

# Overview of Multiple Lines of Defense Strategy to Sustain Coastal Louisiana

Lake Pontchartrain Basin Foundation

&

Coalition to Restore Coastal Louisiana

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Lopez, J. A. , 2006, The Multiple Lines of Defense Strategy to Sustain Coastal Louisiana

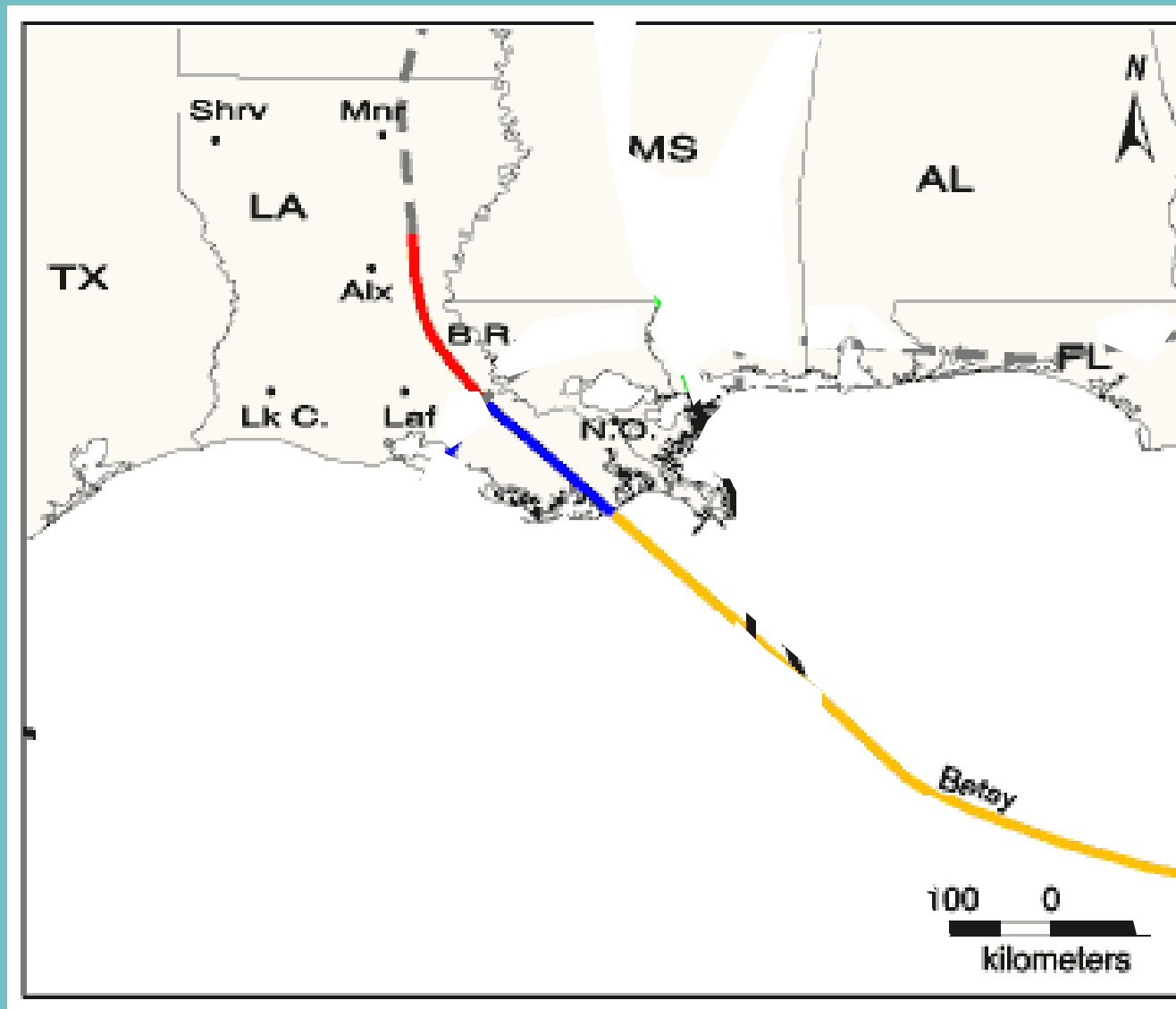
See [MLODS.org](http://MLODS.org)

