



THE WATER INSTITUTE
OF THE GULF

RESTORING HABITATS AND PROCESSES

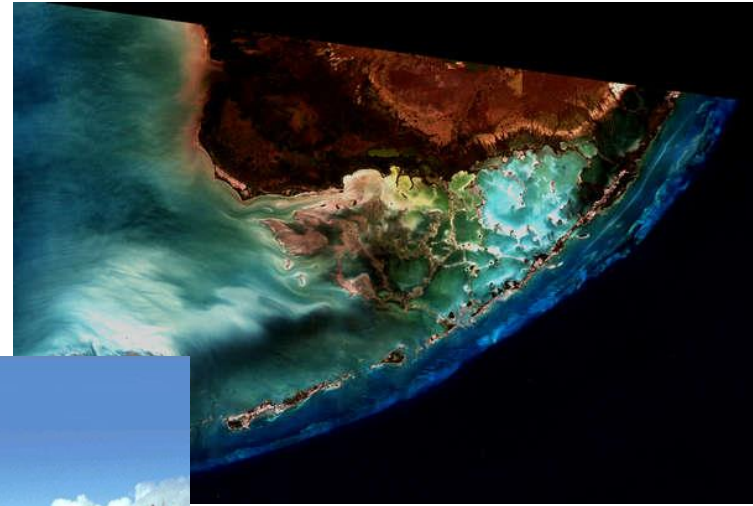
May 22, 2014

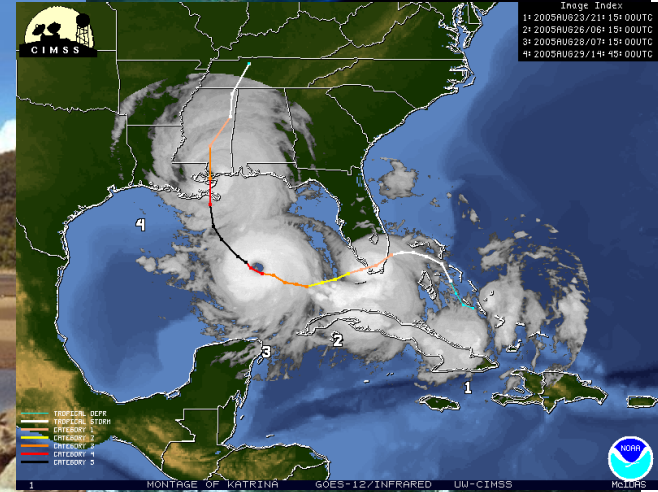
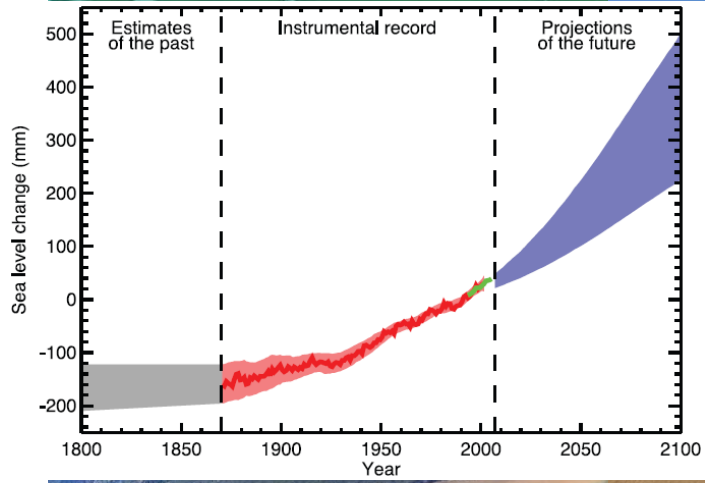
Denise Reed, Ph.D.
Chief Scientist

OUTLINE

- ◆ Resilience of Habitats
- ◆ Losing resilience
- ◆ Gaining it back
- ◆ Role of resilient habitats









Southern Chile



Southern Louisiana



Southern Louisiana



WHY DO NATURAL SYSTEMS LOSE RESILIENCE?



WHAT CAN WE DO ABOUT IT?

💧 'Restoration'

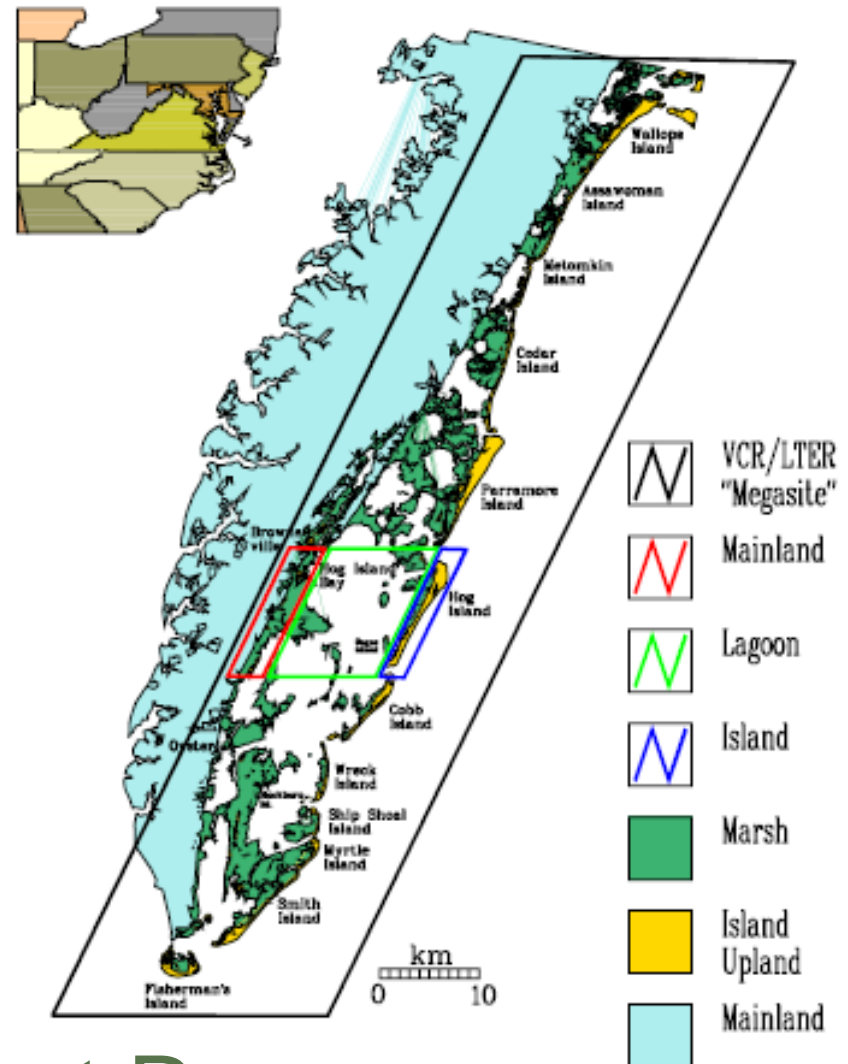
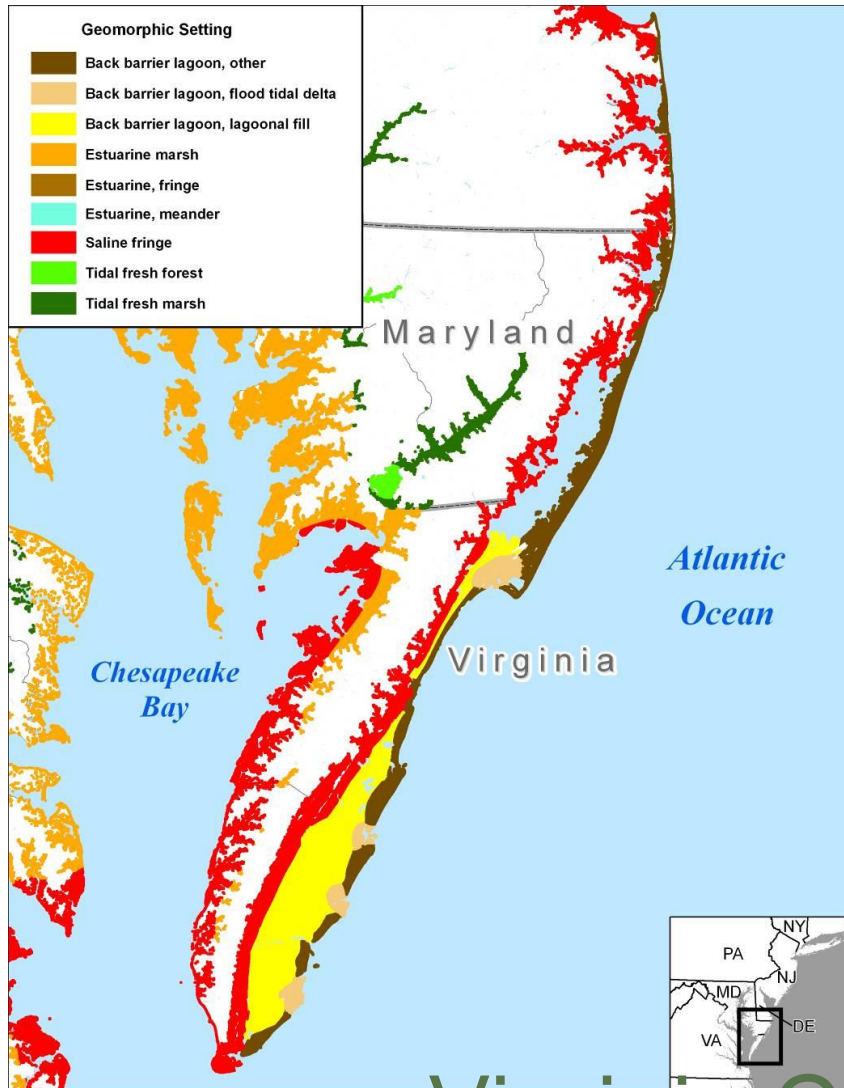
- Recreating processes/function
- Systems context

