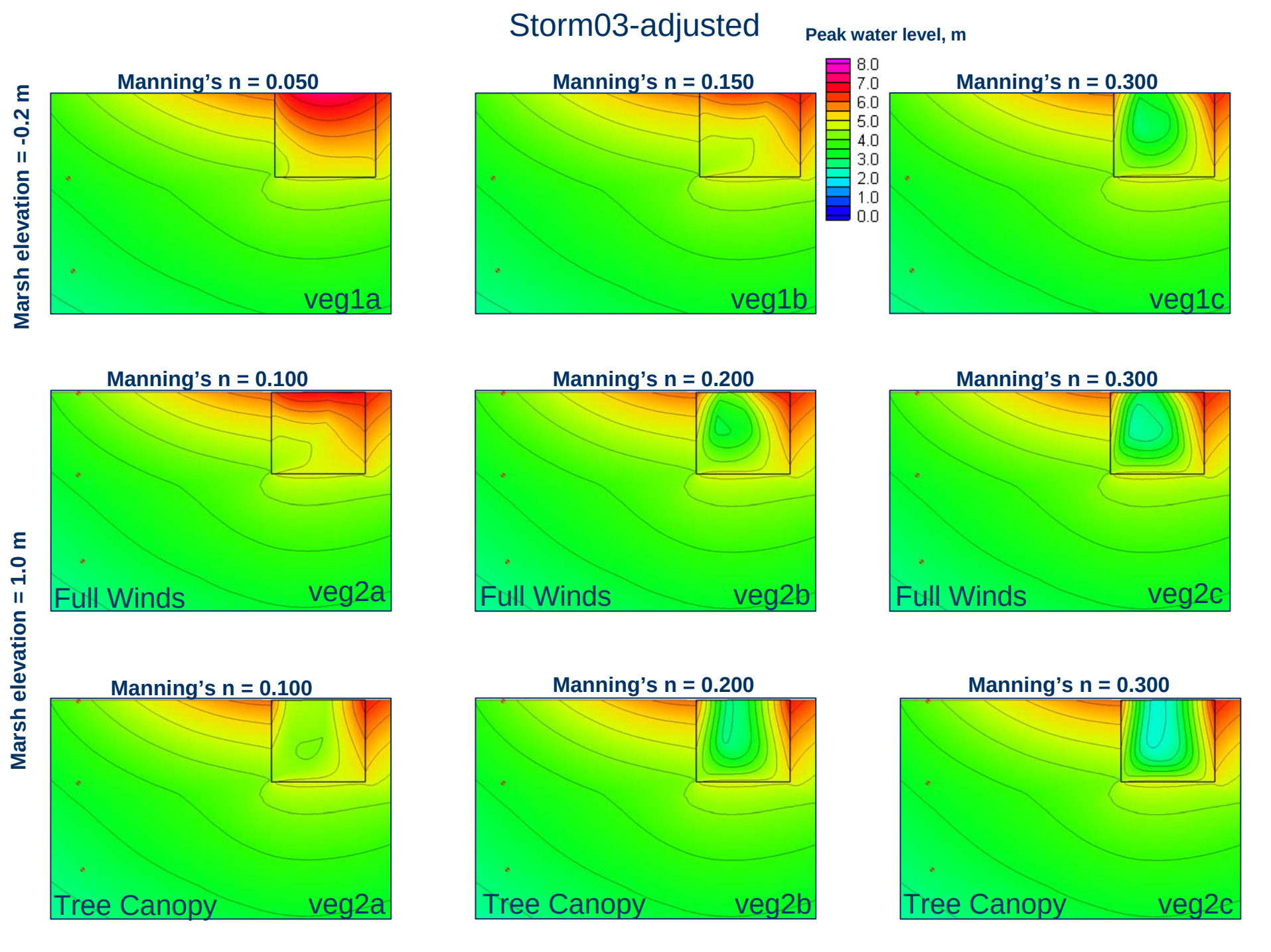
PRELIMINARY DATA

Biloxi Marsh Deterioration



PRELIMINARY DATA

Hurricane Katrina
Lowered - Original


Storm03-adjusted
Peak water level, m
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Marsh elevation = -0.2 m
Marsh elevation = 1.0 m
Manning's n = 0.050
veg1a
Manning's n = 0.150
veg1b
Manning's n = 0.300
veg1c
Manning's n = 0.100
Full Winds
veg2a
Manning's n = 0.200
Full Winds
veg2b
Manning's n = 0.300
Full Winds
veg2c
Manning's n = 0.100
Tree Canopy
veg2a
Manning's n = 0.200
Tree Canopy
veg2b
Manning's n = 0.300
Tree Canopy
veg2c

Summary

- Preliminary simulations indicate that vegetated landscape features do have surge and wave reduction potential.
- Impact is amplified in areas with levee “pockets”.
- Quantitative determinations should not be made.
- Research is needed, including field data collection and laboratory experiments.