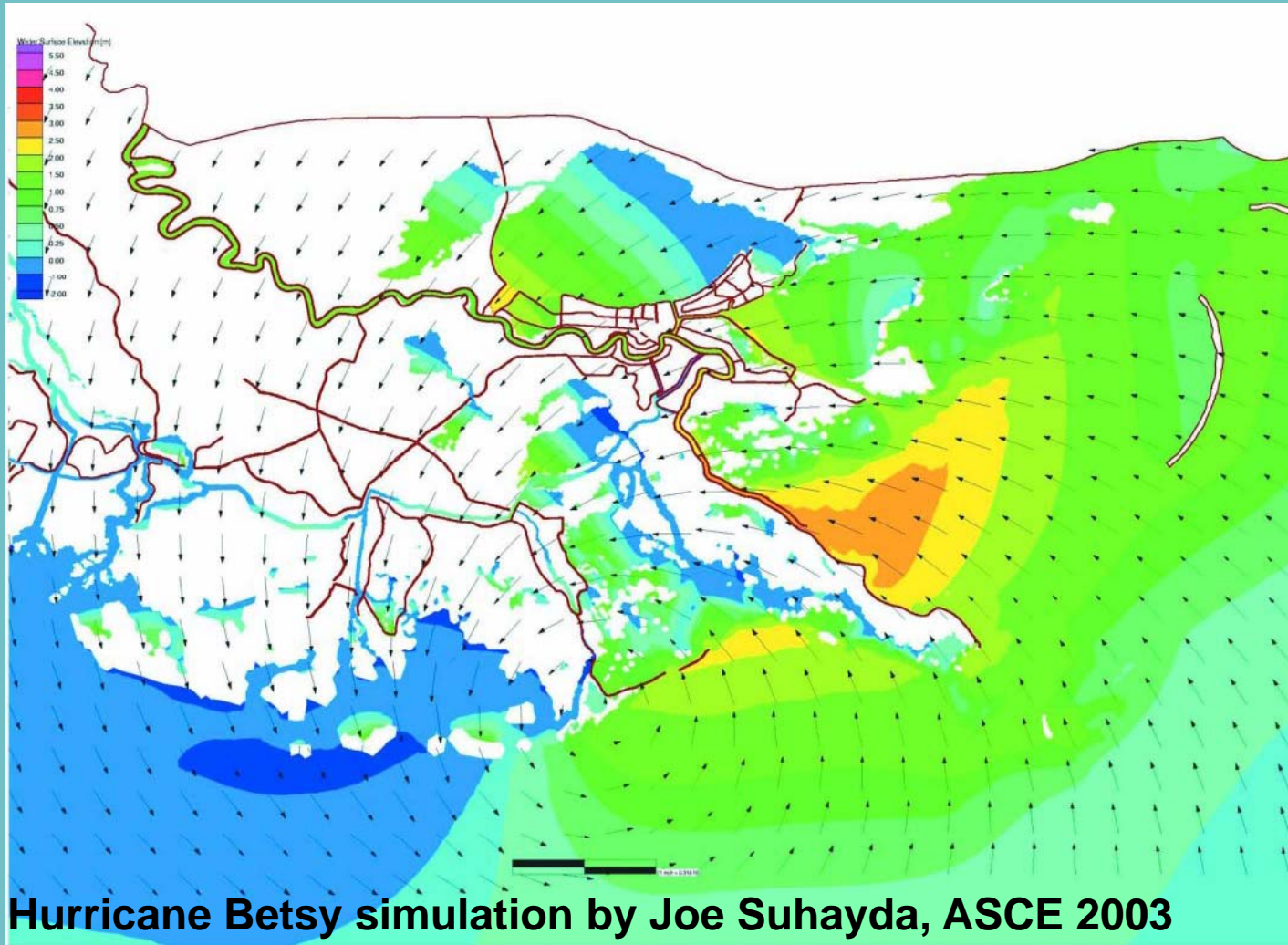


**The Multiple Lines of Defense Strategy is being used to integrate coastal restoration and flood protection in coastal Louisiana. It is based on the premise that coastal wetlands and barrier islands provide a natural buffer to storms that can and must be used to compliment traditional flood protection such as levees and flood gates (Slide 17). This is based on the observation that storm surge is dampened by coastal wetlands.**

**Slides 3 through 6 illustrate the modeled surge for the two most significant hurricanes to impact southeast Louisiana in recent history (Betsy & Katrina). The peak surge is shown to be reduced farther inland across the marsh. This is in contract to Mississippi's coast without significant wetlands, where surge is ramped progressively higher along the coast (Slide 6).**

## Urban Myth: Hurricane Betsy “Hit” New Orleans in 1965





A time-lapse simulation of Hurricane Betsy—with integrated wind speed and direction—replicates the storm’s movement through Louisiana in 1965. Several hurricane models are calibrated by the surge associated *with Betsy, which did not hit New Orleans directly* but flooded much of the city.