💧 'Resilience'

- What does the future hold?
- Anticipating transitions



NO ACTION MAY BE BEST



Virginia Coast Reserve



LOUISIANA IS EXPERIENCING A COASTAL CRISIS



>4,800
square km
lost since the
1930s

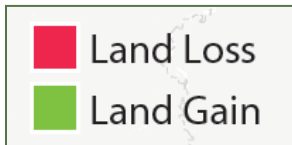


Currently
losing over
41 square km
per year



LOUISIANA IS EXPERIENCING A COASTAL CRISIS

Predicted Land Change Over Next 50 Years



Potential to lose an additional 2000 – 4,500 square km of land over the next 50 years



“ Restoration means returning an ecosystem to a close approximation of its condition prior to **disturbance.**”

Accomplishing restoration means ensuring that ecosystem structure and function are recreated or repaired, and that *natural dynamic ecosystem processes are operating effectively again.*”

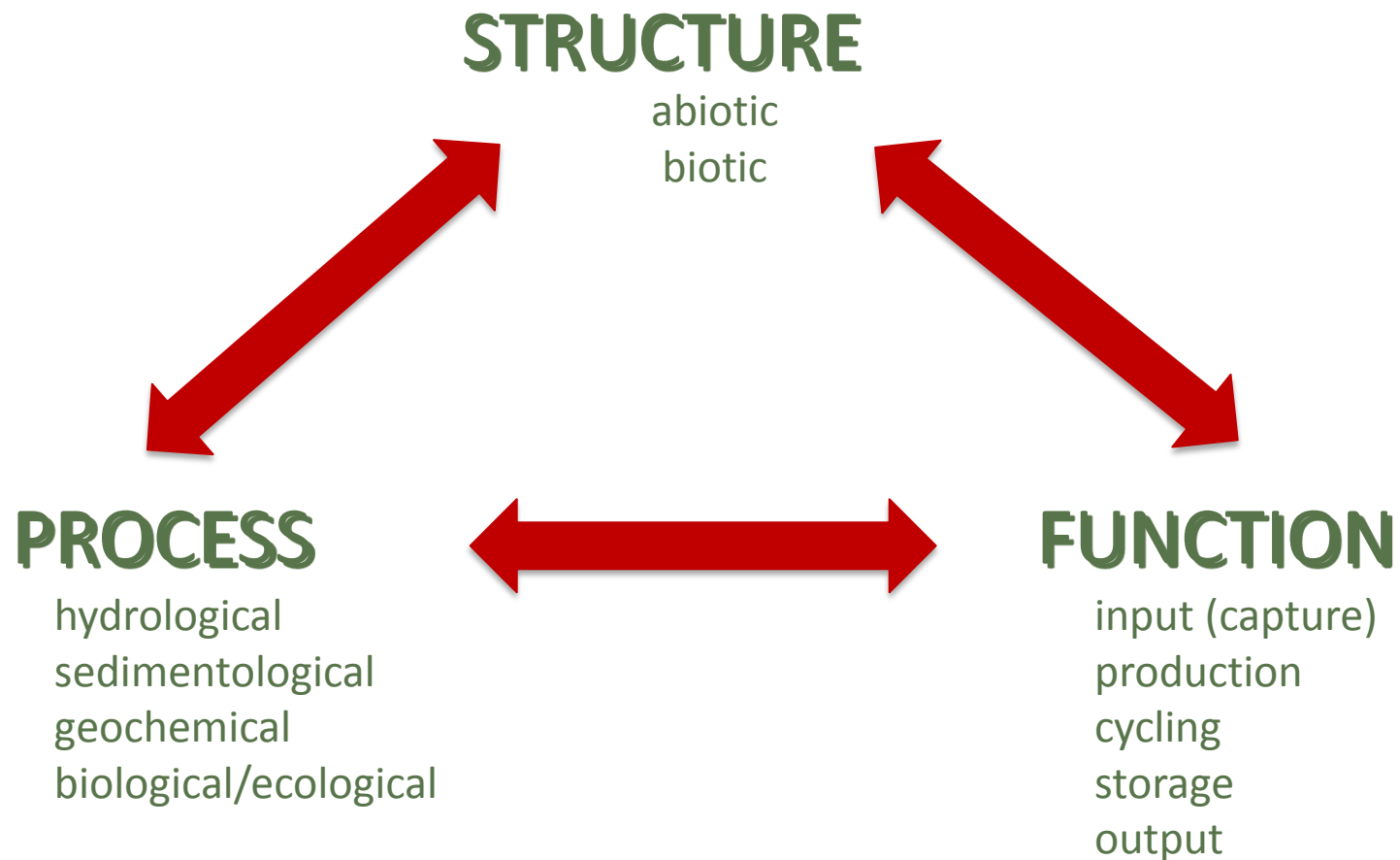
NRC 1992: Restoration of Aquatic Ecosystems—Science, Technology and Public Policy. National Academy Press, Washington, D.C.

“ The goal of restoration is to establish a site that is **self-regulating** and **integrated within its landscape**, rather than to reestablish an aboriginal condition that can be impossible to define and/or restore within the context of the current lands use or global climate change.”

Middleton 1999: Wetland Restoration—Flood Pulsing and Disturbance Dynamics



STRUCTURE - FUNCTION - ECOSYSTEM PROCESSES



IMPORTANCE OF DISTURBANCE

“The ultimate success of a restored wetland as a functional ecosystem will depend on the level to which its reengineered or passively rejuvenated environment can endure natural disturbances. Restored wetlands that will persist are likely to resemble natural wetlands in the region.”

