

# AN OVERVIEW OF THE SEDIMENT RESOURCES OF NORTHERN GULF OF MEXICO

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Coastal Protection and  
Restoration Authority of Louisiana



Coastal Protection and Restoration  
Authority of Louisiana

**committed to our coast**

# Presentation Today ...

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- Introduction/Background: Gulf Regional Sediment Management Master Plan (GRSMMP) & the Technical Frame Work
- Northern Gulf of Mexico (NGOM): Regional Geological Setting & Sediment/Sand Resources
- Sediment/Sand Resources of Florida, Alabama, & Mississippi
- Louisiana Example: Challenges
- Louisiana Example: Sediment Evaluation & Sediment Management
- Path Forward

# Gulf Regional Sediment Management Master Plan (GRSMMP) - Background

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- A partnership through the Gulf of Mexico Alliance (GOMA) among the Gulf States was forged to enhance the ecological and economic health of the Gulf of Mexico.
- The Habitat Conservation and Restoration Team (HCRT) recognized that sediments are integral to and critical resource in accomplishing the GOMA objectives through development of GRSMMP.

# Gulf Regional Sediment Management Master Plan (GRSMMP)

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Gulf Regional Sediment Management Master Plan (GRSMMP) will

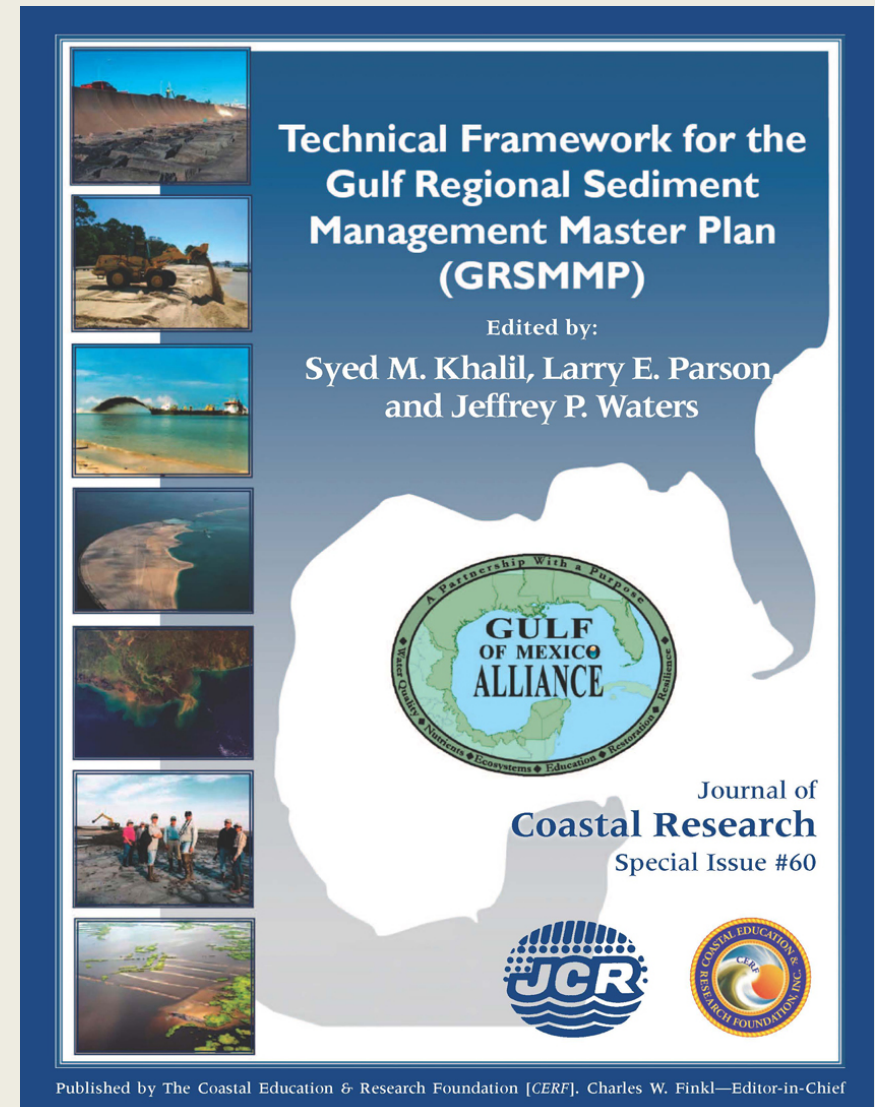
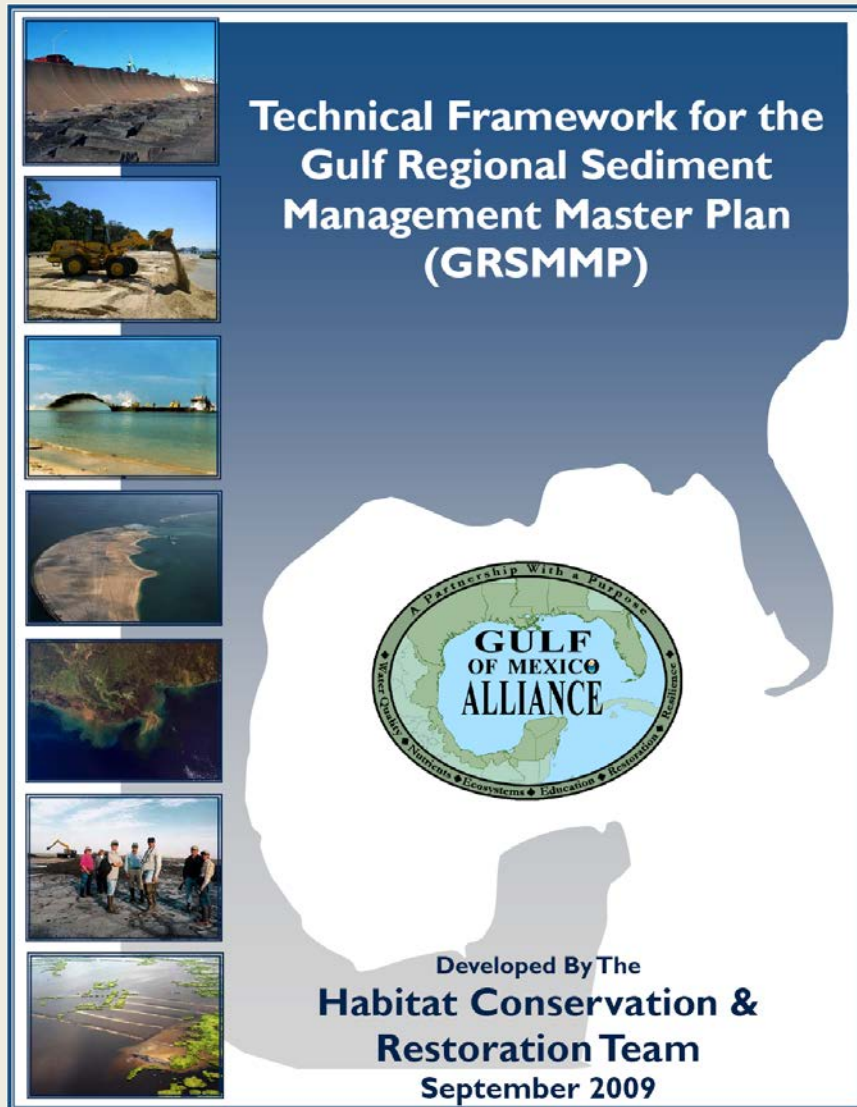
- facilitate effective management of sediment resources and help develop an understanding of sediment dynamics and regional sediment processes unencumbered by any political boundaries
- facilitate the implementation of sediment management (natural and dredged sediments) for cost effective and efficient use of sediment resources for habitat conservation/restoration.
- aid the Gulf States to recognize that sediments are a part of a regional system involving natural and anthropogenic processes



# Technical Framework for GRSMMP

- A Technical Framework is the first step in the development of the GRSMMP
- The technical framework helps in understanding regional sediment systems and processes necessary for sediment management of NGOM.
- Technical framework for GRSMMP along with regional sediment management (RSM) processes provides foundations that are essential to
  - *link sediment sources with sediment needs*
  - *make more effective use of sediment from various sources, inlets, and navigation channels*
  - *establish management guidelines balancing sediment dynamics and available sediment resources with restoration needs*
  - *provide a basis for assessing competing needs for sediment*
  - *provide regional strategies for sediment management*
  - *enhance abilities to make informed management decisions, and develop regional strategies*
  - *facilitate cooperation among states, federal agencies, and other stakeholders in sediment management.*