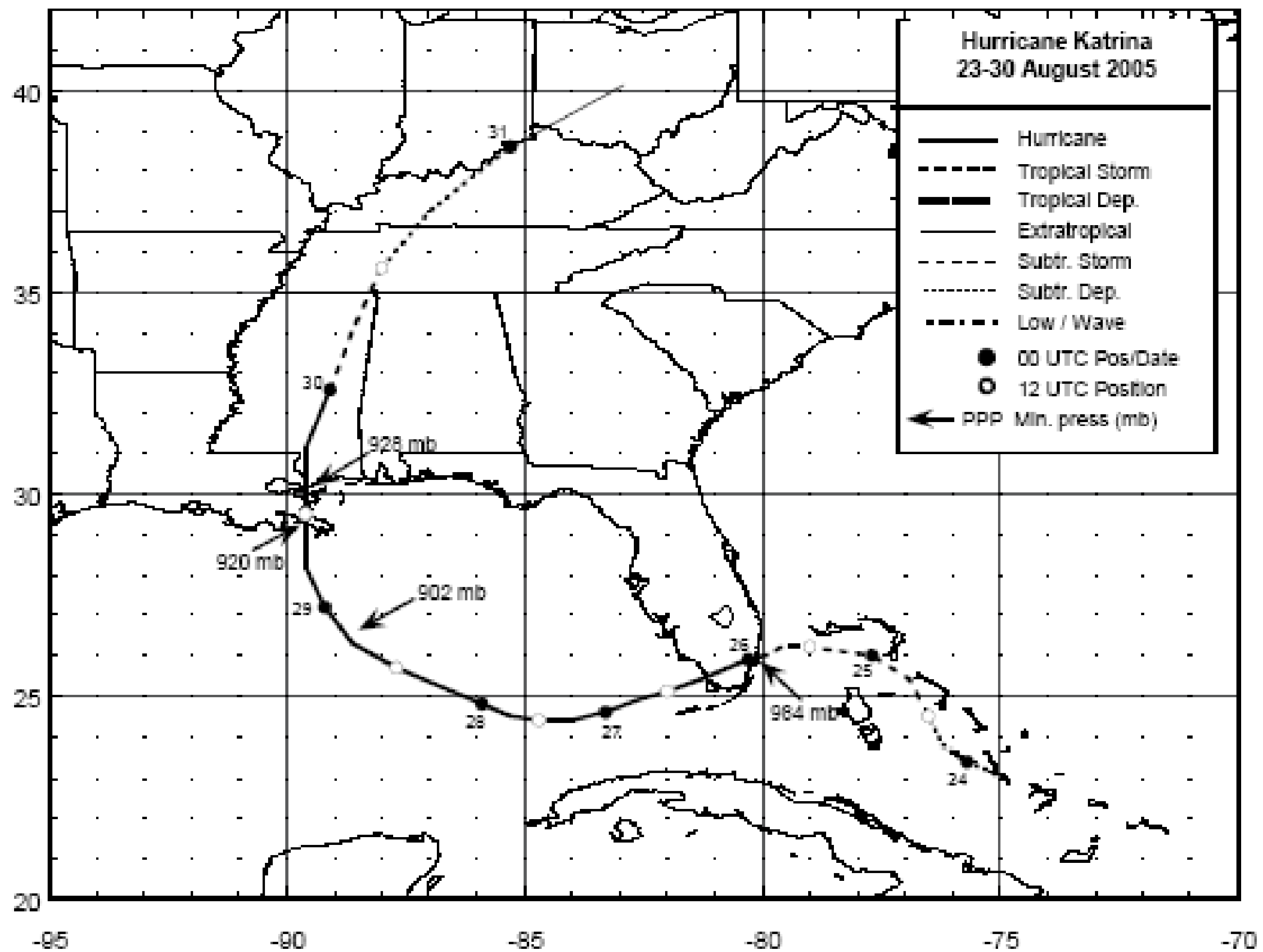


Figure 1. Best track positions for Hurricane Katrina, 23-30 August 2005.