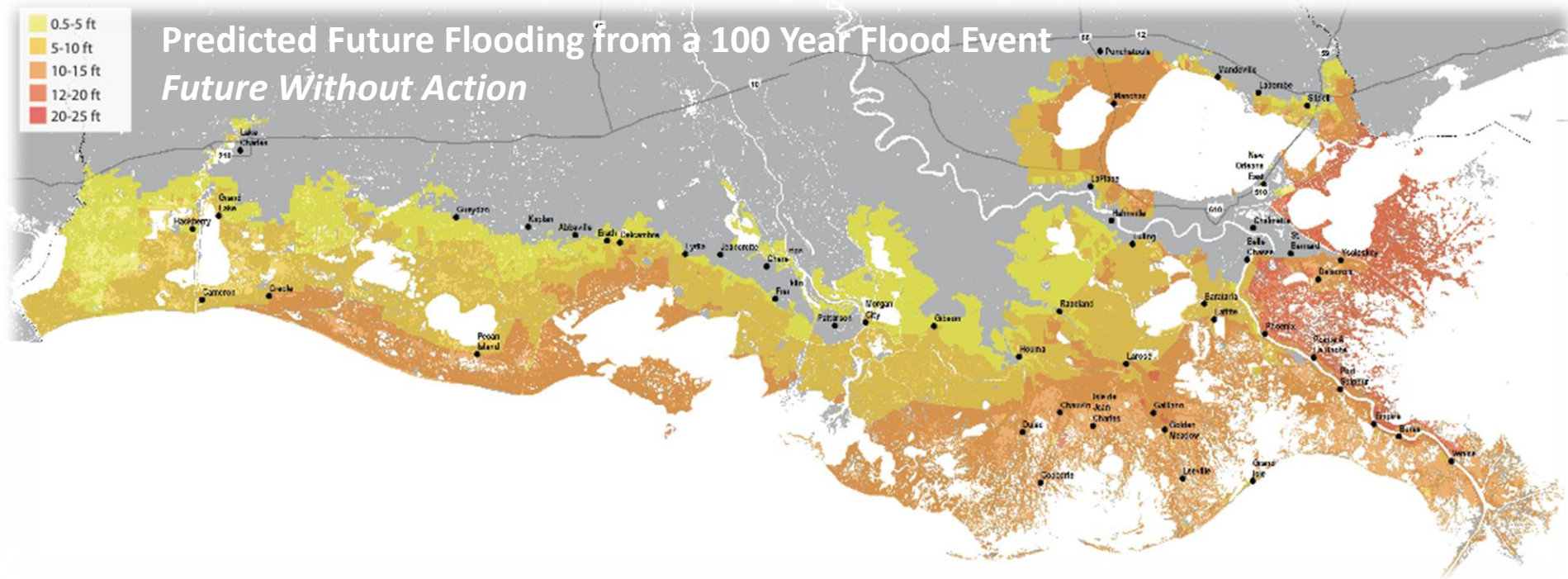
Middleton 1999: Wetland Restoration—Flood Pulsing and Disturbance Dynamics

.....suggest that (ecological) functionality is typically contingent upon natural disturbance regime!





COMMUNITIES AND LIVELIHOODS AT RISK



Potential for damages to reach
\$7.7 to \$23.4 billion annually

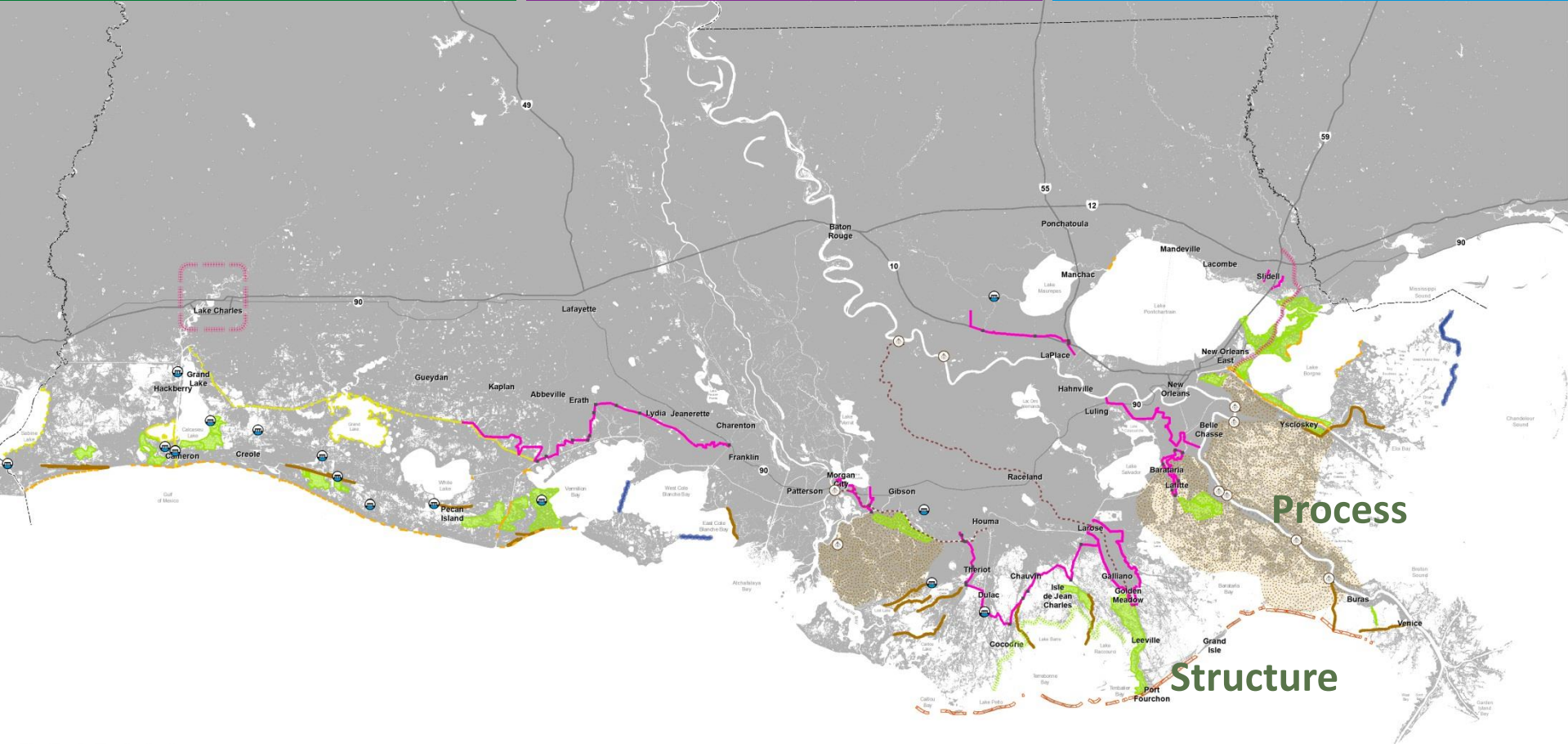


Louisiana's 2012 Coastal Master Plan

Southwest Coast

Central Coast

Southeast Coast



Projects Included:



Projects for Further Planning:



WHAT CAN WE DO ABOUT IT?

💧 'Restoration'

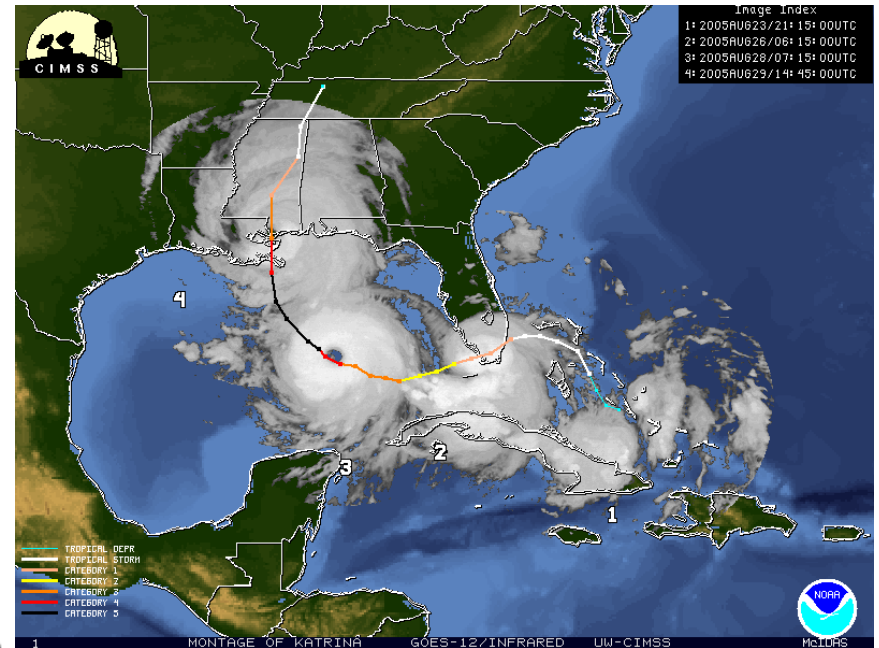
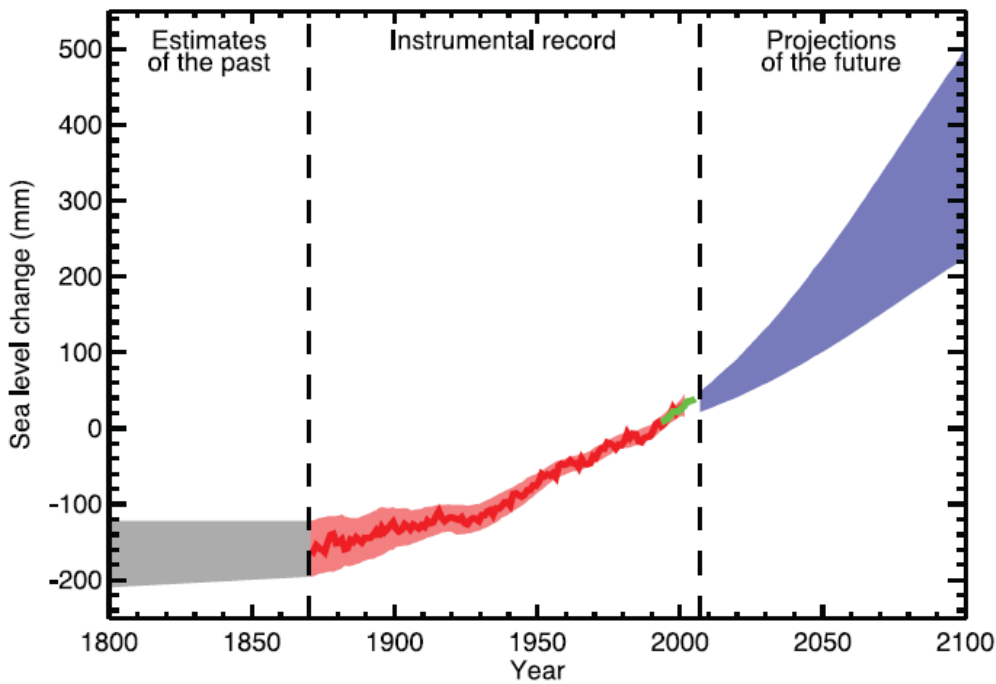
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💧 'Resilience'