Characterizing the Immediate and Long-term Impacts of Hurricanes Katrina and Rita to Support Resource Management Decision-Making

Gregory D. Steyer, USGS NWRC
Charles E. Sasser, LSU CEI
John Barras, USGS NWRC
Steve Hartley, USGS NWRC
Brady Couvillion, USGS/IAP

In Cooperation with CWPPRA, LSU and LDNR
and Funding Support from
LCA Science & Technology Program

Goals & Objectives

- Improve our conceptual understanding of large-scale disturbance on ecosystem function and resilience, and use that knowledge to refine Louisiana Coastal Area (LCA) desktop model algorithms
- Provide data to support the development of a new time 0 (2006-2007) baseline of coastal land area and vegetation communities
- Use GIS technology to describe the interrelationships between site-specific processes and landscape-level response to support a logical interpretation of hurricane impacts and subsequent recovery
  - Task 1 **Assessment of Vegetation Change in Coastal Louisiana**
  - Task 2 **Evaluate hurricane impacts and recovery**
  - Task 3 **Identify changes in land and water areas across southwestern Louisiana**
  - Task 4 **Perform Coastwide Assessment of Vegetation Communities**

BICM

BARRIER ISLAND COMPREHENSIVE MONITORING (BICM) PROGRAM

Pontchartrain Institute for Environmental Sciences
University of New Orleans

UNIVERSITY of NEW ORLEANS

USGS
science for a changing world

BICM

- The goal of the BICM is to provide long-term data on Louisiana's barrier islands to be used to plan, design, evaluate, and maintain current and future barrier island restoration projects.

- Project Tasks
  - Storm Assessment
  - Shoreline Change
  - Topographic Change
  - Bathymetric Change
  - Habitat Change
  - Topobathy Baseline
  - Coast-wide BICM Baseline

