



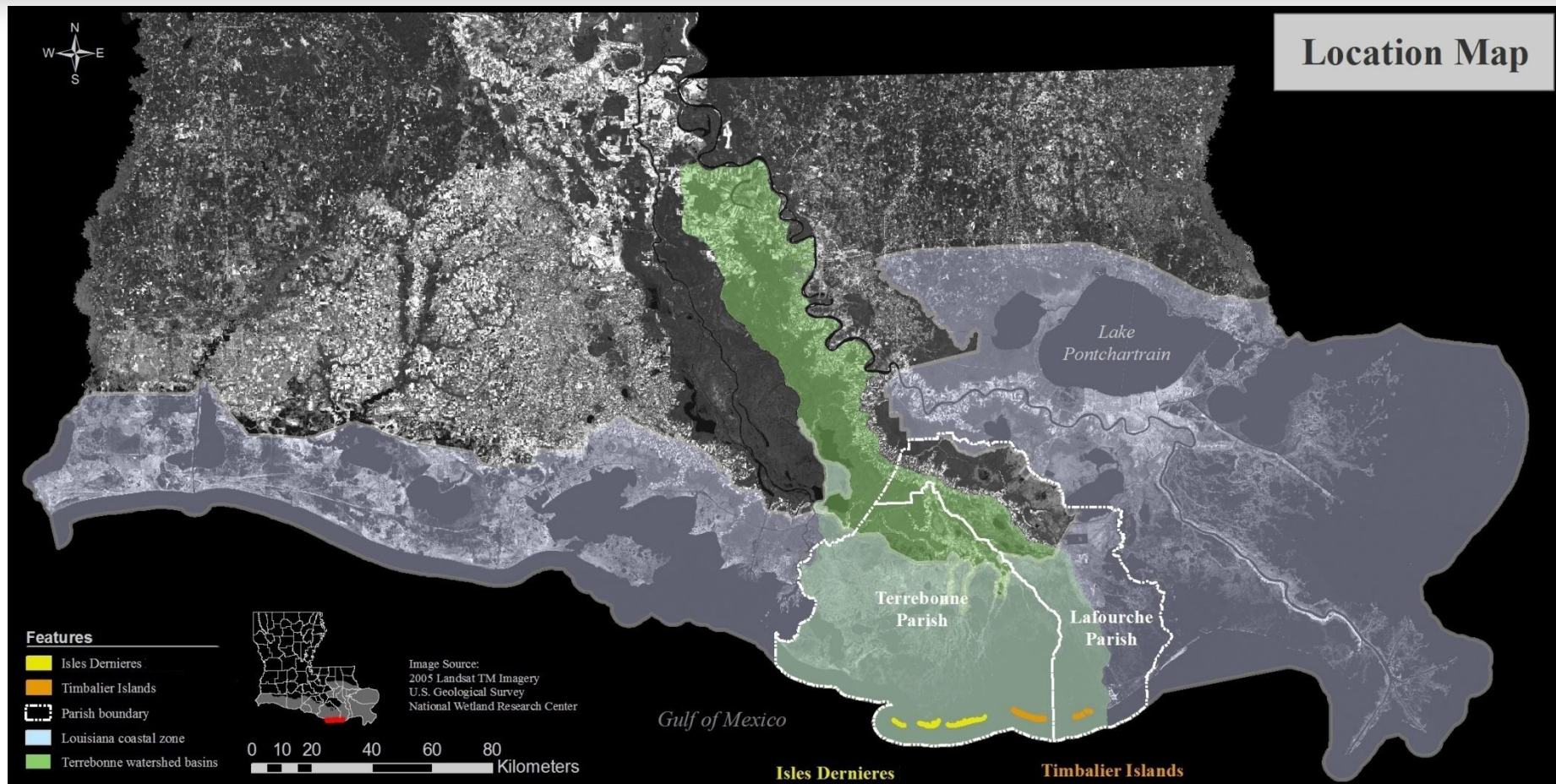
## Meeting the Challenge of Barrier Island Restoration: An Overview of the Terrebonne Basin Barrier Shoreline Restoration Planning Process

9<sup>th</sup> INTECOL International Wetlands Conference  
June 2012

# Acknowledgements

- Louisiana CPRA
- SJB Group, Baton Rouge
- Coastal Engineering Consultants
- U.S. Army Corps of Engineers
- Federal and State PDT Members