# GRSMMP – Publications (Report & Special Issue of JCR)

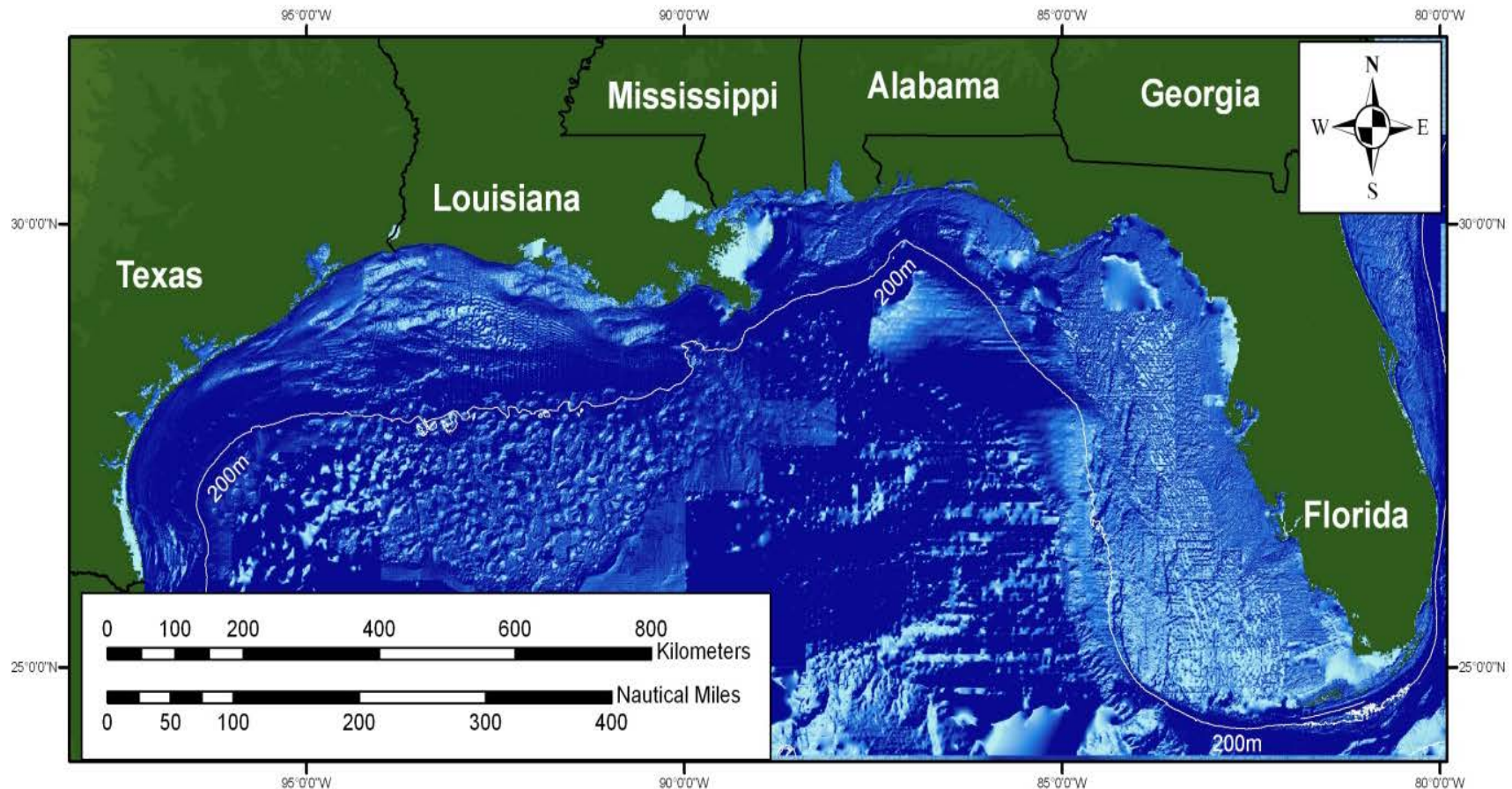


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# Northern Gulf of Mexico (NGOM): Regional Geological Setting & Sediment/Sand Resources

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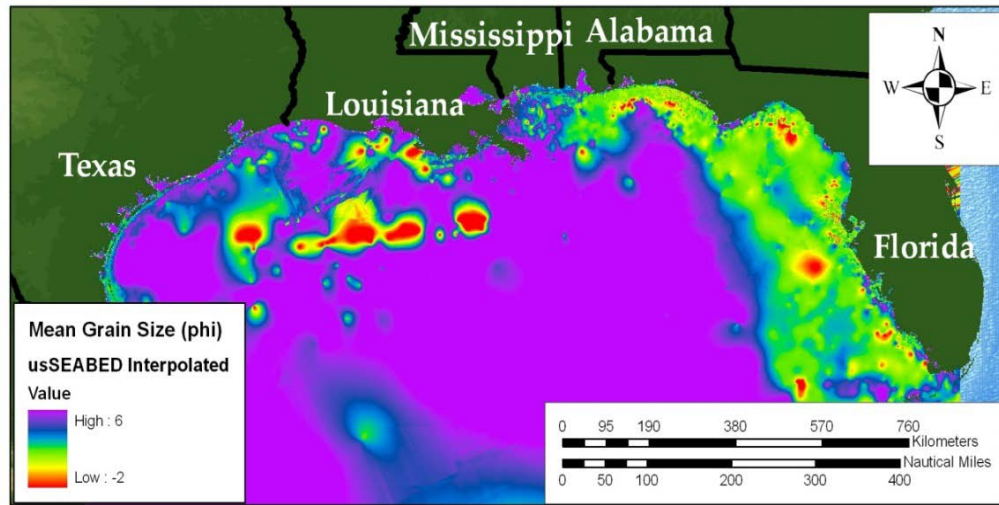
# Gulf of Mexico Basin



Location map showing the complex seafloor bathymetry of the northern Gulf of Mexico. The 200 meter contour line defines the approximate seaward limit of the continental shelf.

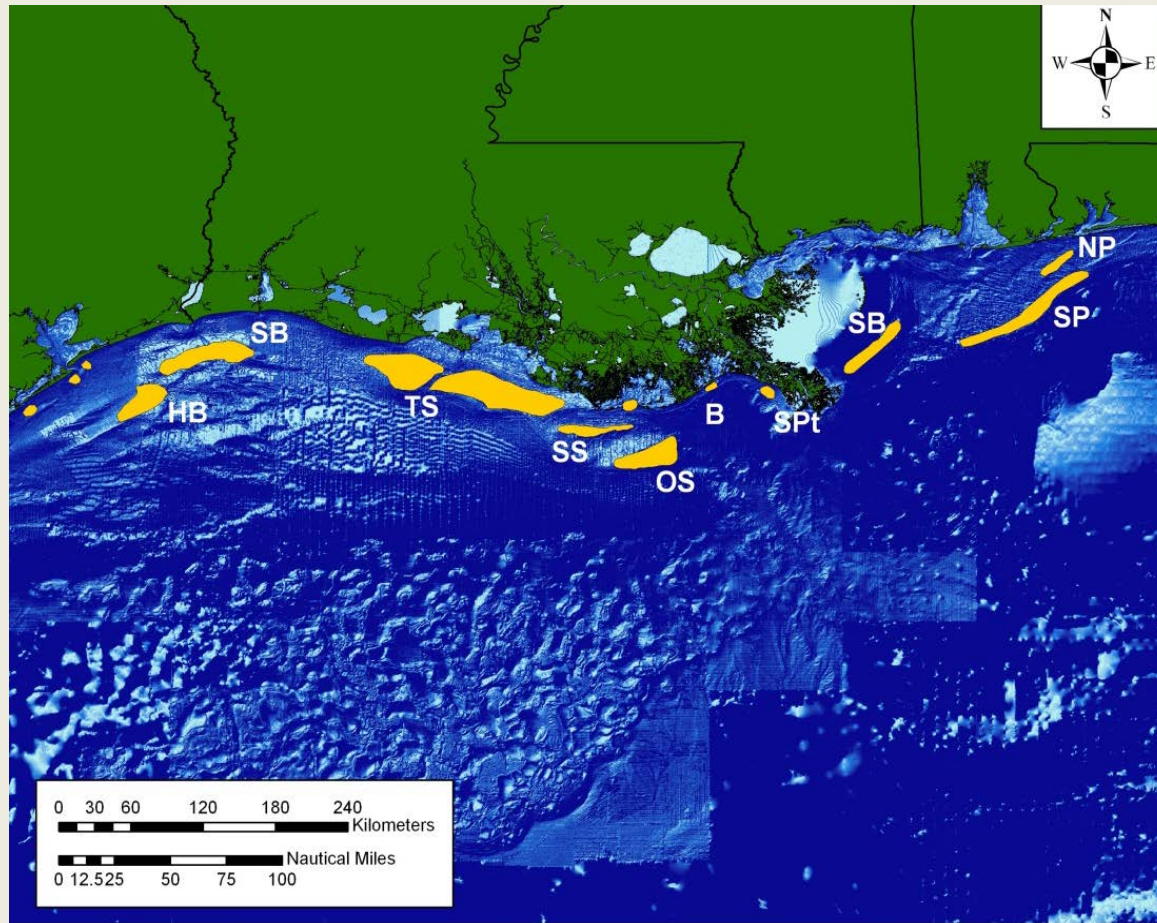


# Northern Gulf of Mexico Sediments



- Sediment sources in the northern Gulf coast especially west of the AL-FL border are predominately fluvial dominated by the Mississippi River.
- Silt and clay are prevalent and sand is scarce, but concentrated at places.
- Mississippi River sediment is largely confined within its channel banks and flows off the continental shelf, thus removing sediment from the nearshore coastal sediment budget.
- The Eastern U.S. Gulf coast significantly varies from the rest of the coast, as it comprises primarily of reworked carbonate from the carbonate-rich (karst) bedrock dominating the region.
- Mobile Bay also contributes sediment and freshwater to the Northern Gulf, primarily via the Mobile and Tensaw Rivers.
- Sediment from Mobile Bay largely remains in the nearshore system.
- The Mobile Delta is prograding and the bay has high relative turbidity flowing offshore between Dauphin Island and Fort Morgan Point.
- In general, the Texas coast has a few large coastal rivers (Trinity and Sabine, for example) that are sediment deficient.
- However, the Colorado and Brazos Rivers, relatively, carry more sediment because of the favorable climatic conditions and topographical features.

# Significant Offshore Sand Resources in NGOM



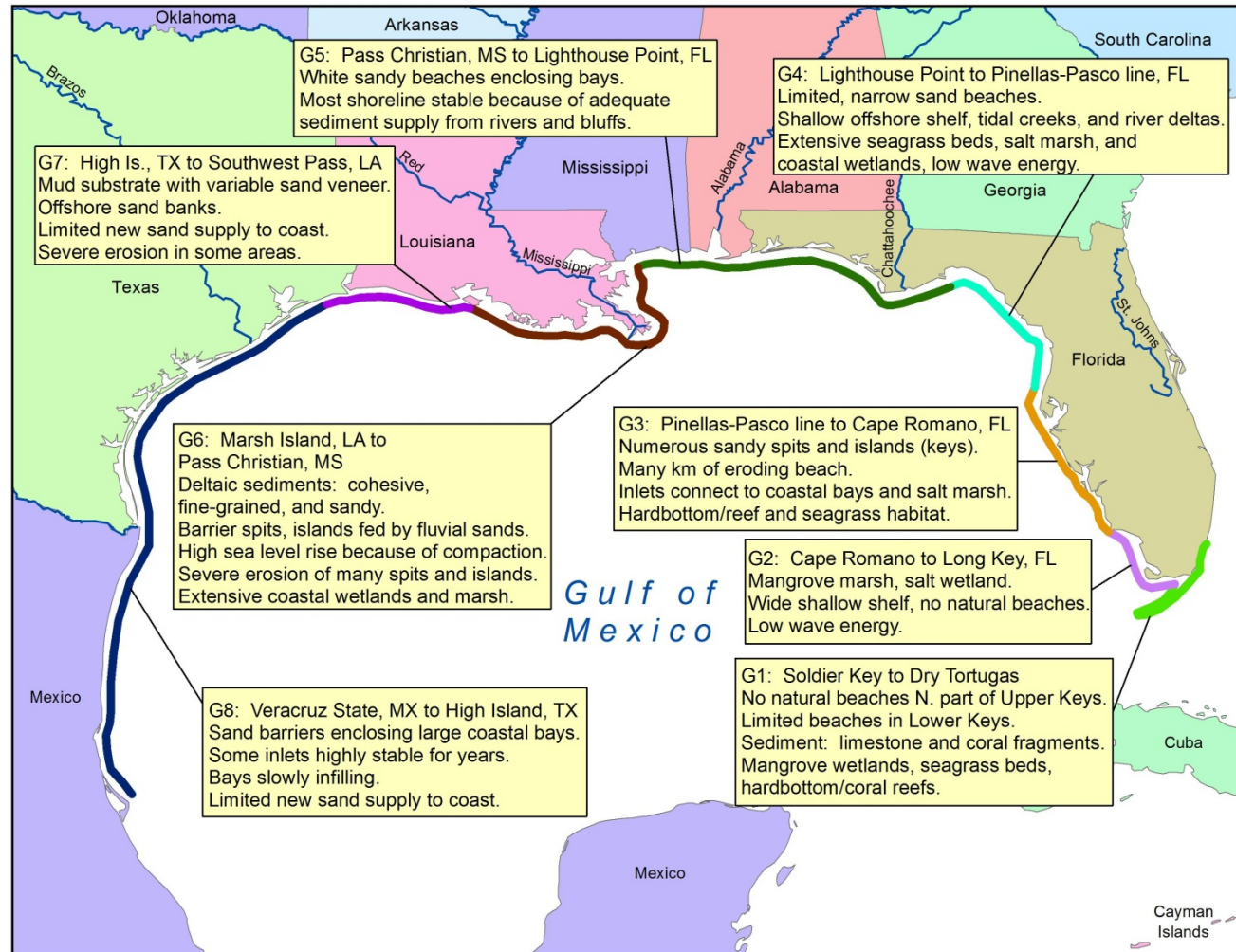
Map of primary sand bodies on the inner shelf from Florida to eastern Texas identified in various studies to date.