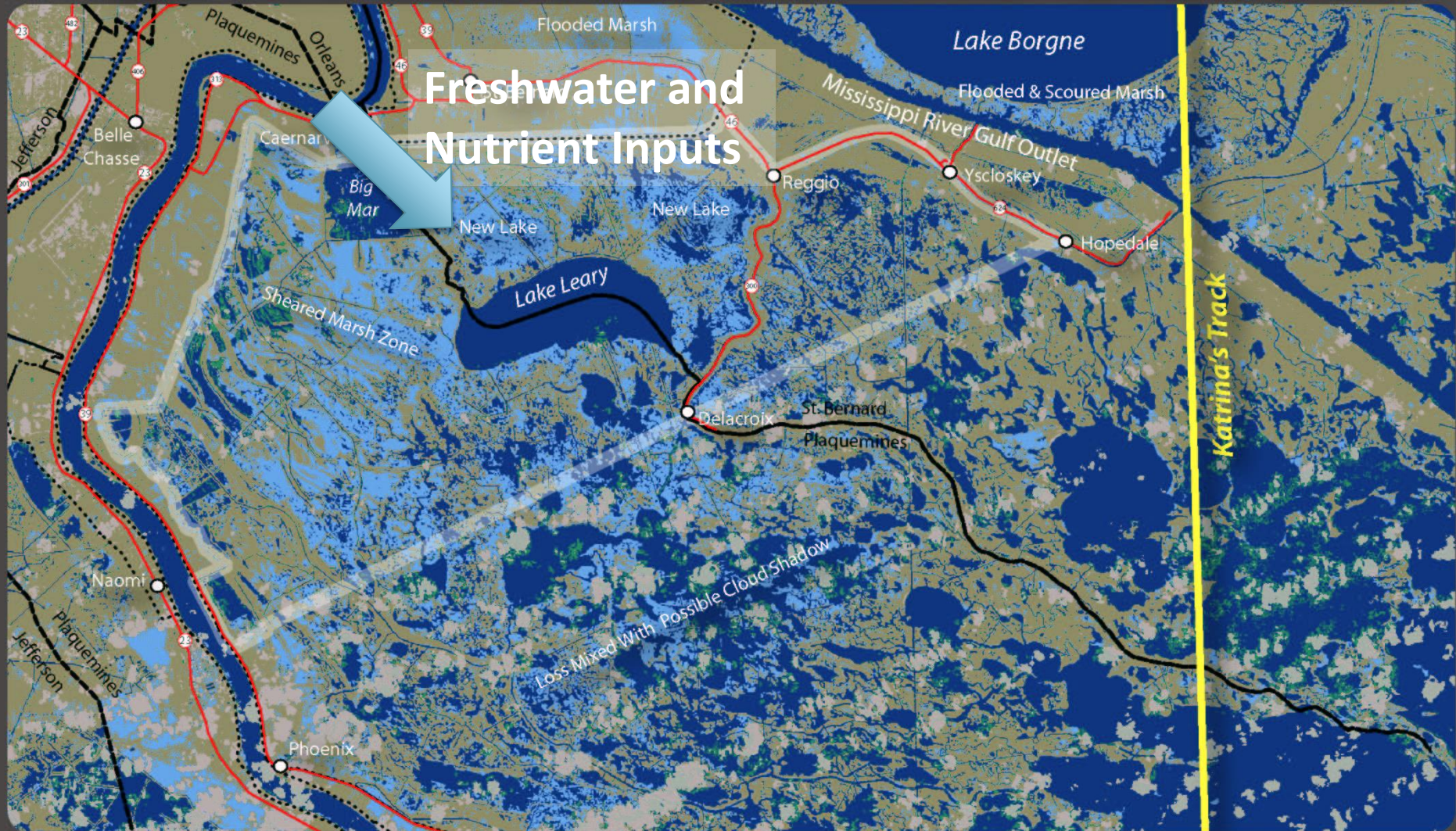
- What does the future hold?
- Anticipating transitions

WHAT NOT TO DO?



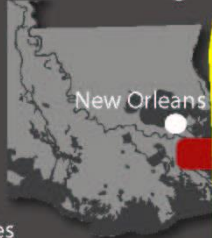


Upper Breton Sound Potential Land Loss After Hurricane Katrina



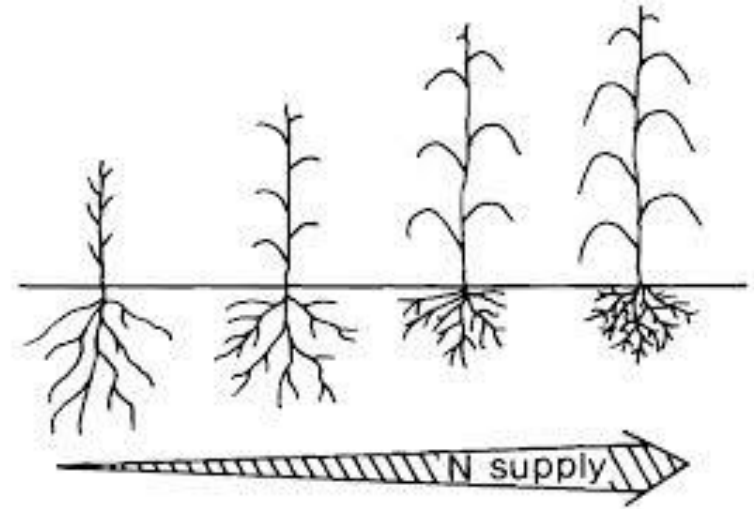
Change Map November 7, 2004 to September 7, 2005 Based on Classified Landsat Thematic Mapper 5 Satellite Land - Water Images

- Trend Area
- Land
- Water
- Potential Land Loss - Includes flooded marsh, sheared/eroded marsh, and scoured marsh
- Land Gain or Clouds
- Unvegetated Area and Clouds
- Main Levees
- Parish Boundary
- Towns
- State Highways