Chandeleur Islands Shoreline Regression: 1855-2005

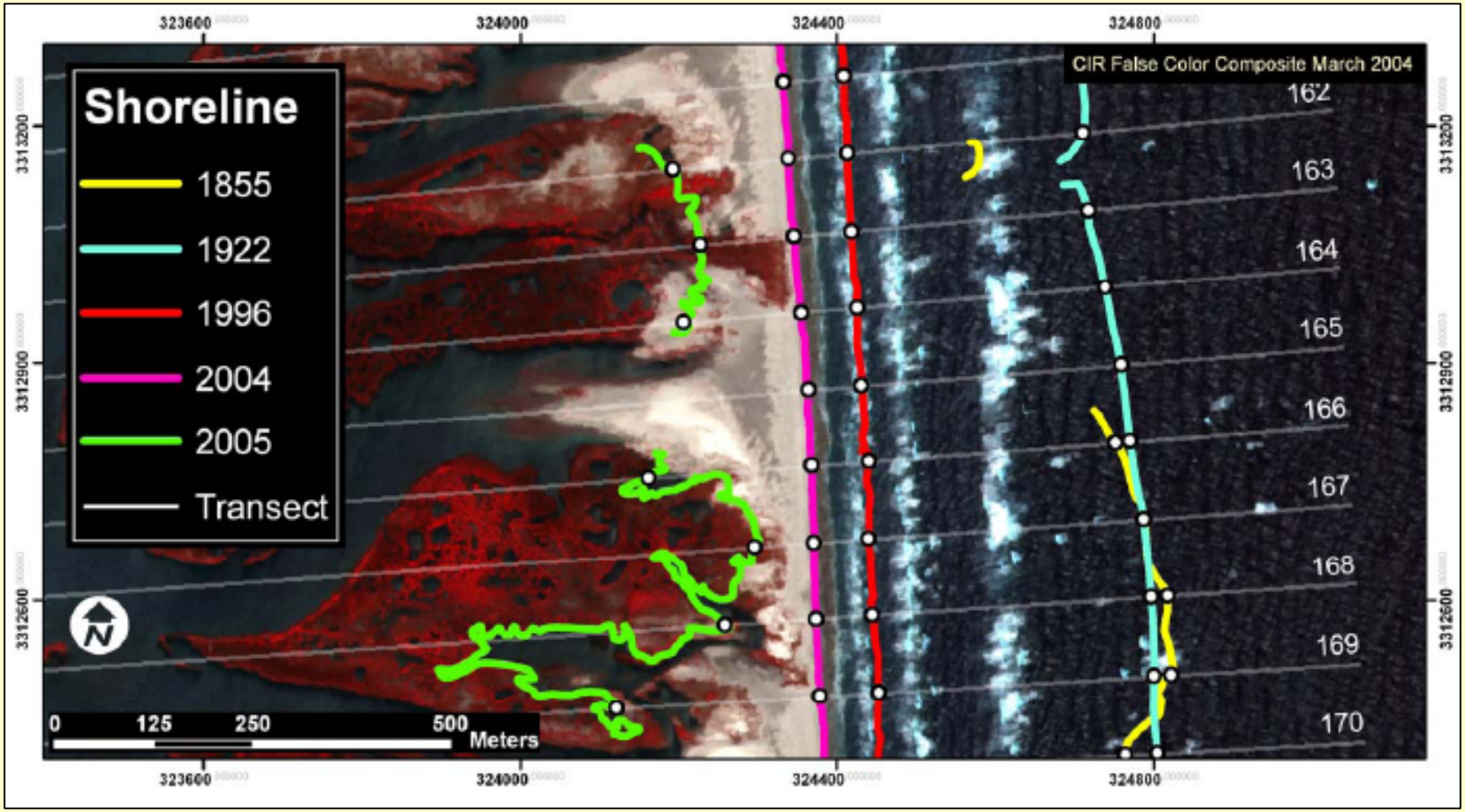