Apparent 5-foot reduction across 14 miles = 1'/2.8 miles

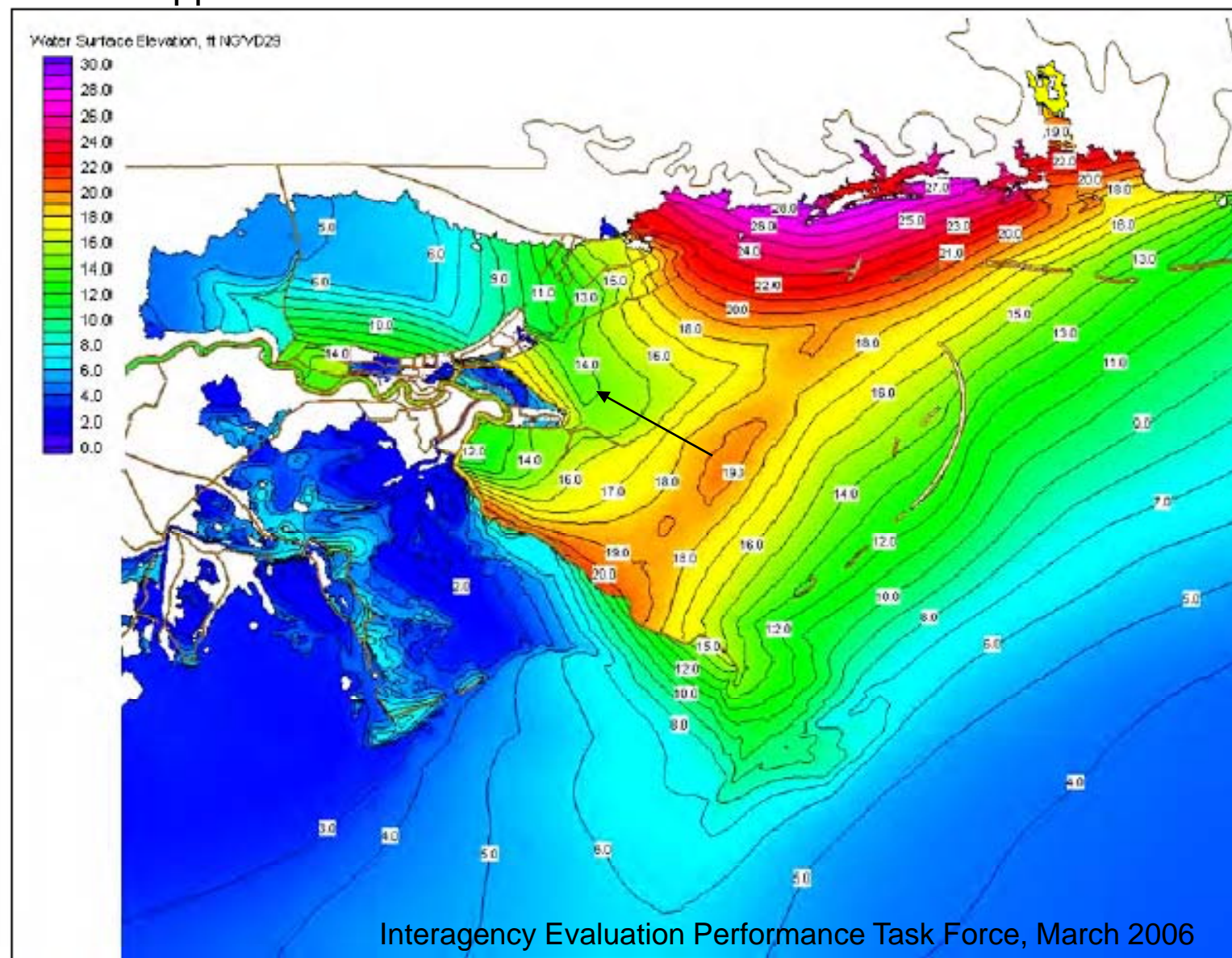
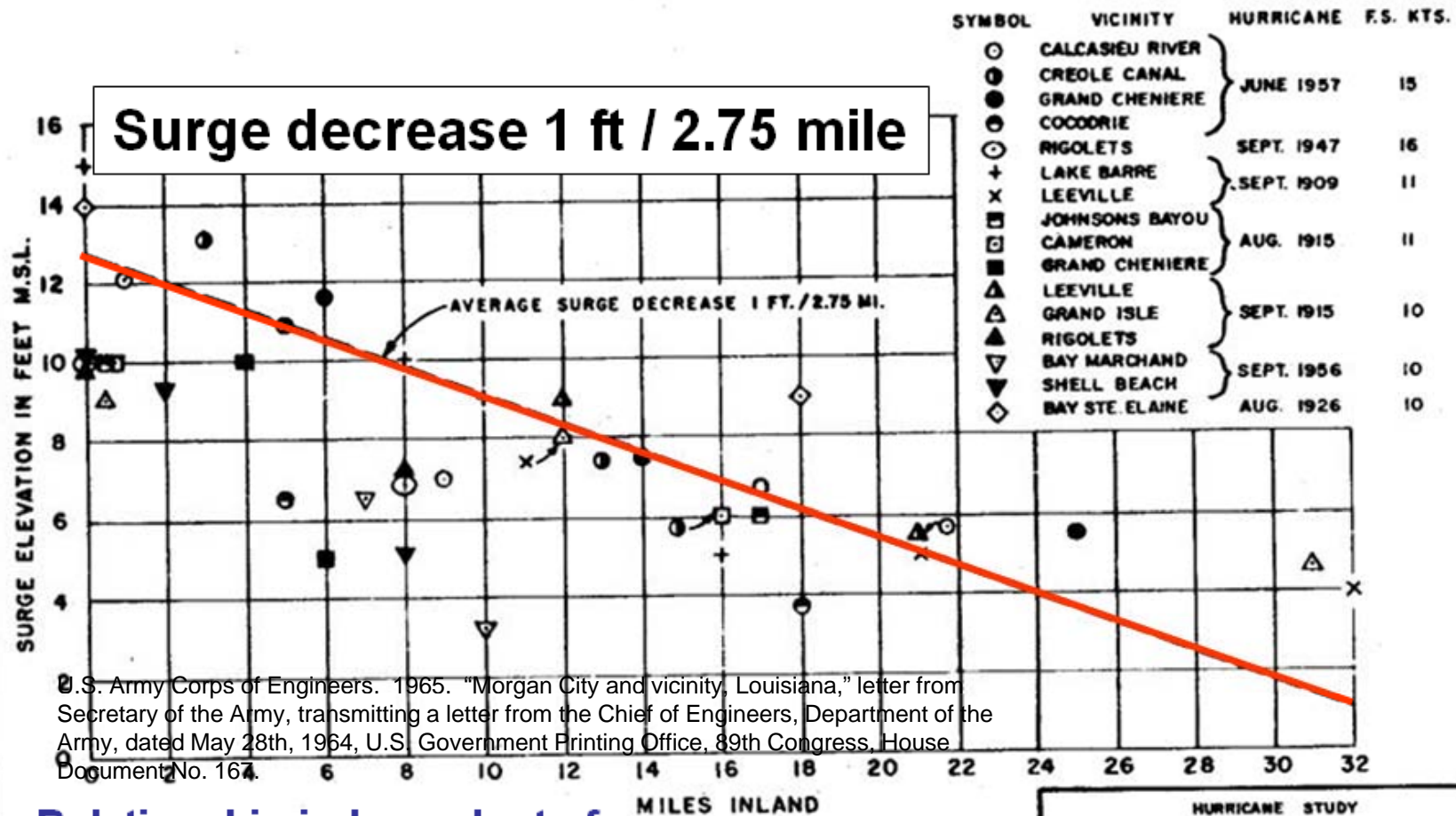