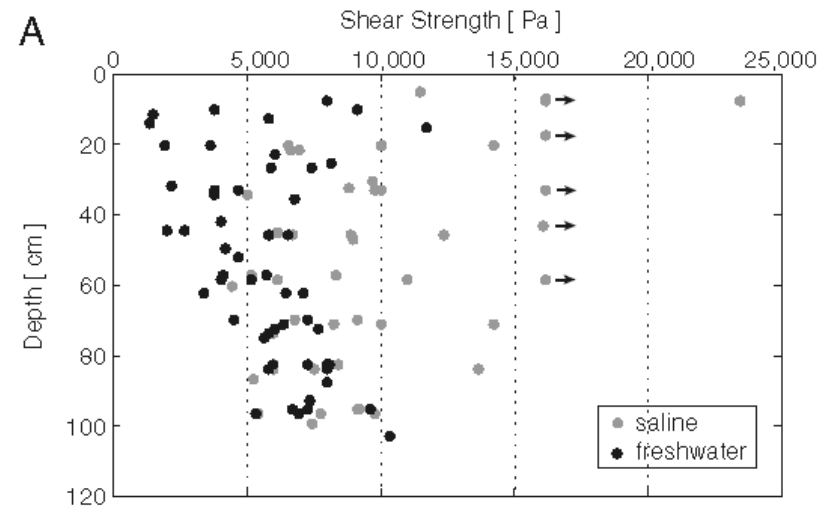


USGS National Wetlands Research Center
Coastal Restoration Field Station
Draft: September 13, 2005





More nutrients = change in root:shoot

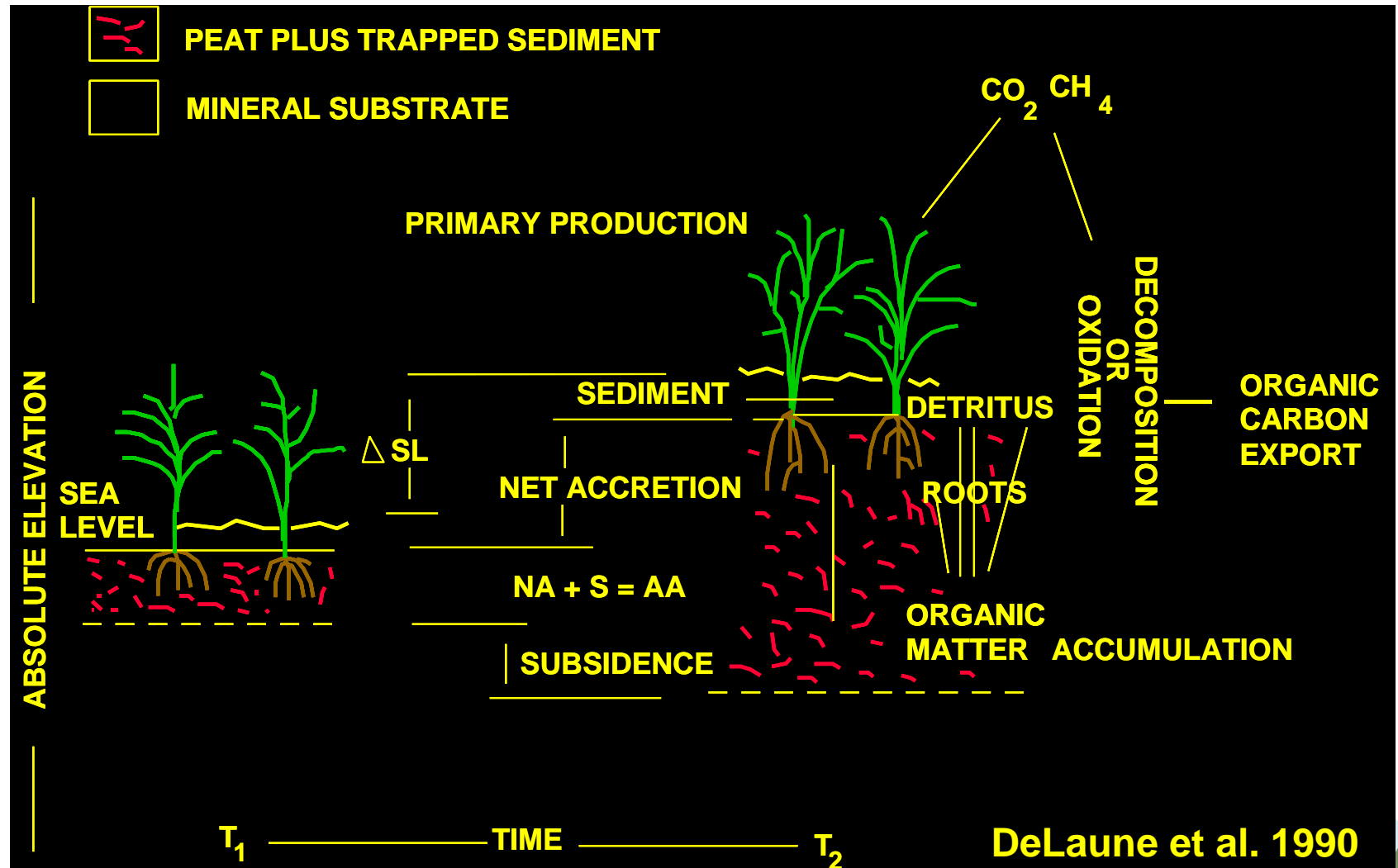


Howes et al.

Fresher marshes less strength

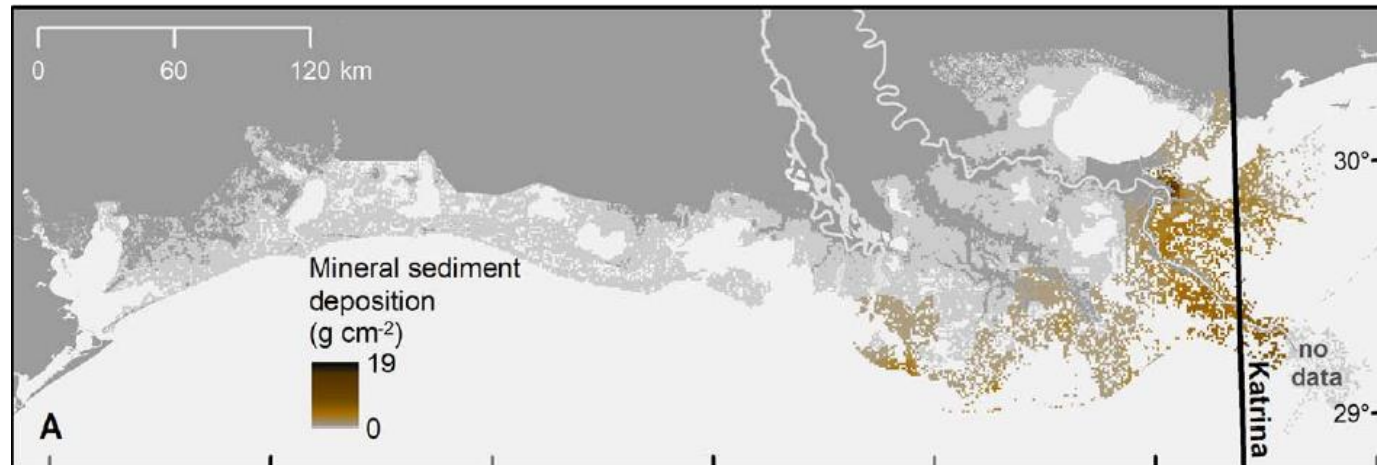
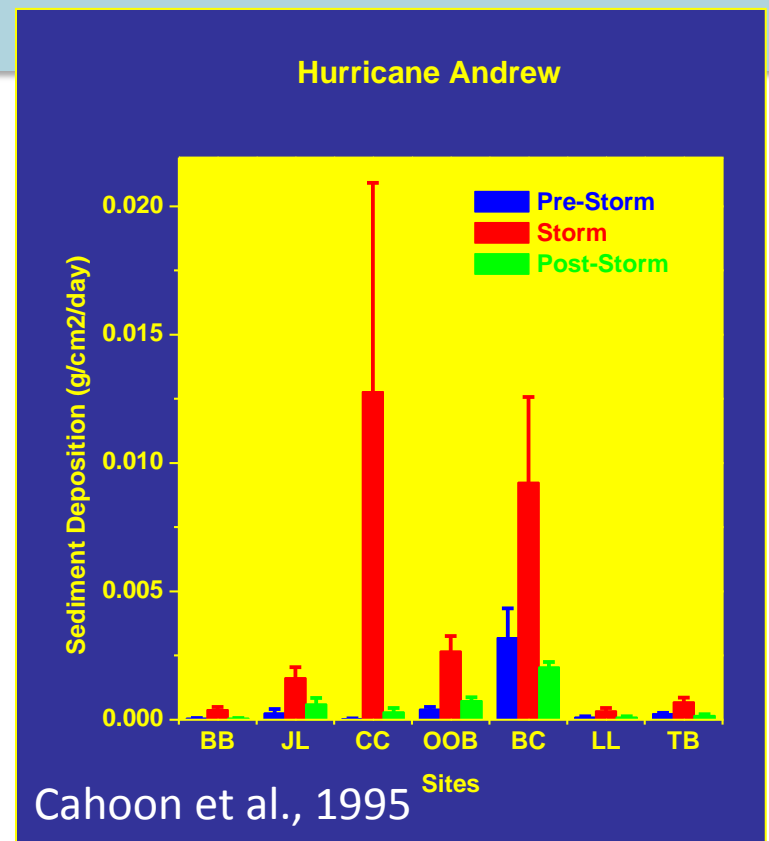


MARSHES NEED ROOTS AND SEDIMENT...