**Offshore Alabama**, NP= North Perdido shoal, SP= South Perdido shoal.

**Offshore Louisiana**, SB= St Bernard shoal, SPT= Sandy Point paleo-channel deposit, B= Barataria paleochannel deposit, OS= Outer shoal, SS= Ship shoal, TS= Tiger and Trinity shoals.

**Offshore Texas**, SB= Sabine Bank shoal, HB= Heald Bank shoal.

# Northern Gulf Of Mexico - Geomorphologic Regions



The NGOM can be divided into 8 geomorphologic regions of similar littoral characteristics such as unique erosion or accretion occurrences, and dredging activities (Morang 2007)



# Northern Gulf of Mexico Regional Sediment Budget

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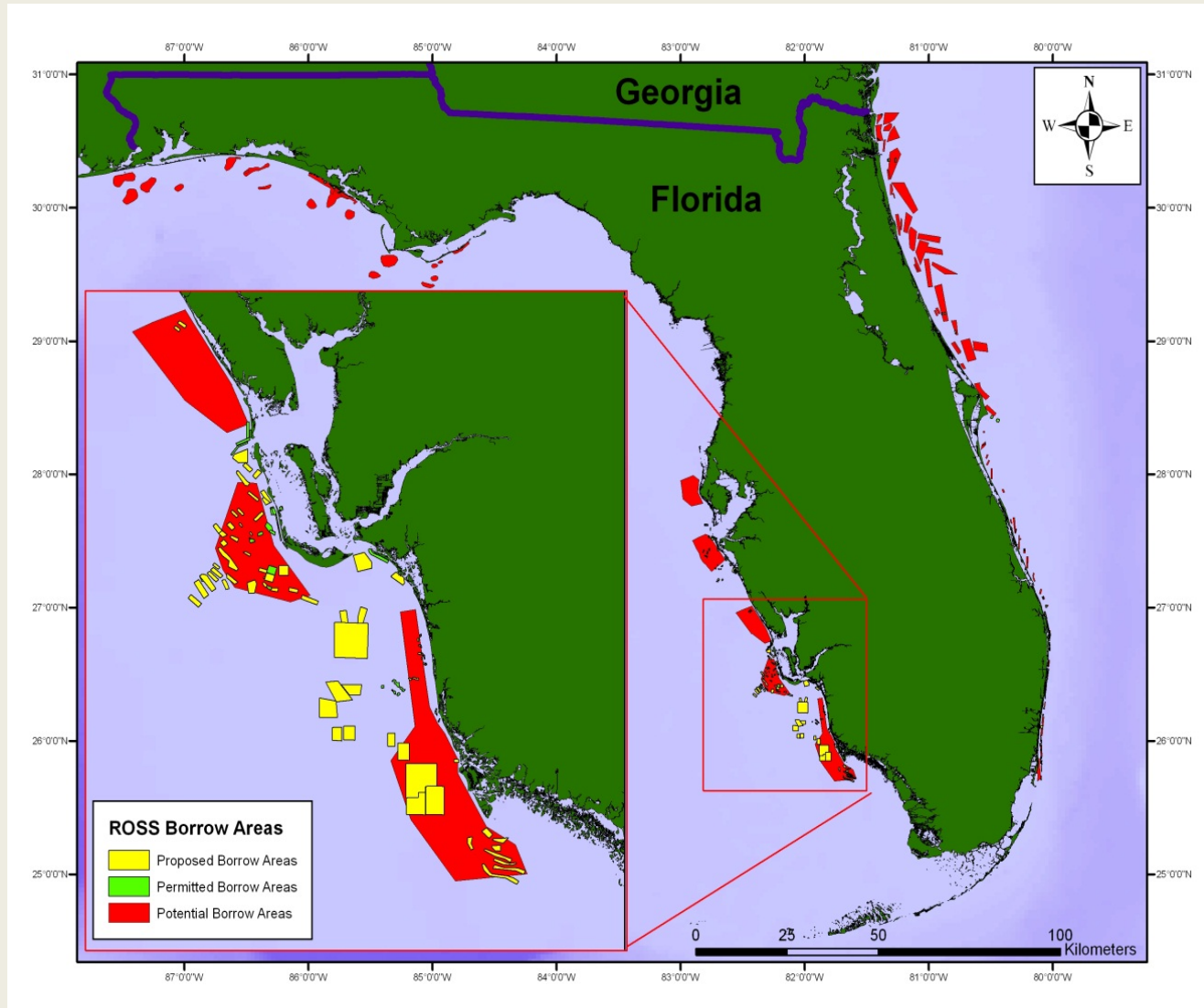
- Developing a Regional Sediment Budget for Northern Gulf of Mexico is an ongoing effort with increasing refinement to ultimately develop an Operational Sediment Budget
- Operational Sediment Budgets for both coarse and fine grained sediment for the entire Northern Gulf of Mexico should be developed.
- Future work should include the development of sediment budgets for riverine and estuarine systems and to link these budgets with existing coastal sediment budgets.
- This will help understand the effects of changes in water flow regimes on sediment budgets in riverine, estuaries & nearshore coastal sediment systems.
- Efforts should be made to increase awareness of the importance of reliable sediment budgets to inform sediment management decisions.

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# Sediment/Sand Resources of Florida, Alabama, & Mississippi

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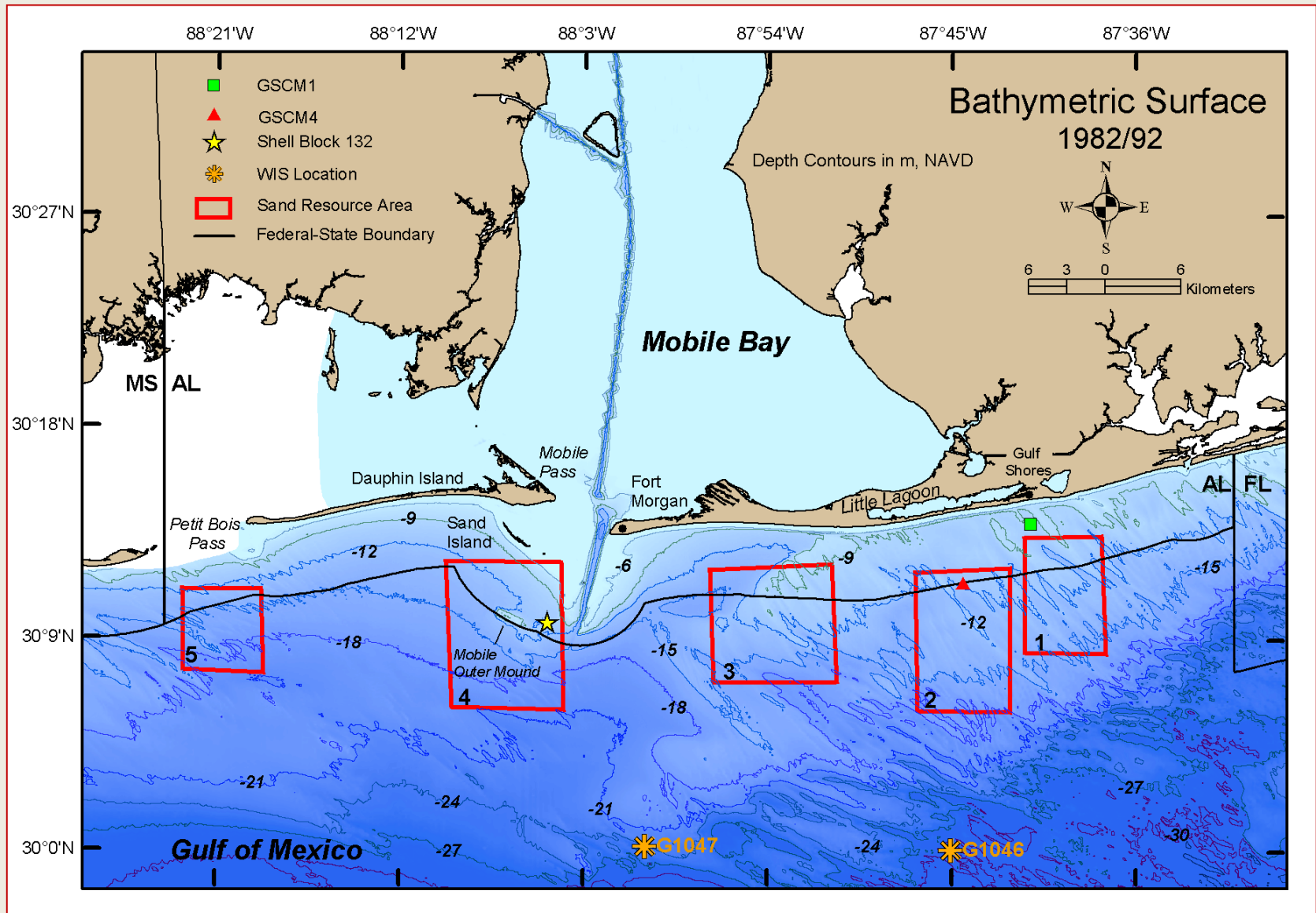
# Reconnaissance Offshore Sand Search (ROSS)-Florida



Map of three classes of sand borrow areas offshore Florida based on the ROSS sediment database system, developed by the Florida Department of Environmental Protection.