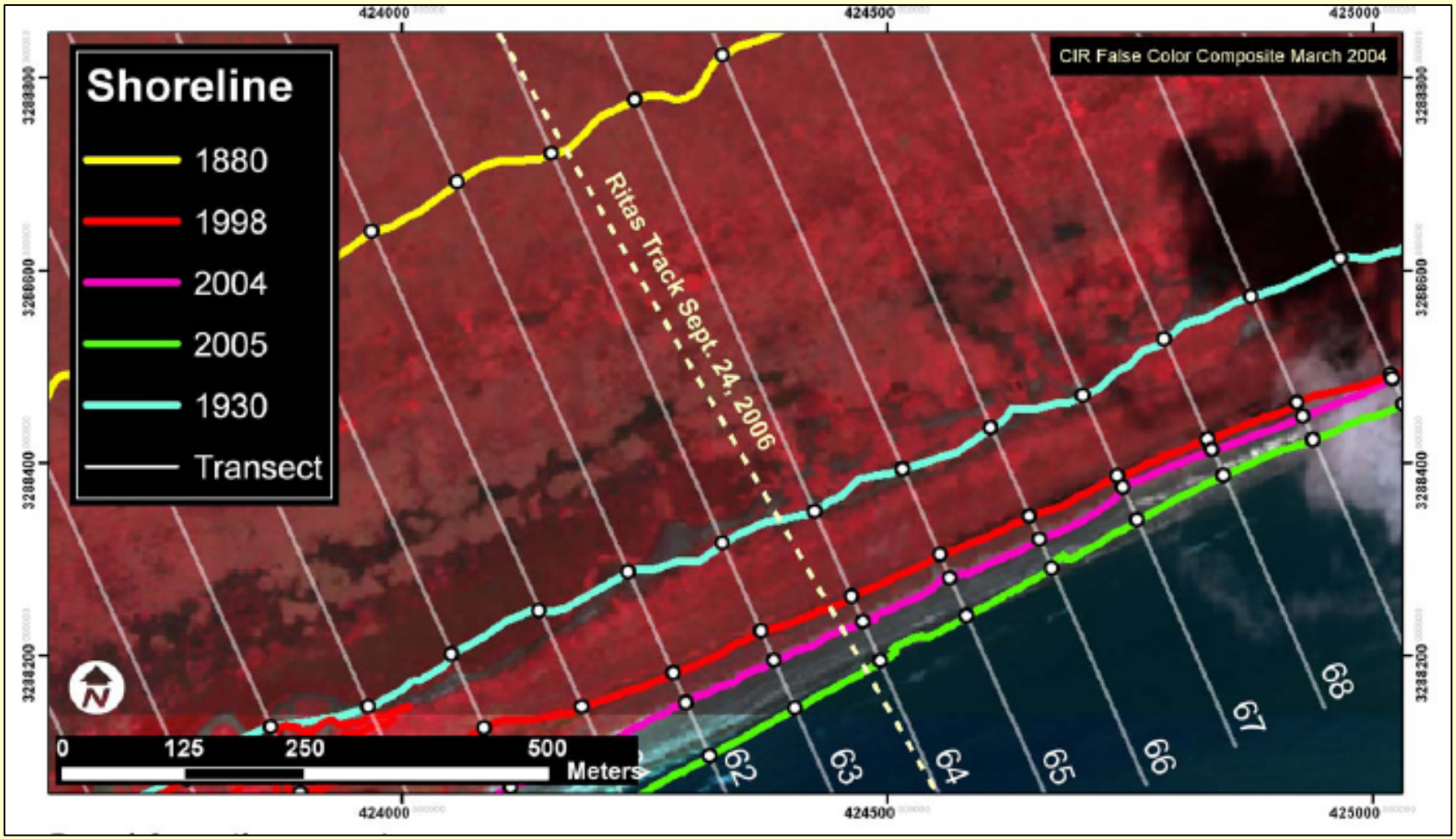
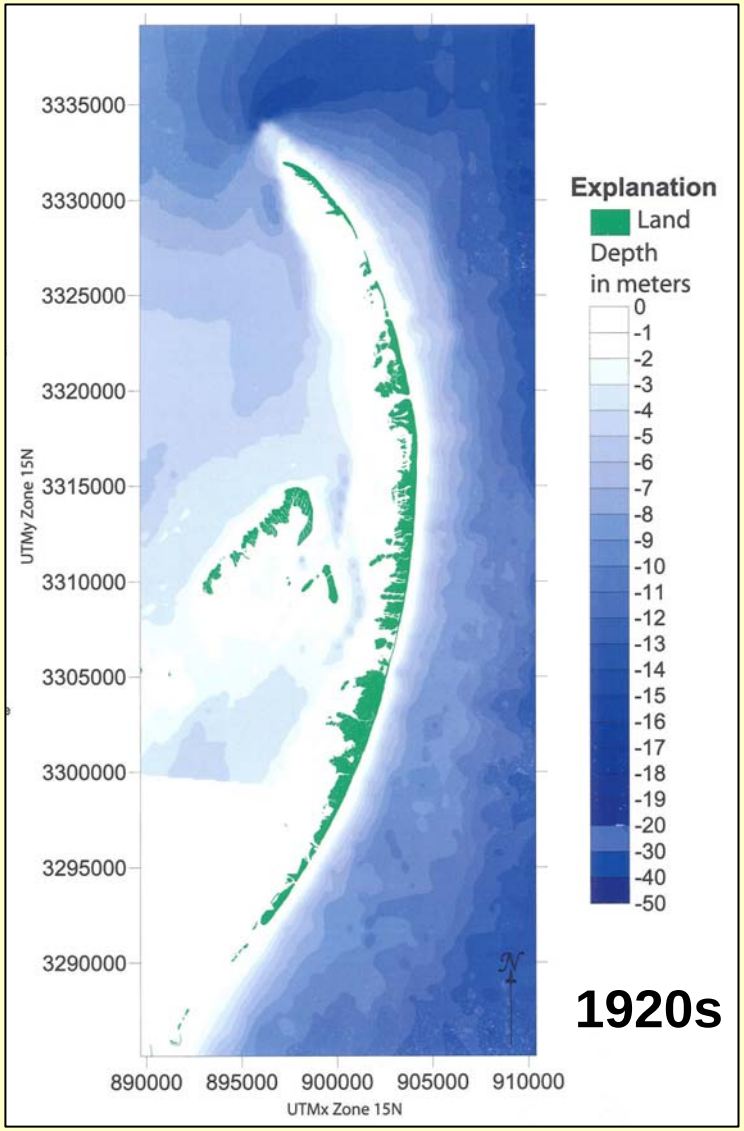