Where to get
sediment?

How to put it on the
marsh surface?



Tweel and Turner, 2012

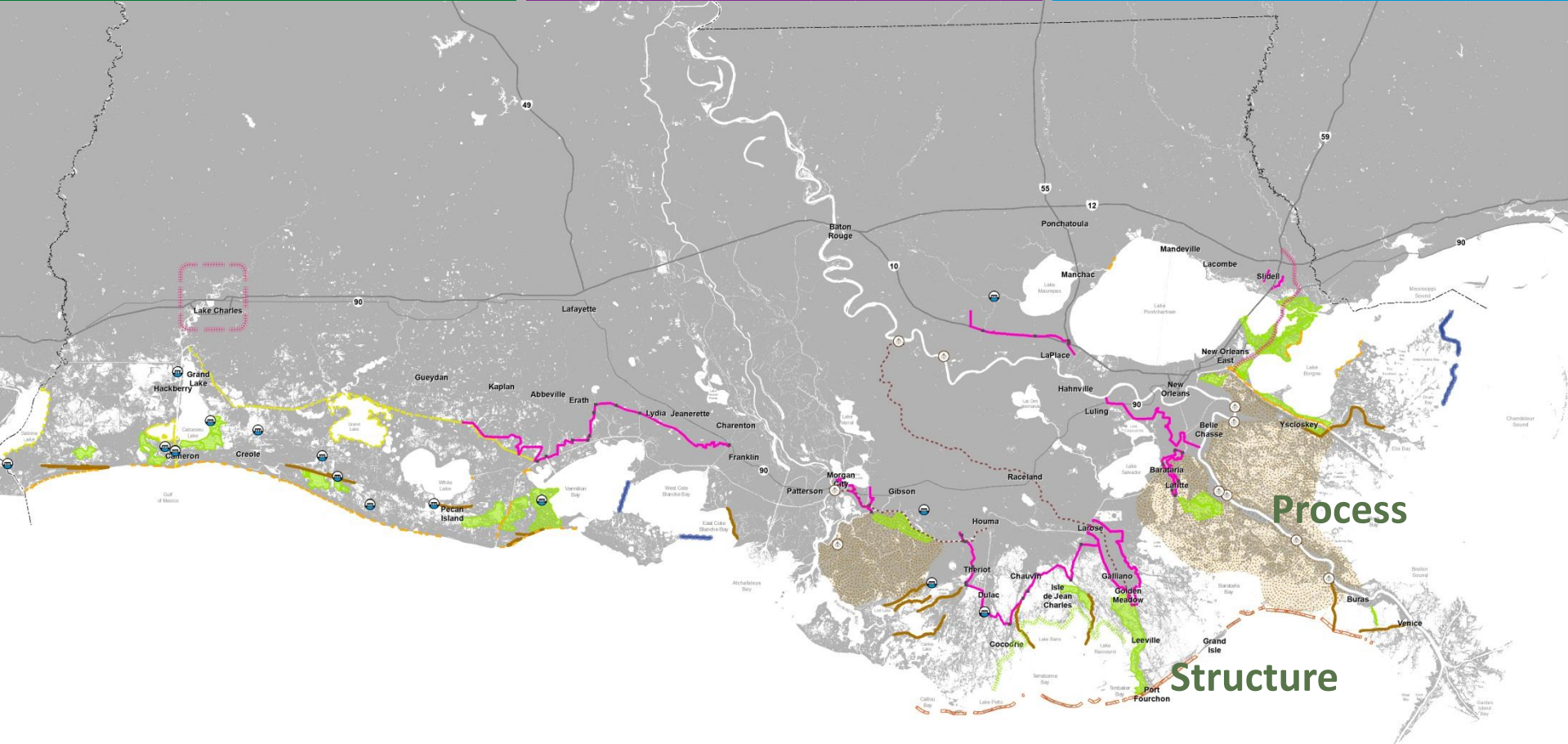


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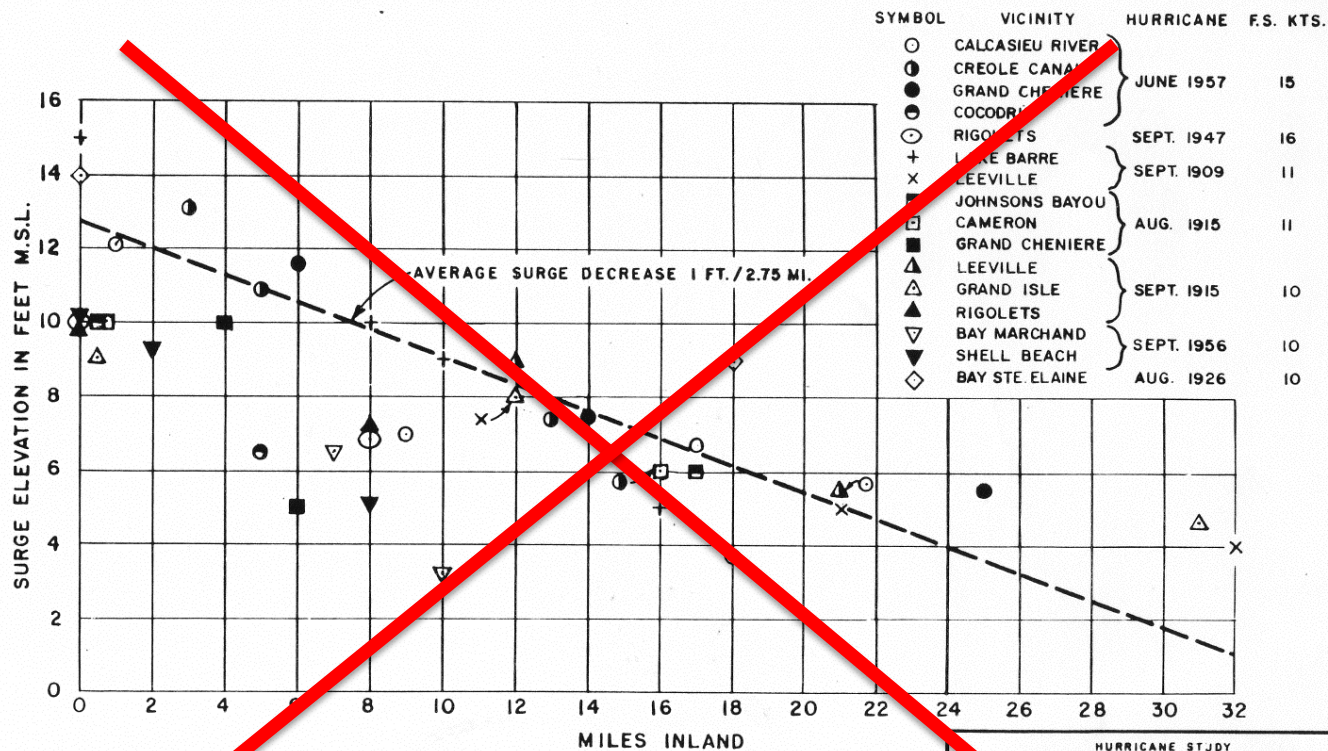


OUTLINE

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- ◆ Gaining it back
- ◆ ***Role of resilient habitats***



WHAT EFFECT DO COASTAL HABITATS HAVE ON STORM FLOODING?