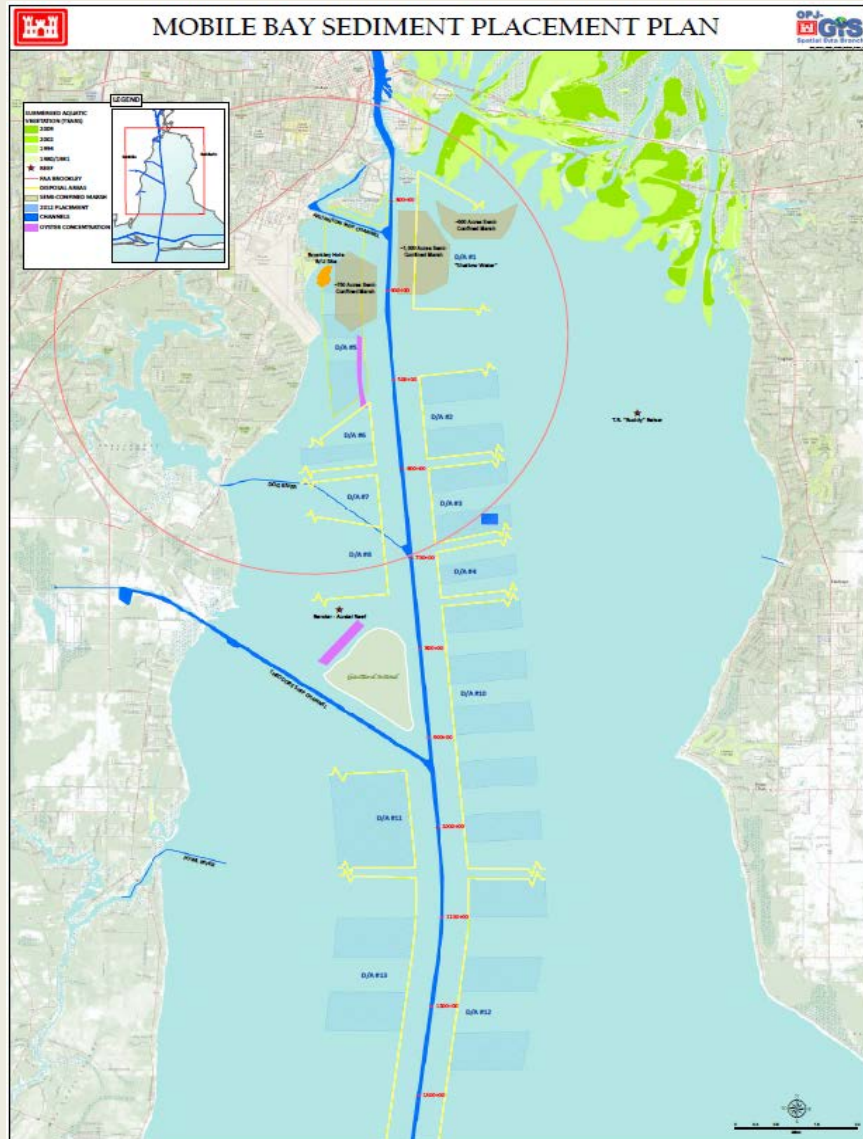
*Courtesy: Mark Byrnes, ACRE*

# Potential Sand Sources Areas off Alabama





# Beneficial Use of Dredged Material – Mobile Bay



Beneficial Use Sites in Mobile Bay

*Courtesy: Larry Parson, USACE*

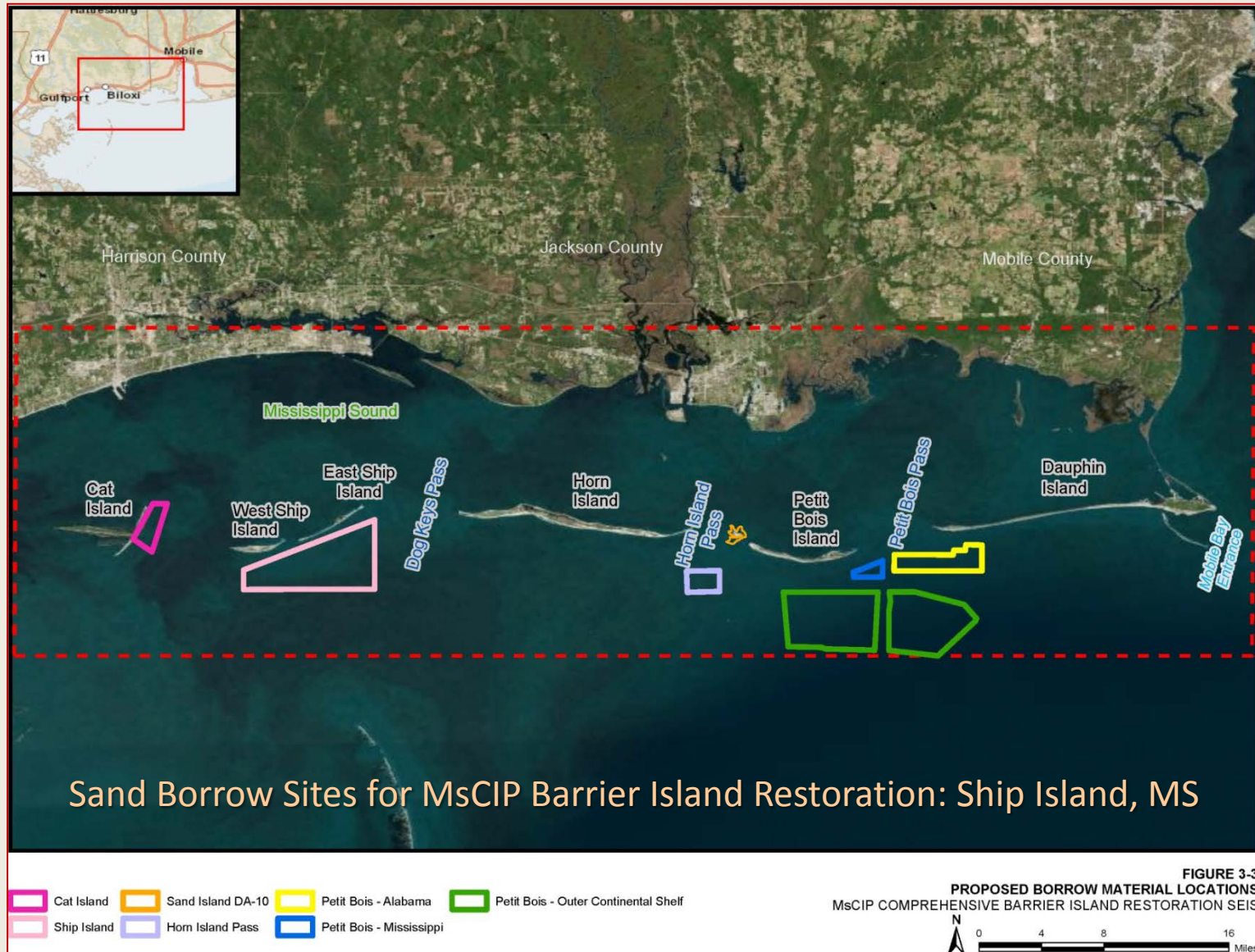
# Mobile Bay Channel Open Water Thin-Layer Disposal



- Summer of 2012
  - Exercised emergency action in permit
- Placed 9 MCY in pre-established historic open water disposal areas
  - Disposal Areas 1-3, 10, 11 and 13
- Utilized hydraulic cutterhead dredge
- Thin-layer disposal techniques
- Significant savings in dredging costs

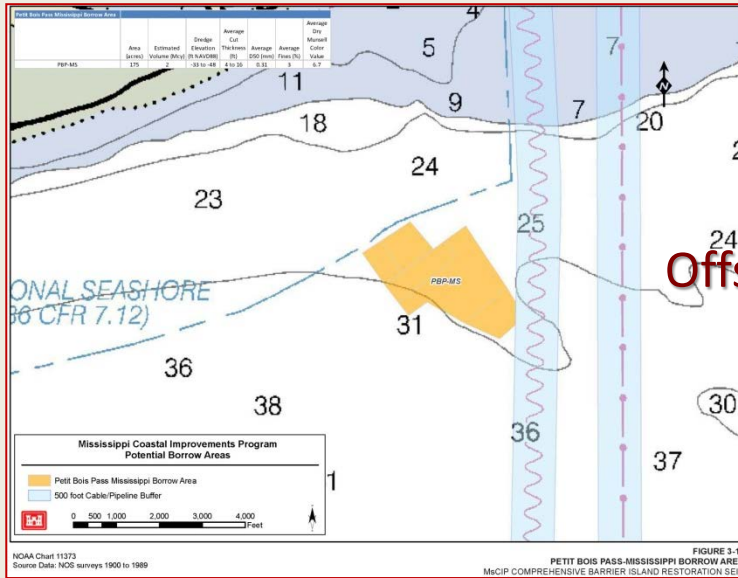


# Potential Sand Sources Areas off Mississippi

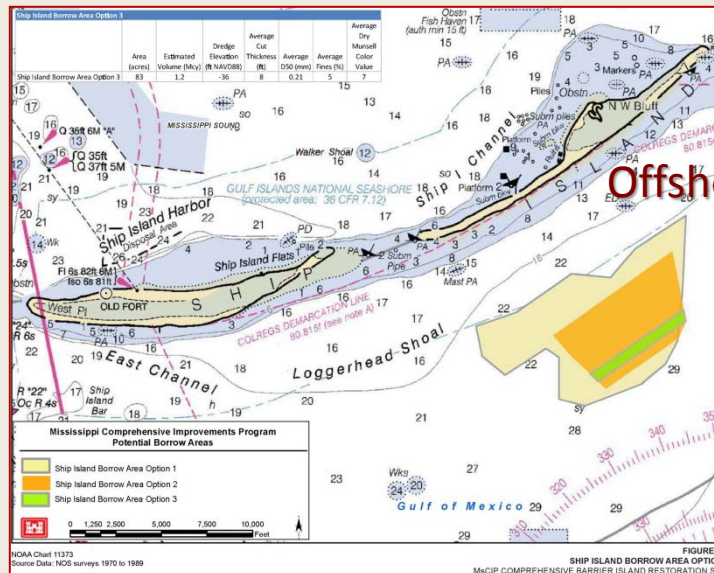
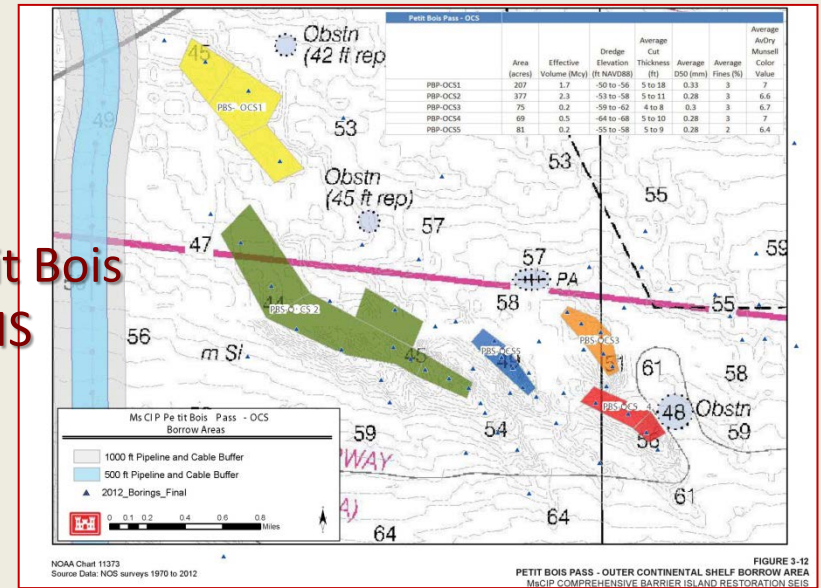