Figure V-36. Maximum computed storm surge using the ADCIRC model, Mississippi to Louisiana region (water levels in feet, NGVD 29)

**Slide 8 is a graph produced by the U.S. Army Corps of Engineers which illustrates the observed reduced storm surge from historical hurricanes in south Louisiana.**

# Wetlands and Storm Surge

U.S. Army Corps of Engineers (1965)



U.S. Army Corps of Engineers. 1965. "Morgan City and vicinity, Louisiana," letter from Secretary of the Army, transmitting a letter from the Chief of Engineers, Department of the Army, dated May 28th, 1964, U.S. Government Printing Office, 89th Congress, House Document No. 167.

- Relationship independent of**
- Hurricane translation speed
  - Wind speed
  - Direction

J. Rosati, USACE 3-06

HURRICANE STUDY  
MORGAN CITY, LA. AND VICINITY  
OVERLAND SURGE ELEVATIONS  
COASTAL LOUISIANA  
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS  
CORPS OF ENGINEERS

**Although it is evident that coastal restoration and flood protection in Louisiana are intimately related, prior to Hurricanes Katarina and Rita these endeavors were administered separately by state and federal agencies (slide 10).**

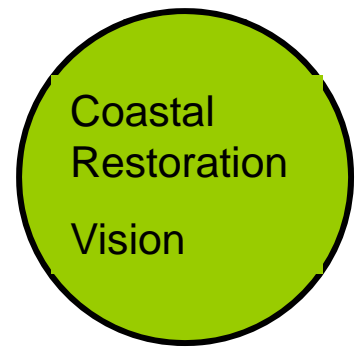
**This began to change due to the publication of the Multiple Lines of Defense Strategy and due to the impact of the storms in 2005 (slides 11 though 14).**

# Traditional Model Addressing Coastal Restoration and Flood Protection

**This must be done differently.**

Natural Resource Agencies

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Flood Protections Agencies

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Incompatible visions  
equals  
non- Sustainable Coast

Old Model: No Integration

## The “Post – Katrina” Effect on Coastal Planning *In Louisiana*

Governor’s Commission for Coastal Restoration October 24, 2005

requested that, with haste, methods to integrate coastal habitat restoration and engineered flood protection be developed.

Governor Blanco November 10, 2005

*“Coastal restoration and hurricane protection must go hand in hand and must not be treated as separate efforts. This integration will allow us to achieve true coastal protection for south Louisiana.”*

# The “Post – Katrina” Effect on Coastal Planning *Nationally*

CRS Report to Congress November 18, 2005 RE: LCA

*“Congress might consider asking the corps to examine how each of the restoration projects might mute future storm damage, and whether there are some modifications that could be made to pending projects that would further protect the city or other south Louisiana communities.”*

National Research Council Re: LCA

*“To Achieve this, the development of an explicit map of the future landscape of coastal Louisiana should be a priority as the implementation of the LCA study moves ahead.”*