HURRICANE STUDY
INTERLYING AREA ALONG COASTAL L.A.
IN THE VICINITY OF HOUMA

OVERLAND SURGE ELEVATIONS COASTAL LOUISIANA

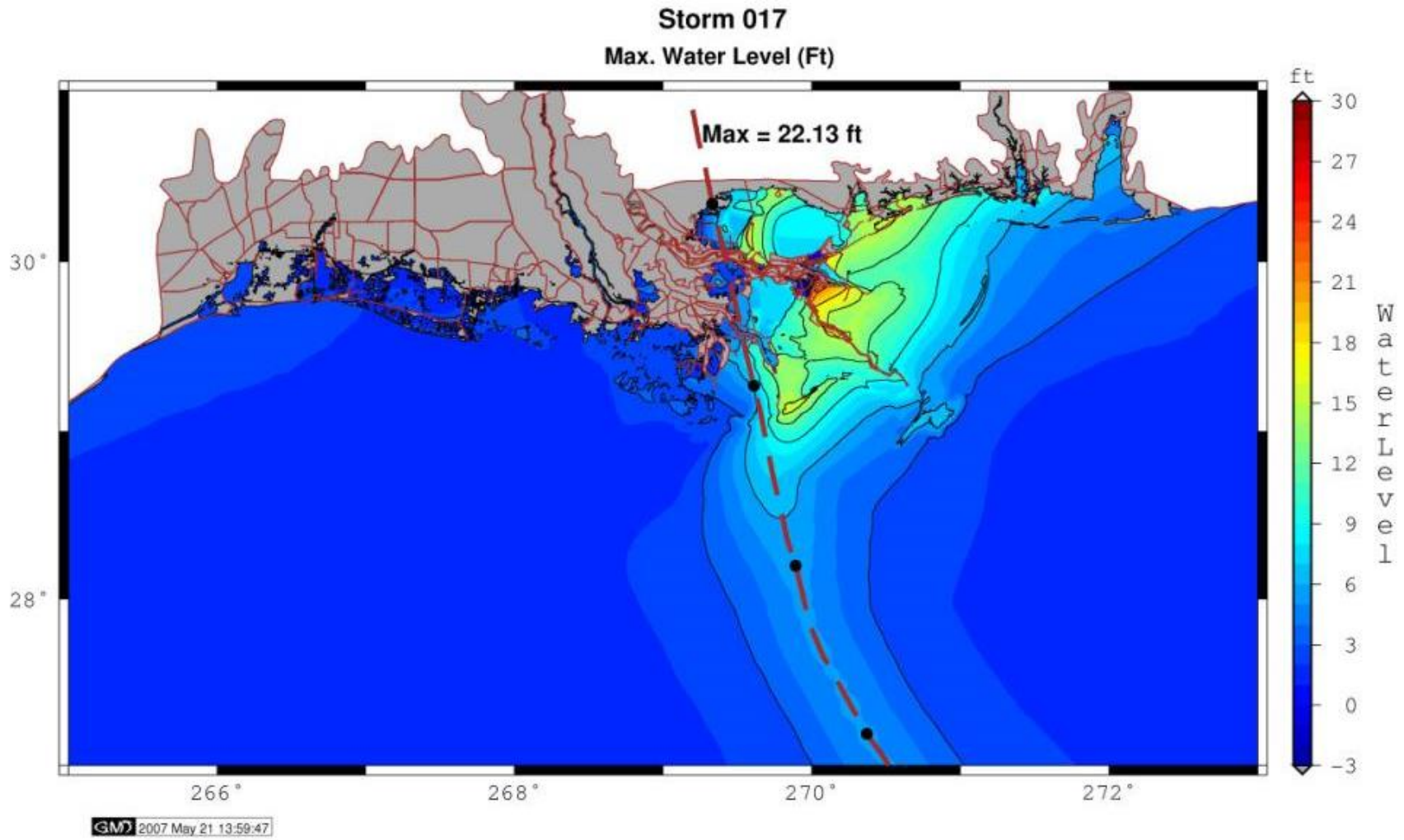
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

OCTOBER 1963

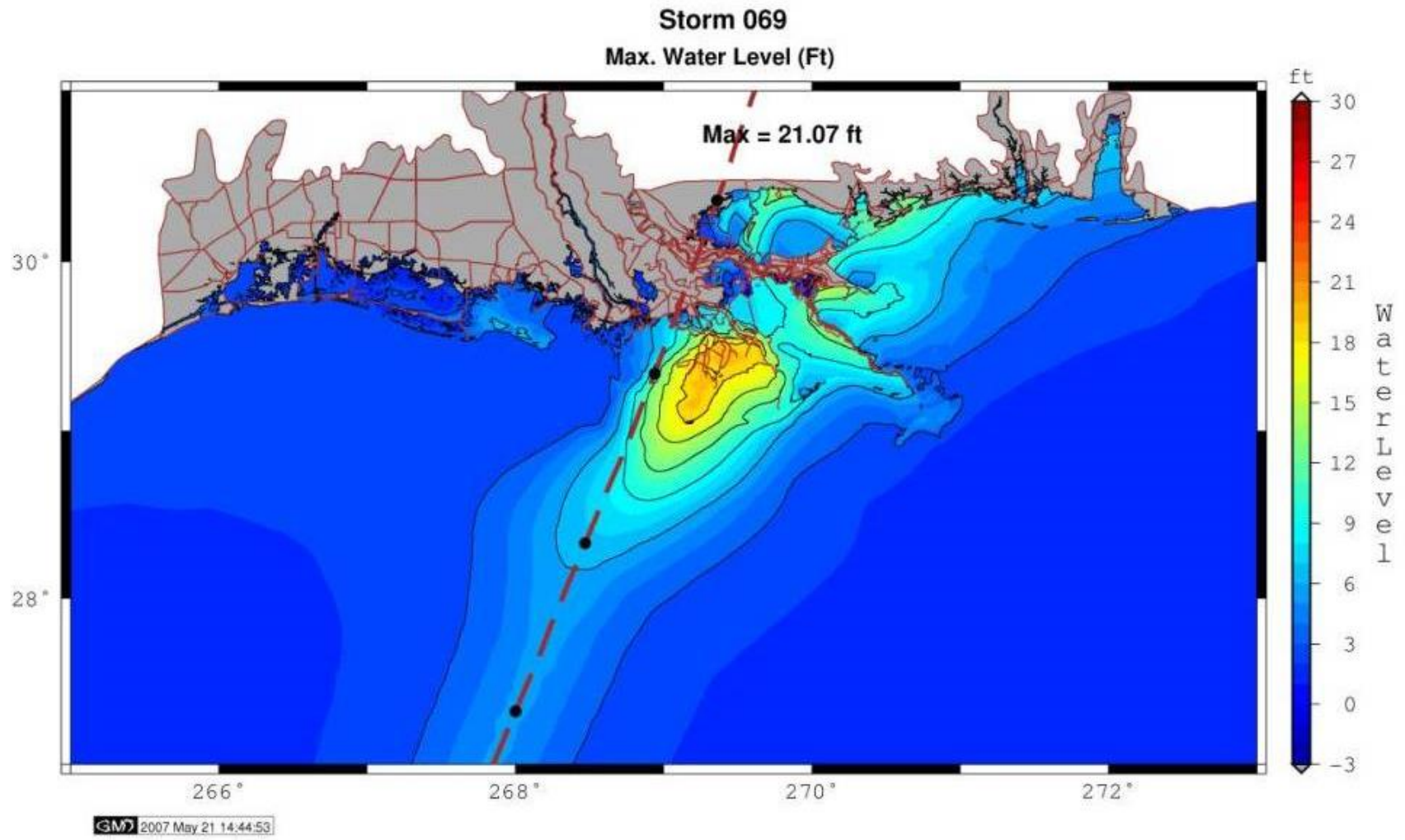
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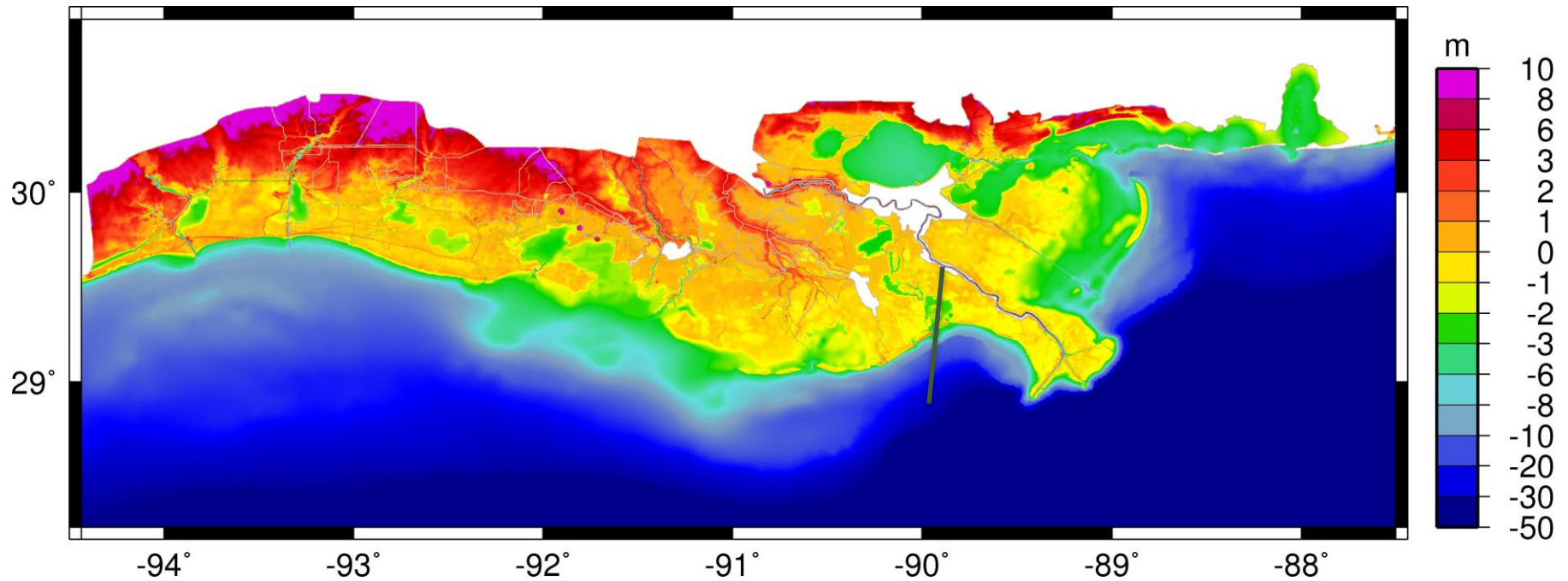
Storm Simulation Output