# Potential Sand Sources Areas off Mississippi



Offshore Petit Bois Island, MS



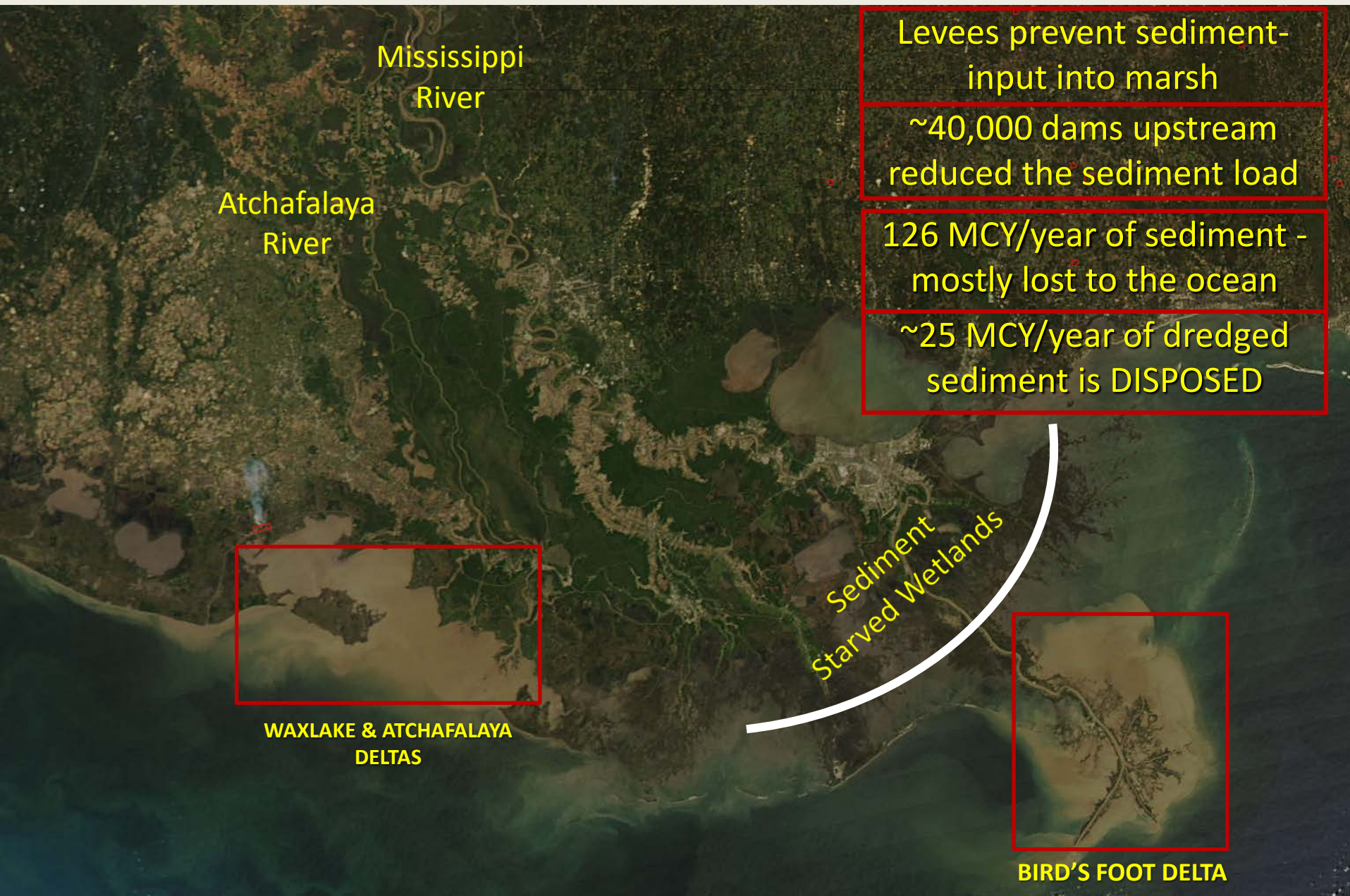
Offshore Ship Island, MS

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# Louisiana Example - Challenges

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# Mississippi River Delta (MRD) Plain - *A Sediment Starved System*

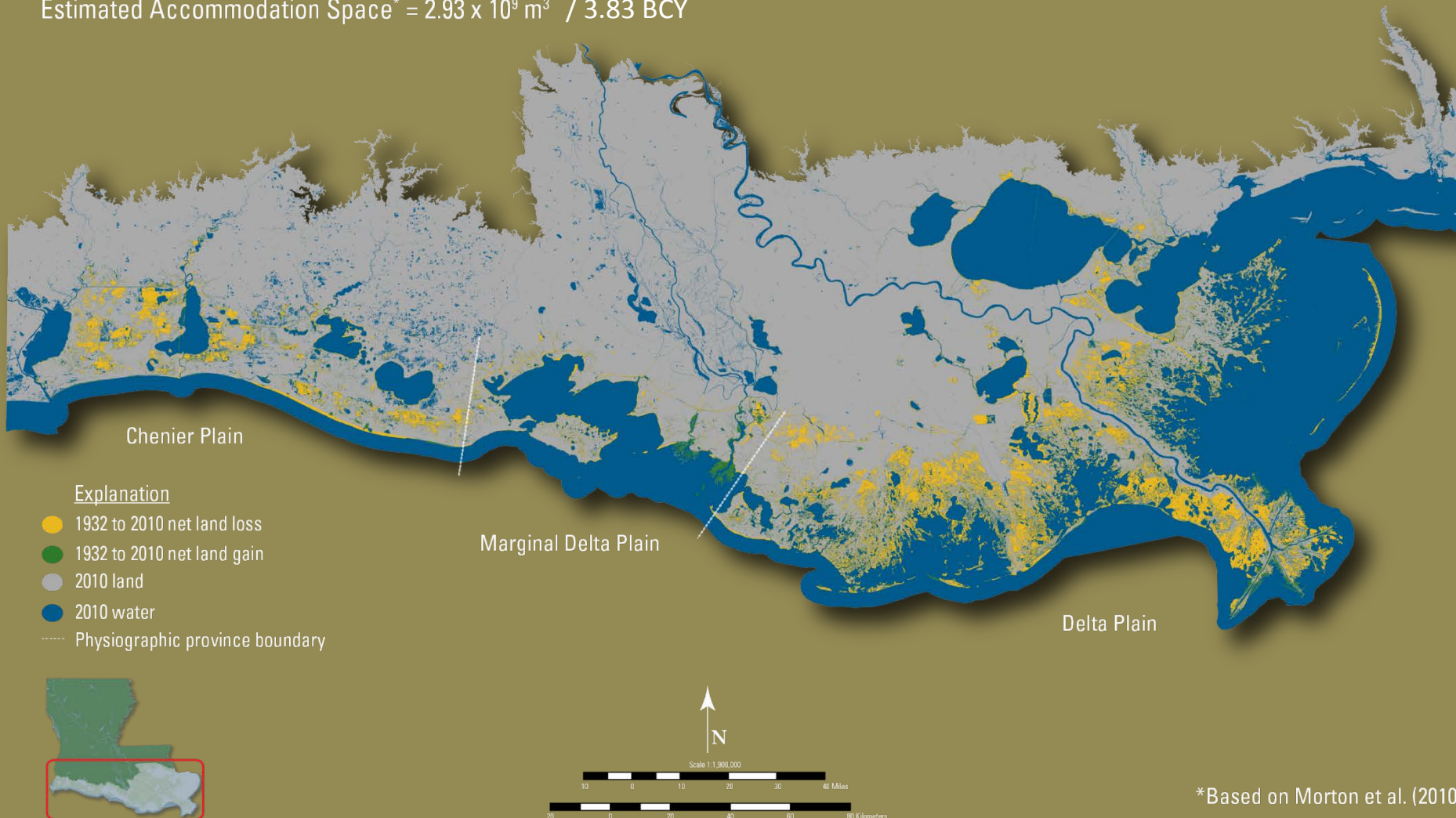




# 1932 to 2010 Land Change

Net Loss = 4,877 km<sup>2</sup> (1,883 mi<sup>2</sup>)

Estimated Accommodation Space\* = 2.93 x 10<sup>9</sup> m<sup>3</sup> / 3.83 BCY



\*Based on Morton et al. (2010)