# The Future Model to Integrate of Coastal Restoration and Flood Protection

Natural Resource Agencies

Flood Protection Agencies



Future Model: Common Vision

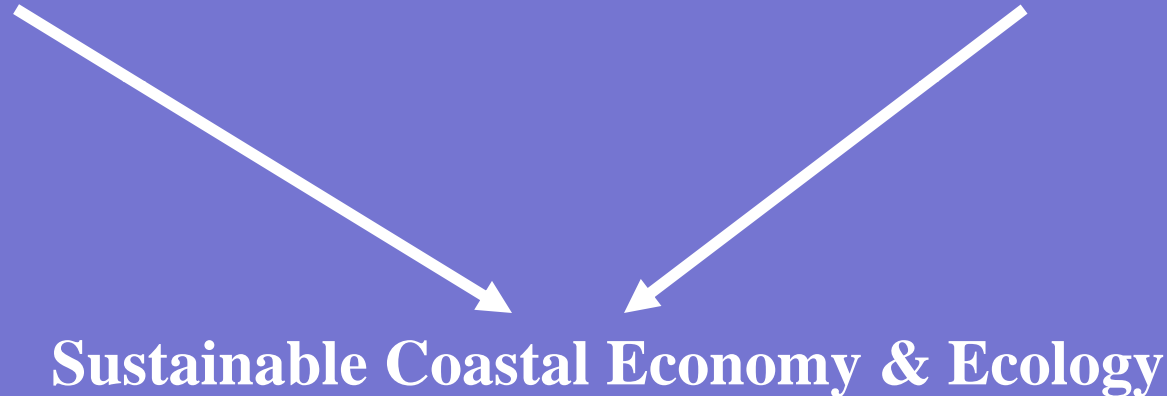
***“With its many and varied proposals, the state plan adopts a "multiple lines of defense" strategy proposed by John Lopez, a former corps official who now works for the Lake Pontchartrain Basin Foundation.”***

**Times Picayune New paper, November 9, 2006**

# Multiple Lines Of Defense Strategy

Lines of Defense

Habitat Goals

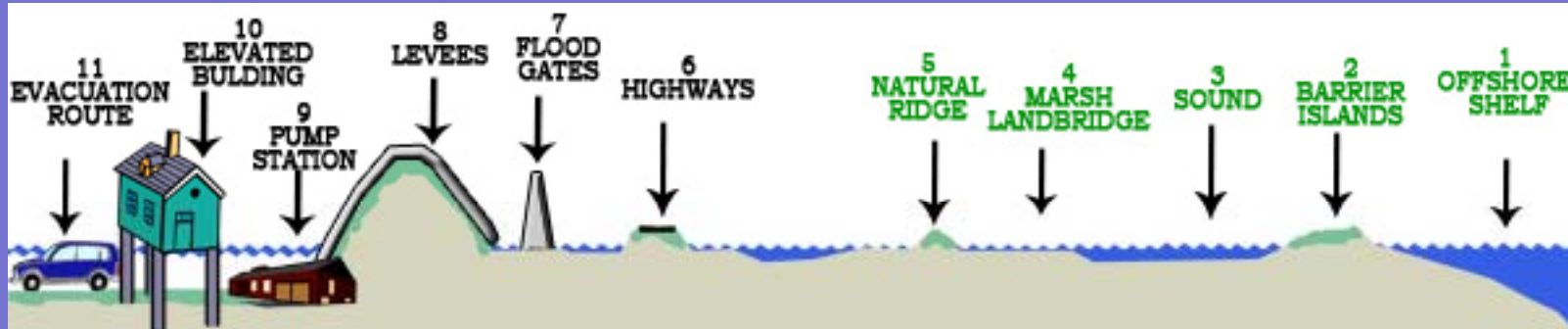


**Prioritizes Restoration projects providing greatest restoration value and flood protection benefit. (See documents at [SaveOurLake.org](http://SaveOurLake.org))**

**Lines of Defense (LOD) are definable geographic areas in which certain **natural or manmade features** or activities are promoted or implemented, resulting in the reduction of impacts by tropical weather systems in the Louisiana coast. (Slide 17)**

(The order of LOD's derived from the physical location of the LOD's moving from the Gulf of Mexico inland. The order is not intended to indicate a relative significance, just relative physical position.)

# Multiple Lines Of Defense Strategy



Lines of Defense (LOD) are definable geographic areas in which certain natural or manmade features or activities are promoted or implemented, resulting in the reduction of impacts by tropical weather systems in the Louisiana coast.