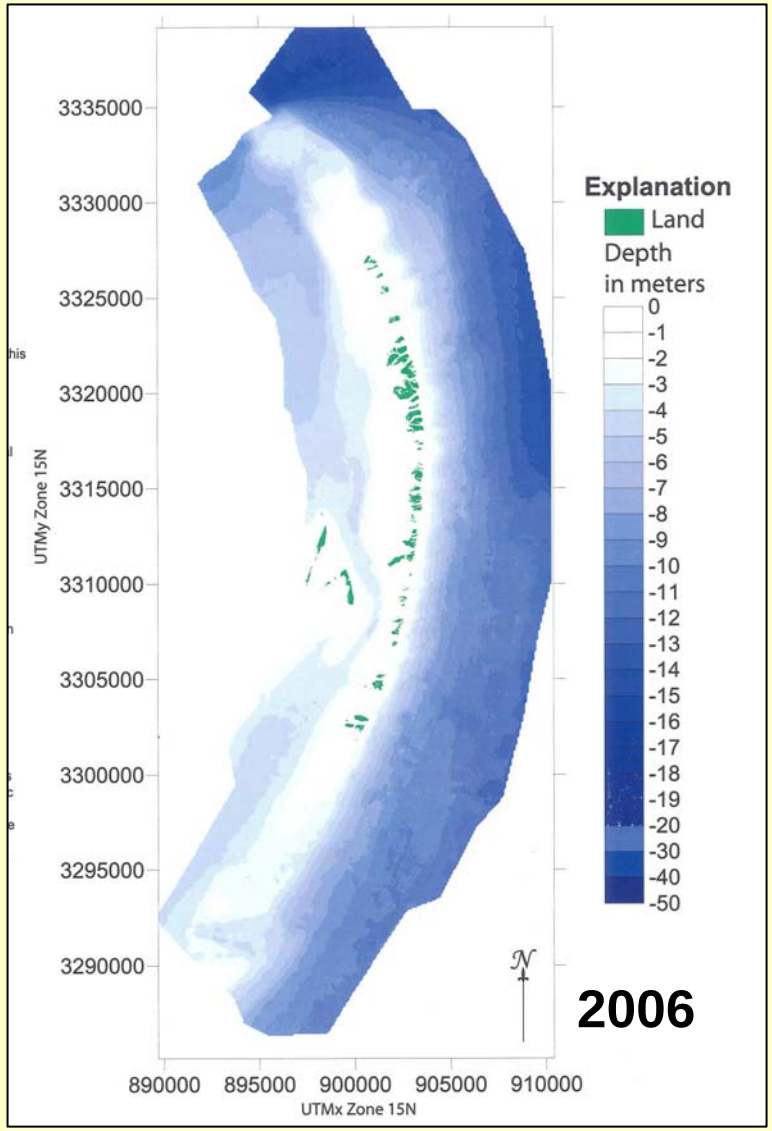
Image courtesy of UNO

Chenier Plain Shoreline Progression: 1880-2005



Case Study:
Chandeleur Islands Bathymetry





FY09 "Funding Priorities"

- Mississippi River modeling efforts
- Continued studies of the role of wetlands, coastal features and vegetation in surge and wave attenuation
- Lake Pontchartrain simulations
- CLEAR model review and improvement
  - Upgrading land building module
  - Development of water quality module
  - Review/formulation of habitat use module
- Regional Sediment Management – conceptual sediment budgets
- HGM wetland assessment models for Louisiana wetlands
- Update of NWI wetland maps
- Contract student support?

http://el.erdc.usace.army.mil/lcast/

Louisiana Coastal Area (LCA)

U.S. Army Corps of Engineers | Engineer Research & Development Center | Louisiana DNR

LCA Structure

Science Board

Science Coordination Team

Ad Hoc Peer Review Committees

Projects

Technology Transfer

Related Links

Science & Technology Program

Barbara A. Kleiss, USACE MVD - Director 601-634-4674
James W. Pahl, OCPR - Interim Deputy Director 225-342-2413

- Current Research Program *Updated*
- Subscribe to the automatic subscription service for notification of products, publications and news (a blank message is all that is required)

The coastal wetlands of Louisiana are among the Nation's most productive and important natural assets in terms of habitat, wildlife diversity, storm protection, port commerce, and oil and natural gas production. Unfortunately, Louisiana coastal wetlands account for 90 percent of the total coastal marsh loss occurring in the Nation. Hurricanes Katrina and Rita in 2005 accelerated the loss of Louisiana wetlands with deleterious effects on the ecosystem. The Louisiana Coastal Area (LCA) Ecosystem Restoration Plan was established to reverse the degradation trend of the Louisiana coastal ecosystem. The LCA Plan emphasizes the use of restoration strategies towards achieving and sustaining a coastal ecosystem that can support and protect the environment, economy, and culture of southern Louisiana. The LCA study area, which includes the Louisiana coastal area from Mississippi to Texas, is comprised of two wetland-dominated ecosystems, the Deltaic Plain of the Mississippi River and the closely linked Chenier Plain, both of which are influenced by the Mississippi River.


Lane Lefort