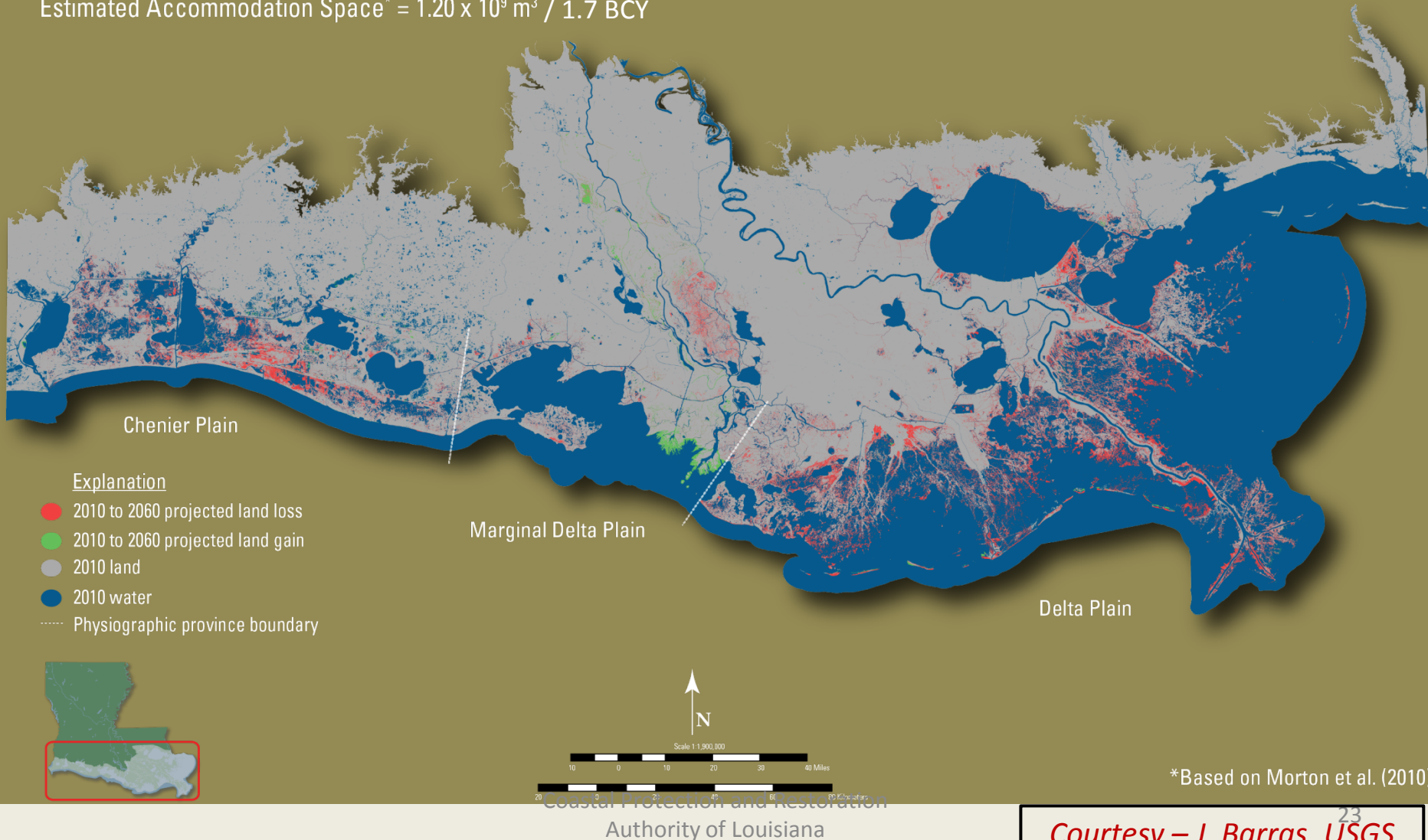
*Courtesy – J. Barras, USGS*

# Comparison of Predicted Land Change Over the Next 50 Years

## Moderate Scenario

Projected Loss = 1,994 km<sup>2</sup> (770 mi<sup>2</sup>)

Estimated Accommodation Space\* =  $1.20 \times 10^9 \text{ m}^3$  / 1.7 BCY

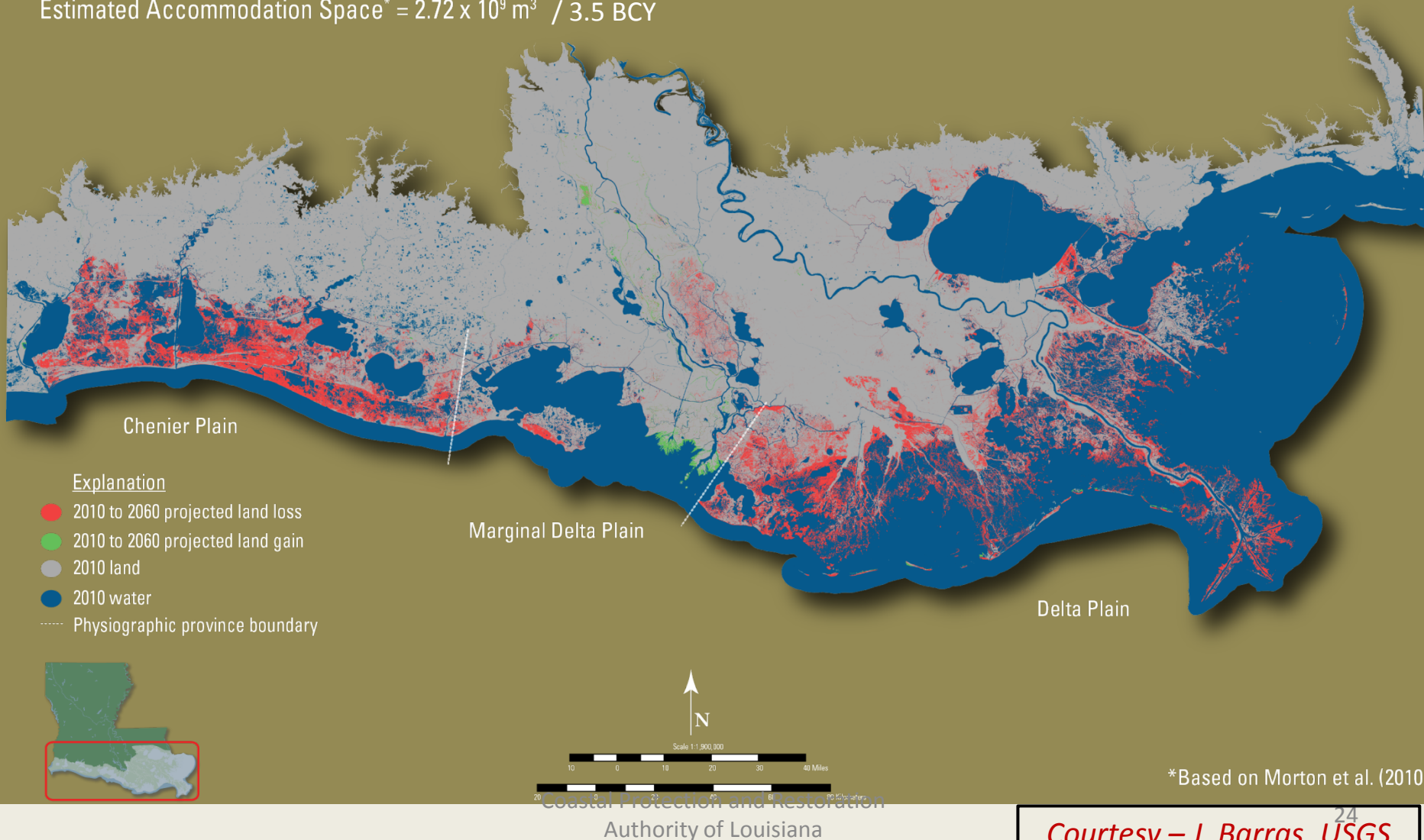


# Comparison of Predicted Land Change Over the Next 50 Years

## Less Optimistic Scenario

Projected Loss = 4,532 km<sup>2</sup> (1,750 mi<sup>2</sup>)

Estimated Accommodation Space\* =  $2.72 \times 10^9 \text{ m}^3$  / 3.5 BCY





# Sediment & Sediment Management

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## SEDIMENT

### 1. Offshore Sediment Sources

- Shoals & Buried Paleochannels -- Sand & Mixed Sediment - Barrier Islands & Marsh Restoration (*Dedicated Dredging*)

### 2. Nearshore Sediment Sources

- Ebb / Flood Deltas & Buried Paleochannels - Mixed Sediment & Sand - Barrier Islands & Marsh Restoration (*Dedicated Dredging*)

### 3. Fluvial/Riverine Sources

- Suspended Sediment - Fines & Fine Sand - Sediment Diversions
- Riverbed Sediment – Sand & Mixed – Barrier Islands & Marsh Restoration (*Dedicated Dredging*)
- Riverbed Sediment – Sand & Mixed – Beneficial Use (*Maintenance Dredging*)

## SEDIMENT MANAGEMENT

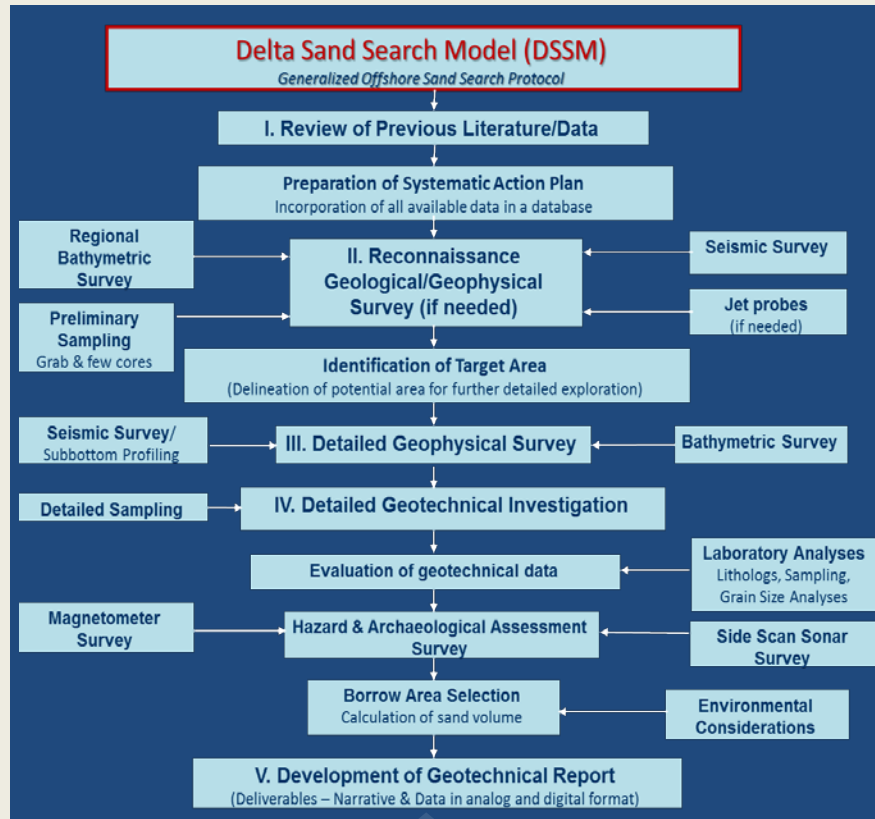


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# Louisiana Example: Sediment Evaluation & Sediment Management