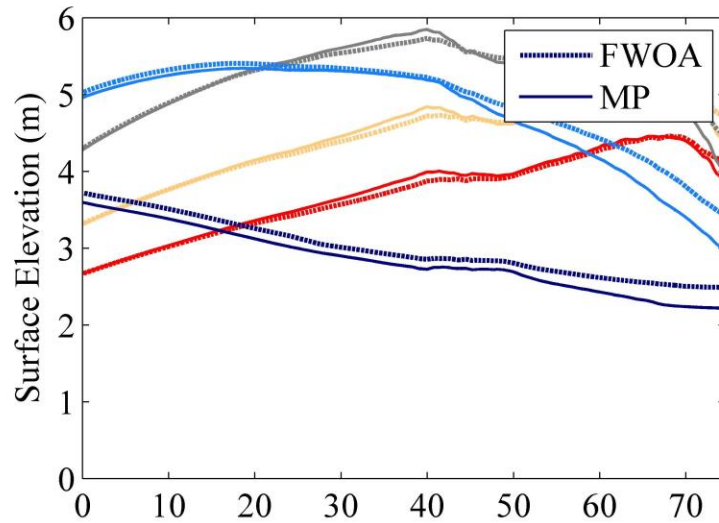
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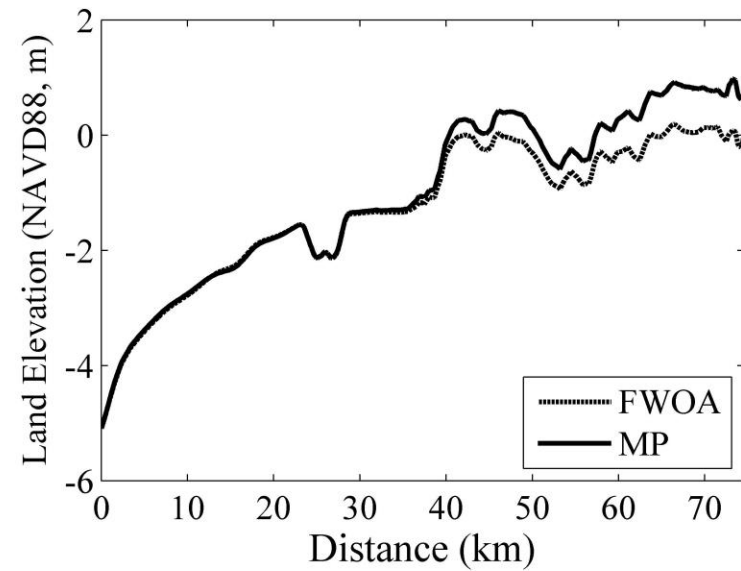
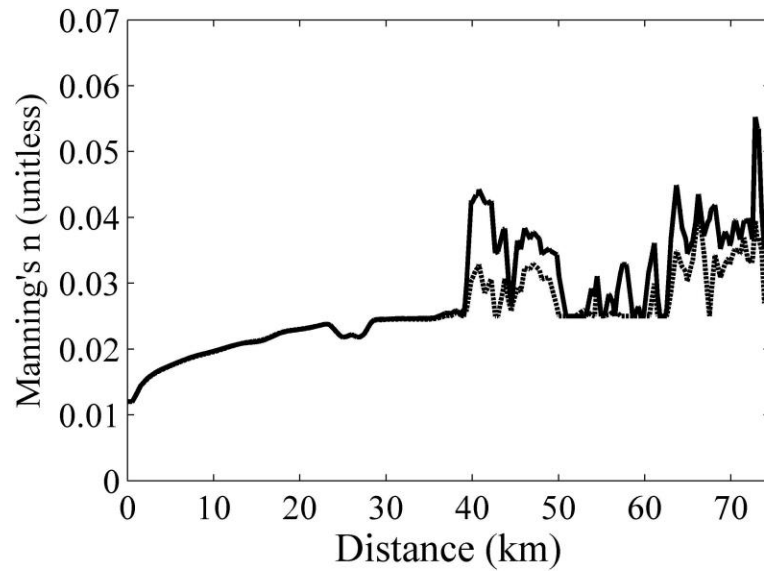
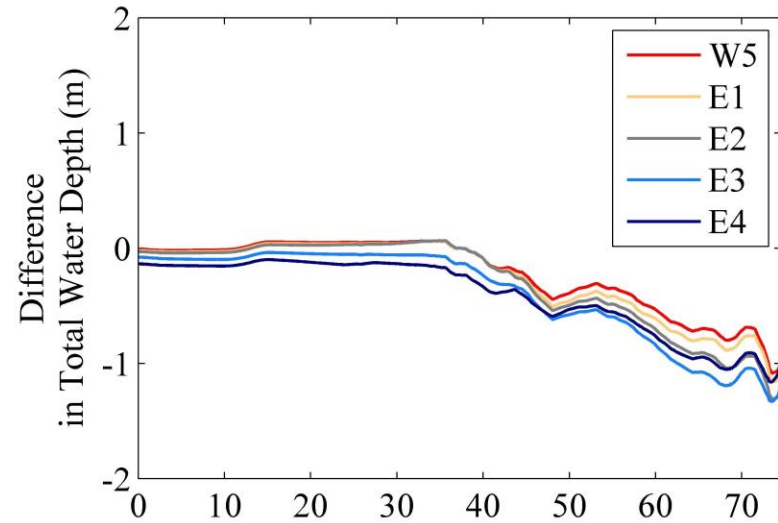
WHAT HAPPENS IF WE CHANGE THE LANDSCAPE?



PB#7Year-50



PB#7Year-50



Can we understand what causes the change and apply it elsewhere?