(See documents at [SaveOurLake.org](http://SaveOurLake.org))

LPBF first presented 6 months prior to Hurricane Katrina

Now adopted:

- US Army Corps of Engineers for the LaCPR
- LA Department of Natural Resources for the “Master Plan”

**The Multiple Lines of Defense Strategy also requires a complimentary goal to restore wetlands habitats. Generally, this is defined by historic wetland distribution but is ultimately the best habitat distribution which in the future will sustain a functioning estuary across Louisiana's coast.**

**Slide 19 list the benefits of wetland habitat goals and Figure 20 is a draft map of habitat goals for south Louisiana.**

**Slide 20 is a draft map of proposed wetland habitat goals for south Louisiana.**

# Benefits of Wetland Habitat Goals

**Clear and Measurable Restoration Targets**




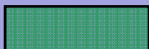

**Forces Hydrologic Integration of all Projects**

**Forecasts Natural Resources**

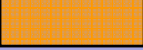
**Optimizes Funding between Natural Resource Agencies**

**Shifts Estuary toward a more Riverine System**

**Defines areas where levees and freshwater habitat overlap which are targeted for restoration of cypress swamp buffers**

Saline	18 ppt (8-29 ppt)	
Brackish	10 ppt (4-18 ppt)	
Intermediate	4 ppt (2-8 ppt)	
Fresh	0 ppt (0-3 ppt)	
Fresh Swamp	0 ppt (0-3 ppt)	

# Draft Wetland Habitat Goals

Wetland Habitat Types		
Saline	18 ppt (8-29 ppt)	
Brackish	10 ppt (4-18 ppt)	
Intermediate	4 ppt (2-8 ppt)	
Fresh Marsh/Swamp	0 ppt (0-3 ppt)	



The wetland habitat goals are the desired future habitat distribution proposed in this plan. This habitat distribution was selected because they compliment other restoration proposals, and they represent potentially sustainable conditions for the coast. The wetland habitat distribution, in general, also correspond s to the historic distribution of habitats around 1900 before significant alteration by humans. One exception is in the area of Atchafalaya & Vermillion Bays where the habitat goals are fresher than historic 1900 conditions. The post-1900 freshening here is due to the increase in discharge through the Atchafalaya River. Since it is desirable to continue the land building of the active deltas which also contribute to the western shore's mud stream, it is not considered desirable to re-establish the more saline conditions of 1900 in this area of the coast.

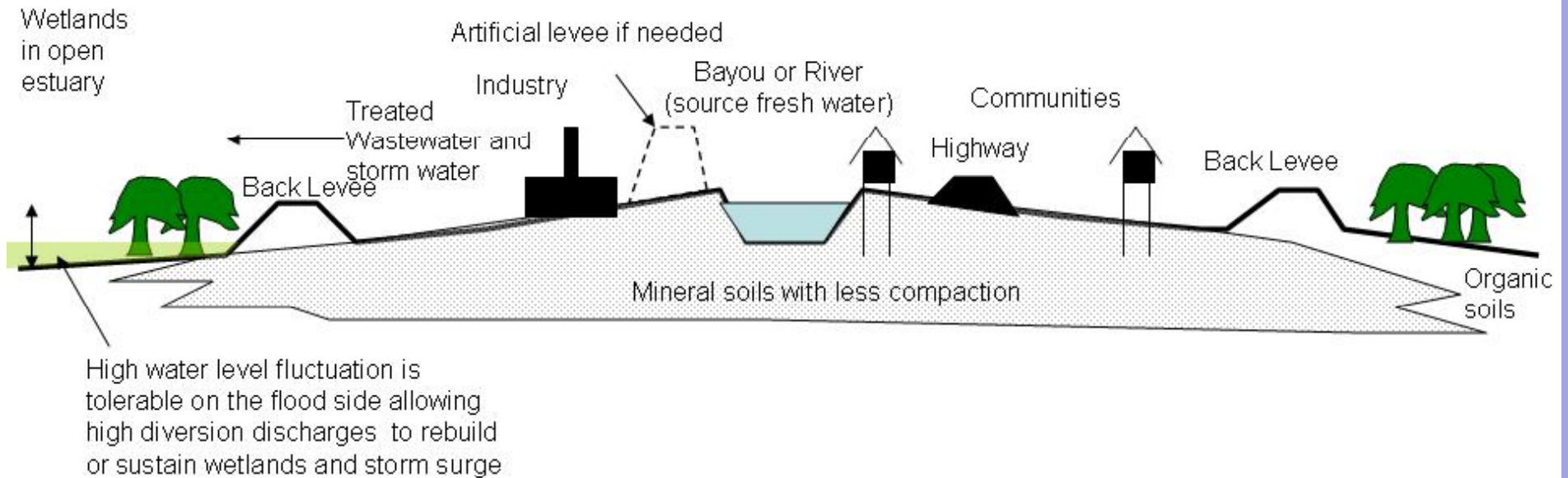
**The Multiple Lines of Defense strategy incorporates the natural geography and the development patterns in coastal Louisiana to advantage of both restoration and flood protection.**

**Most of south Louisiana is developed along natural bayou ridges. These ridge often have “back levees” which separate the ridge form the adjacent wetlands. By expanding the use of back levee or ring levees along the ridges, communities may be protected while allowing the wetlands to function and be restored by use of diversions.**