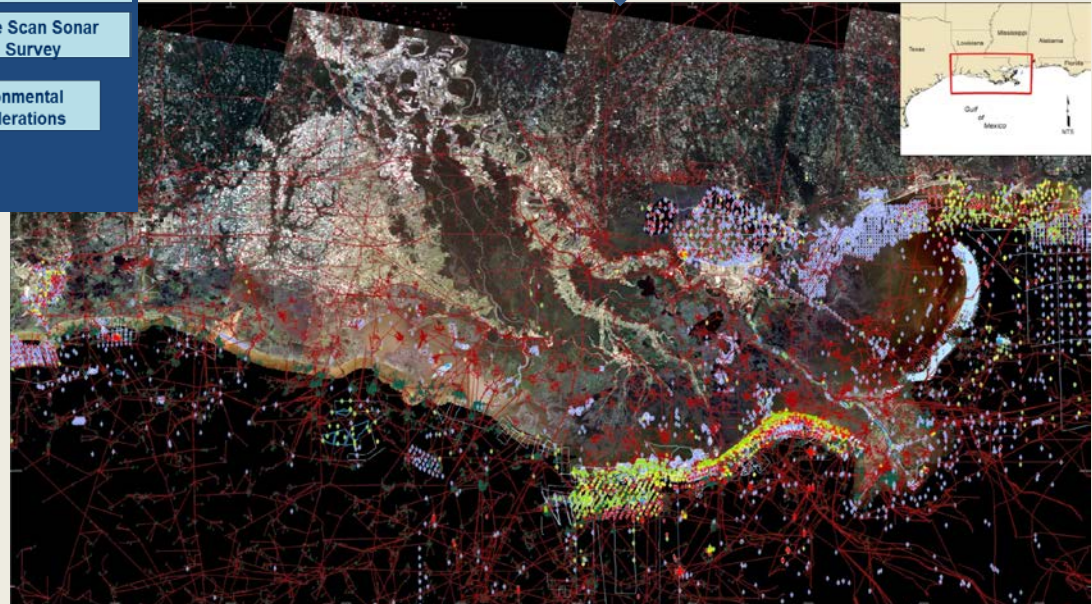
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# Protocol for Offshore & Riverine Sand Search and Geoscientific Data Management



## Louisiana Sand Resources Database (LASARD)

provides a central data resource for sediment resource information, compilation of baseline data, a clearing house to access all geoscientific data on GIS platform at one place reducing the possibility of duplication

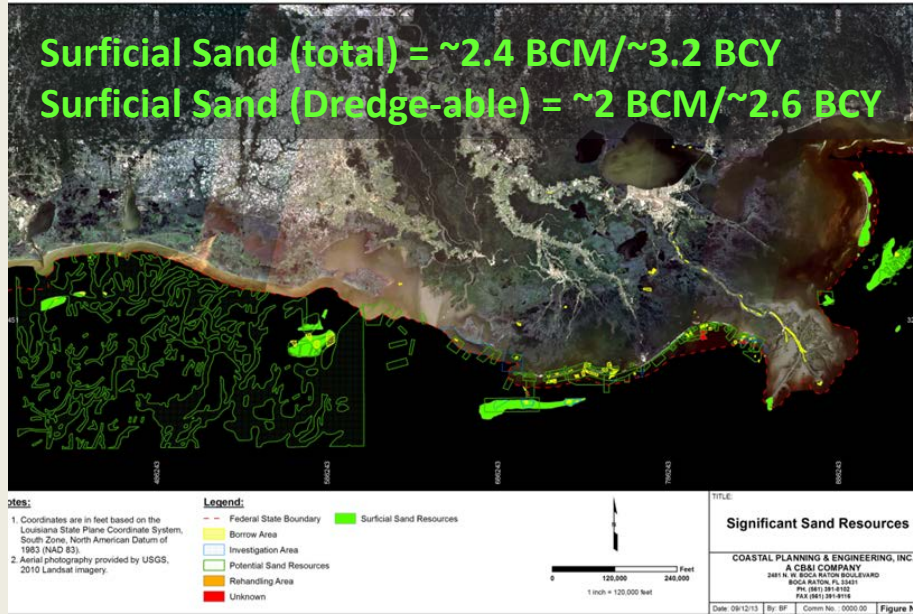


**Delta Sand Search Model (DSSM)**  
facilitates systematic and cost effective sand search



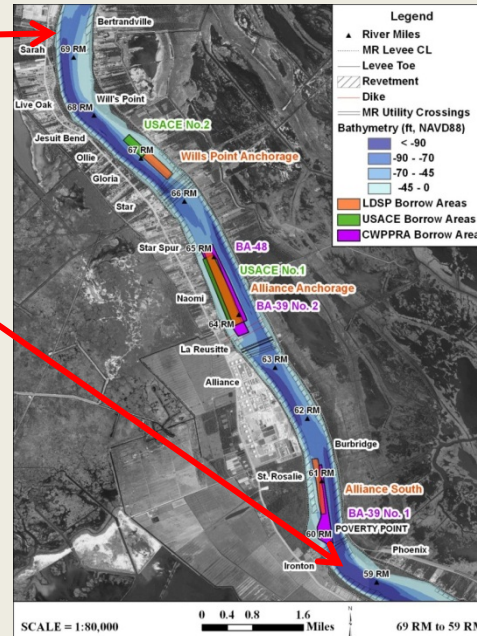
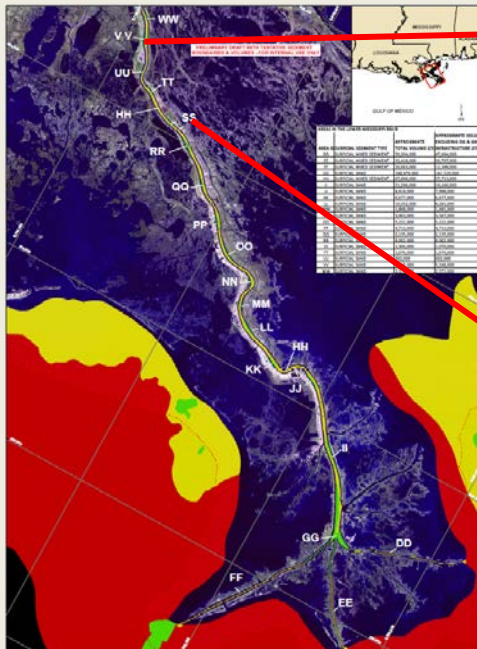
# Offshore & Riverine Significant Sand Sources

**Surficial Sand (total) = ~2.4 BCM/~3.2 BCY**  
**Surficial Sand (Dredge-able) = ~2 BCM/~2.6 BCY**



**Surficial Sand (total) = ~2.4 BCM/~3.2 BCY**  
**Surficial Sand (Dredge-able) = ~2 BCM/~2.6 BCY**  
**Surficial Mixed Sediment (total) = ~19.3 BCM/~25.3 BCY**  
**Surficial Mixed Sediment (Dredge-able) = ~13.1 BCM/~17.2 BCY**  
**Surficial Fines Unknown**

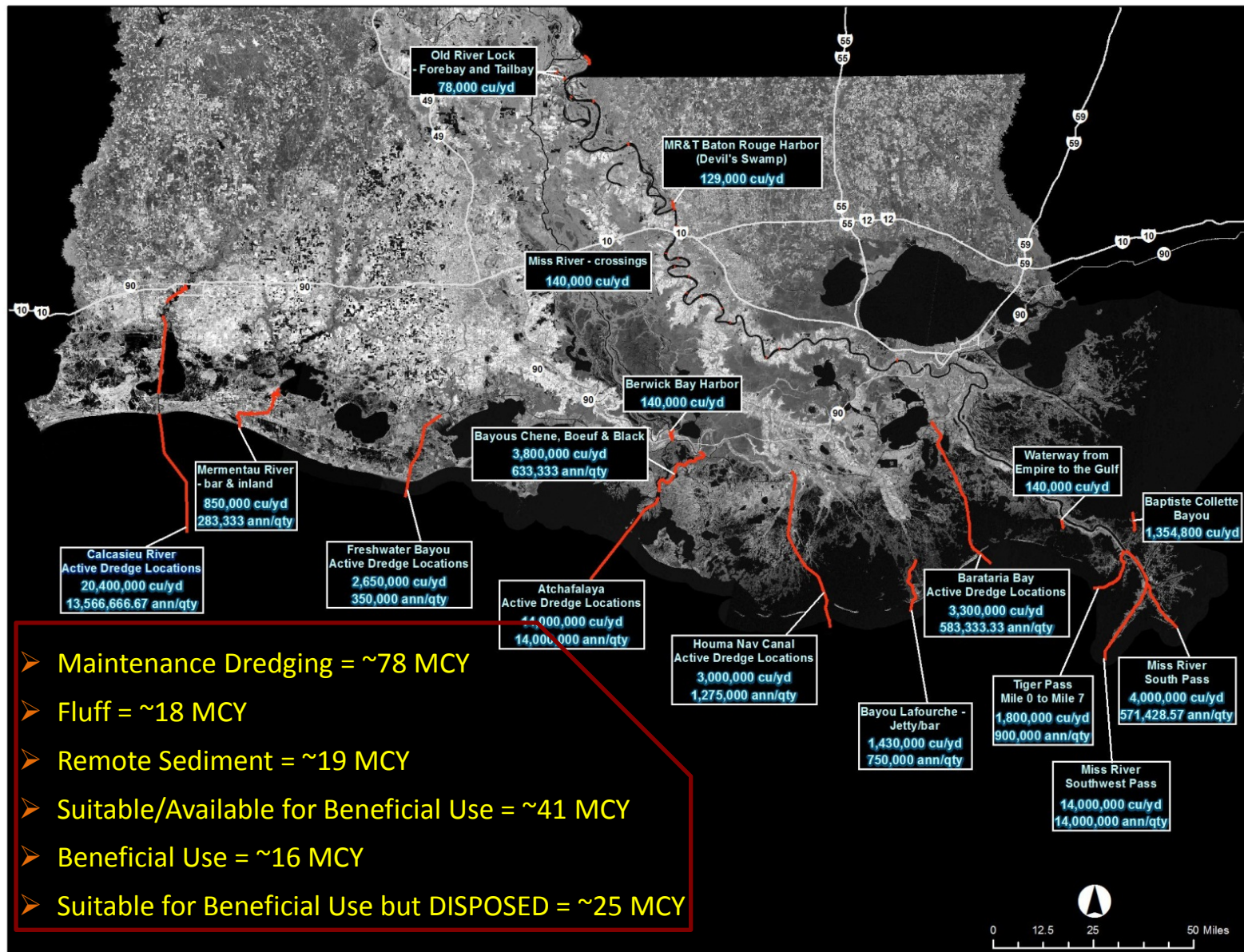
**Assumptions:**  
**1<sup>st</sup> Order Estimates**  
**Thickness = 3 m/10 ft**  
**From -3 m / 10 ft isobath to 22 – 28 km / 12-15 nmi offshore}**



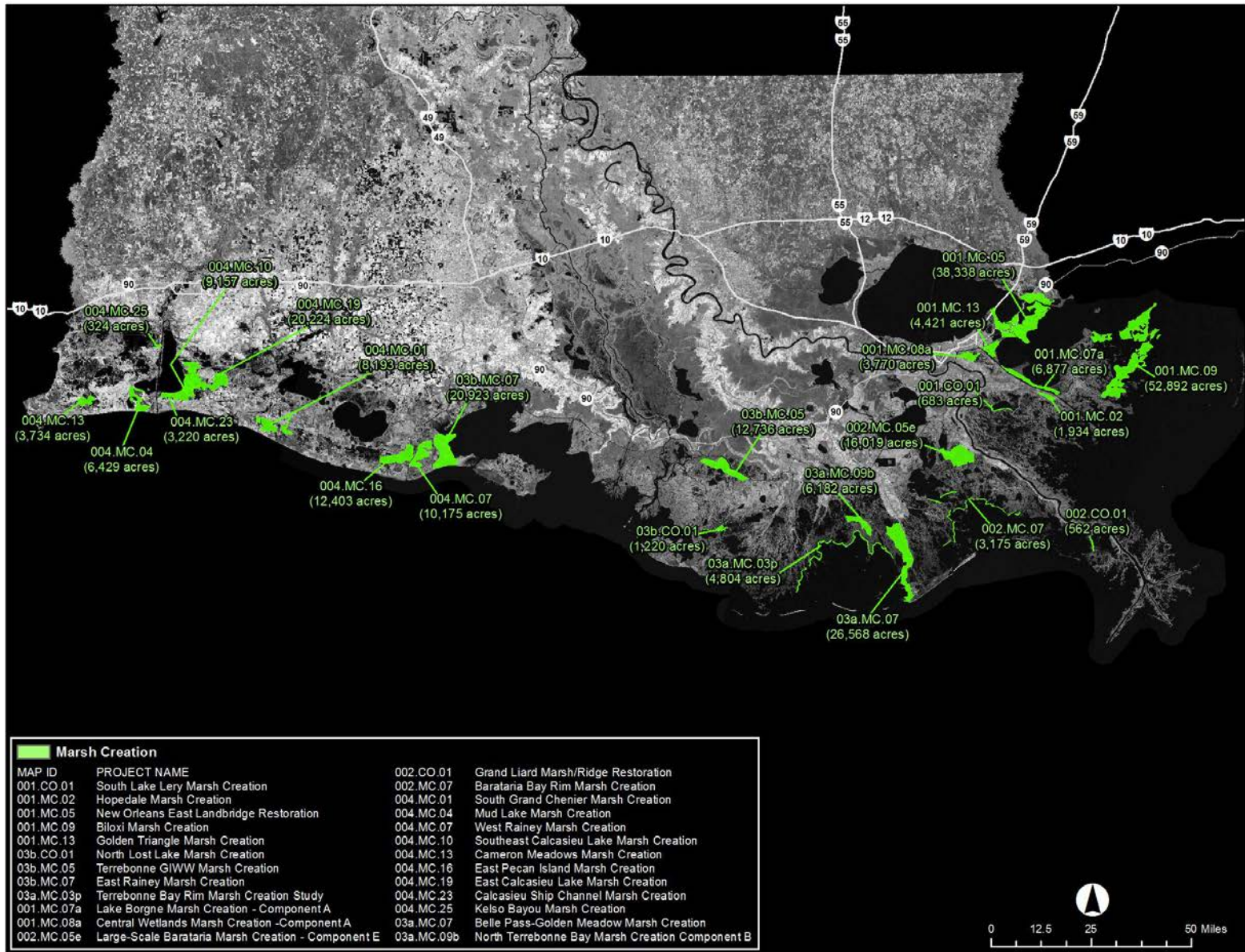
**From RM 70 to HOP**  
**Total Sand Volume: ~61 MCY**  
**Dredge-able Sand Volume: ~58 MCY**  
**{1<sup>st</sup> order estimates}**



# Louisiana Federal Navigation Channels

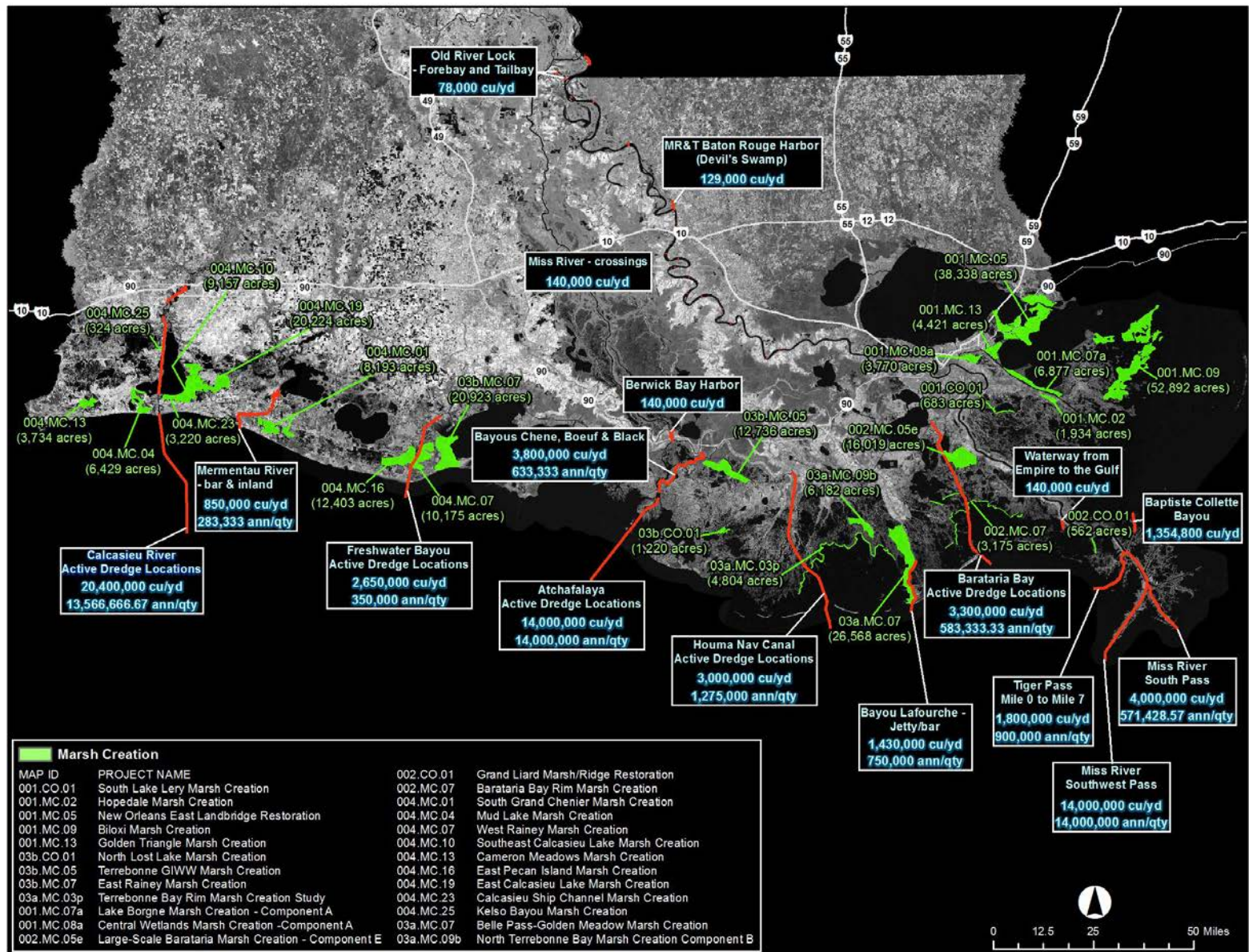


# Marsh Creation Sites – Master Plan 2012





# Aligning Beneficial Use Opportunity with Restoration Needs



# Louisiana Sediment Availability and Allocation Program (LASAAP)

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- Traditionally matching of sediment sources and projects has been done manually.
- Development of a system/tool to assist with matching sediment sources and sediment needs would not only be cost-effective but also an efficient use of limited sediment supplies
- This tool would need to consider:
  - *Sediment characteristics*
  - *Infilling rates (re-use of borrow areas)*
  - *Transportation cost*
  - *Environmental impacts*
  - *Conflicting/competing uses*
  - *Leveraging mobilization for multiple projects*
  - *Policy updates*
  - *Permitting*



# Louisiana Sediment Management Plan (LASMP)

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- Provides the State's first unified sustainable comprehensive strategy for Regional Sediment Management
- Sets forth a pathway for implementing restoration strategies based upon resource availability/quantities and their proximity to restoration sites – promoting cost-effectiveness and minimization of environmental impacts
- Setup to maximize the usefulness of identified sediment resources based on sound scientific and engineering information
- Contains elements that are extremely relevant to furthering stakeholder synergy, promoting Adaptive Management principles, and advancing policy and restoration innovation

# SEDIMENT

OCS Waters, State Waters, Coastal Zone Lower  
Mississippi & Atchafalaya River

## Sediment Borrow Area

### Borrow Area Management & Monitoring (BAMM)

- Optimal Utilization
- Location vs. project
- Location vs. pipeline
- Delineation of potential sand sources in OCS
  - Infilling rate
  - Slope Stability Issues
  - Hypoxia

### Programmatic Monitoring

- Barrier Island Comprehensive Monitoring Program (BICM)
  - Bathymetric data
  - Sediment data
- Met-Oceanic Data - WAVCIS
- Eustatic Sea Level Rise
- Subsidence

## Sediment Evaluation

- Protocol of exploration
- Evaluation of potential areas
  - Offshore/State & Federal Waters
  - Lower Miss River
  - Atchafalaya River

## River Studies

- LCA Miss River Delta Mgmt Study
- Atchafalaya Basin Sed Mgmt Plan
- Others

## Sediment Data Management (LASARD)

- Protocol for standardization of data acquisition

## Regional Sediment Management

- Sediment Resources
- Sediment Budget
- Dredged sediment
- Diversions

## Policy/ Regulation

- Prioritization of allocation
- Federal Standard
- Environment Issues

## Pipeline/O&G/ Oysters

## Sea Level Rise Policy

## Coordination with Stakeholders State, Federal, NGO

# LOUISIANA SEDIMENT MANAGEMENT PLAN (LASMP)

# Path Forward ...

1. Technical Framework GRSMMP has set the stage for the Plan itself
2. GRSMMP does not have to follow any political boundary and can be really meaningful following geomorphic divisions of the entire NGOM
3. For this Plan to be successful /meaningful, there is a need for
  - *geoscientific database on a GIS-Platform for data management*
  - *development of a robust sediment inventory*
  - *more refined sediment budget*
  - *a sediment distribution map*
  - *aligning opportunities for beneficial use of sediments from maintenance dredging*
4. Development of a tool (similar to Louisiana Sediment Availability and Allocation Program) will improve efficiency and cost-effectiveness, and optimize the utilization of limited sediment resources.



# THANKS