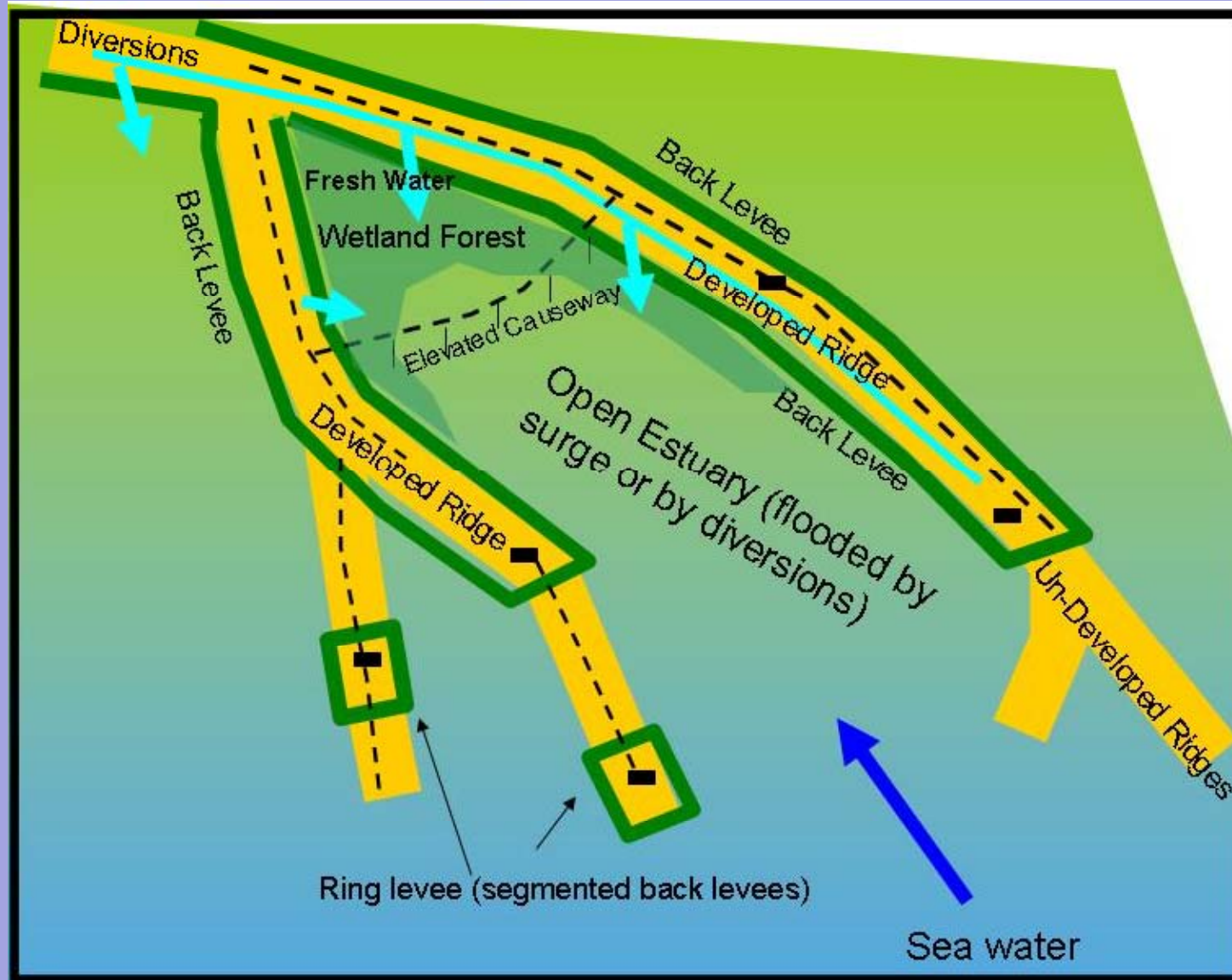
**The back levees prevent flooding that might occur by hurricane surge but also flooding induced by restorative water diversions which flood the wetlands with fresh water.**

**Slides 22 and 23 are illustrations of the ridges and back levees. Slide 24 is an actual example of back levees and a less desirable levee alignment located off the natural ridge and along Lake Pontchartrain.**

## Development Ridge and Estuarine Basin: *The Traditional Louisiana "Smart Growth"*



**Profile Illustration of Typical Development on Ridges in coastal Louisiana.** This is a conceptual profile view of elements of a ridge development corridor and an adjacent estuarine basin. The back levee allows compatibility between the development corridor and an estuarine basin. The estuary on the flood side is subject to storm surge, marine influence and elevated water levels from river diversions. Elevated causeways may connect ridges by crossing the estuarine basin between ridges. Back levees do require management of drainage and will likely require pump stations.



Map Illustration of Relation of Natural Ridges to the Estuary. This is a conceptual plan view of elements of a ridge development corridor and adjacent estuaries. The back levee allows compatibility between the development corridor and an estuarine basin. Ring levees (segmented back levees) may be appropriate in sparsely populated areas or areas in need of direct water access.