# Terrebonne Basin Barrier Shoreline Restoration Project

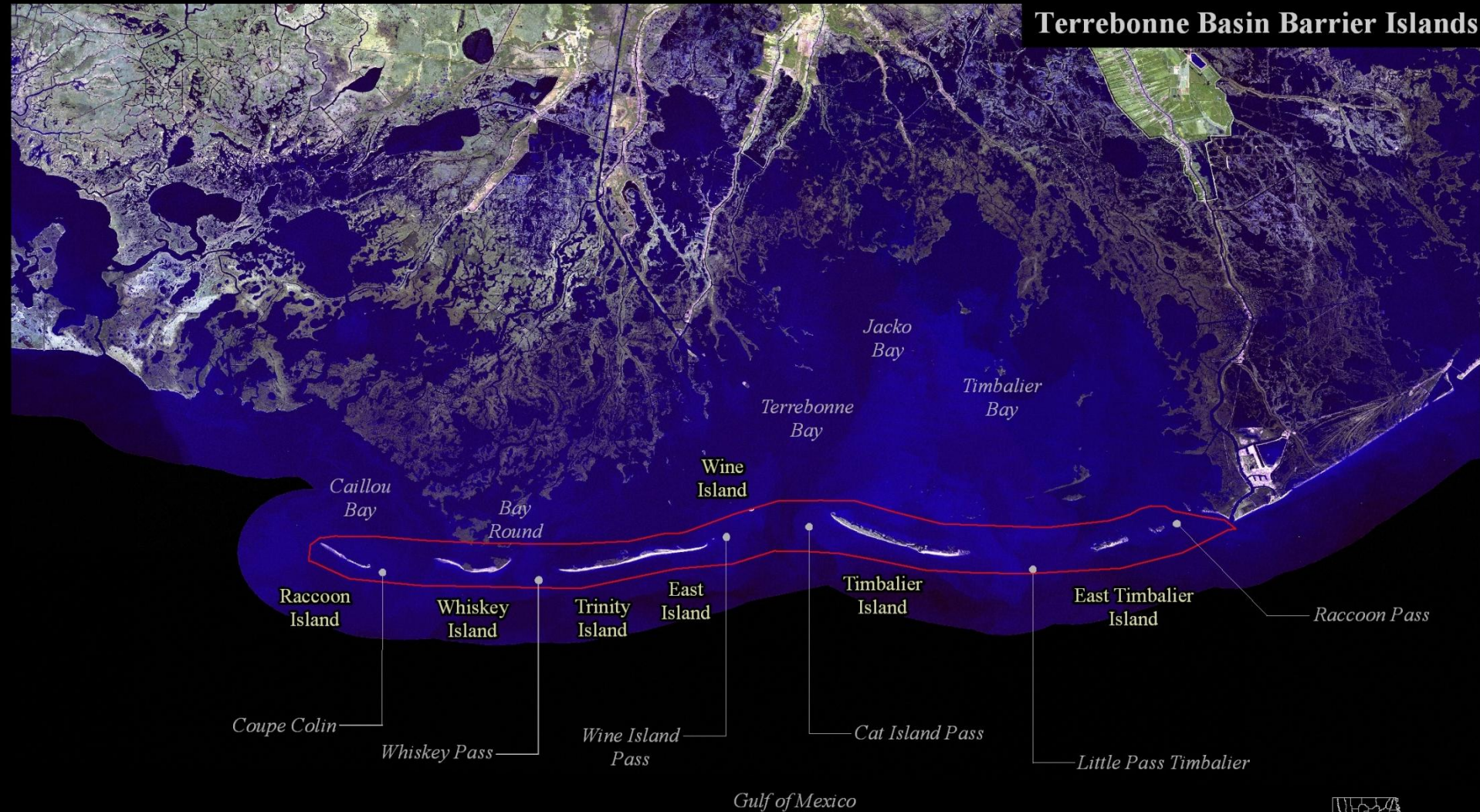


# Outline

- **Project Setting and Background**
- Island Restoration Plans
- Pre-Screening Analysis
- Benefits
- IWR Model
- Recommended Plan

# Project Area

## Terrebonne Basin Barrier Islands



### Features

Project area boundary



Image Source:  
2005 Landsat TM Imagery  
U.S. Geological Survey  
National Wetland Research Center

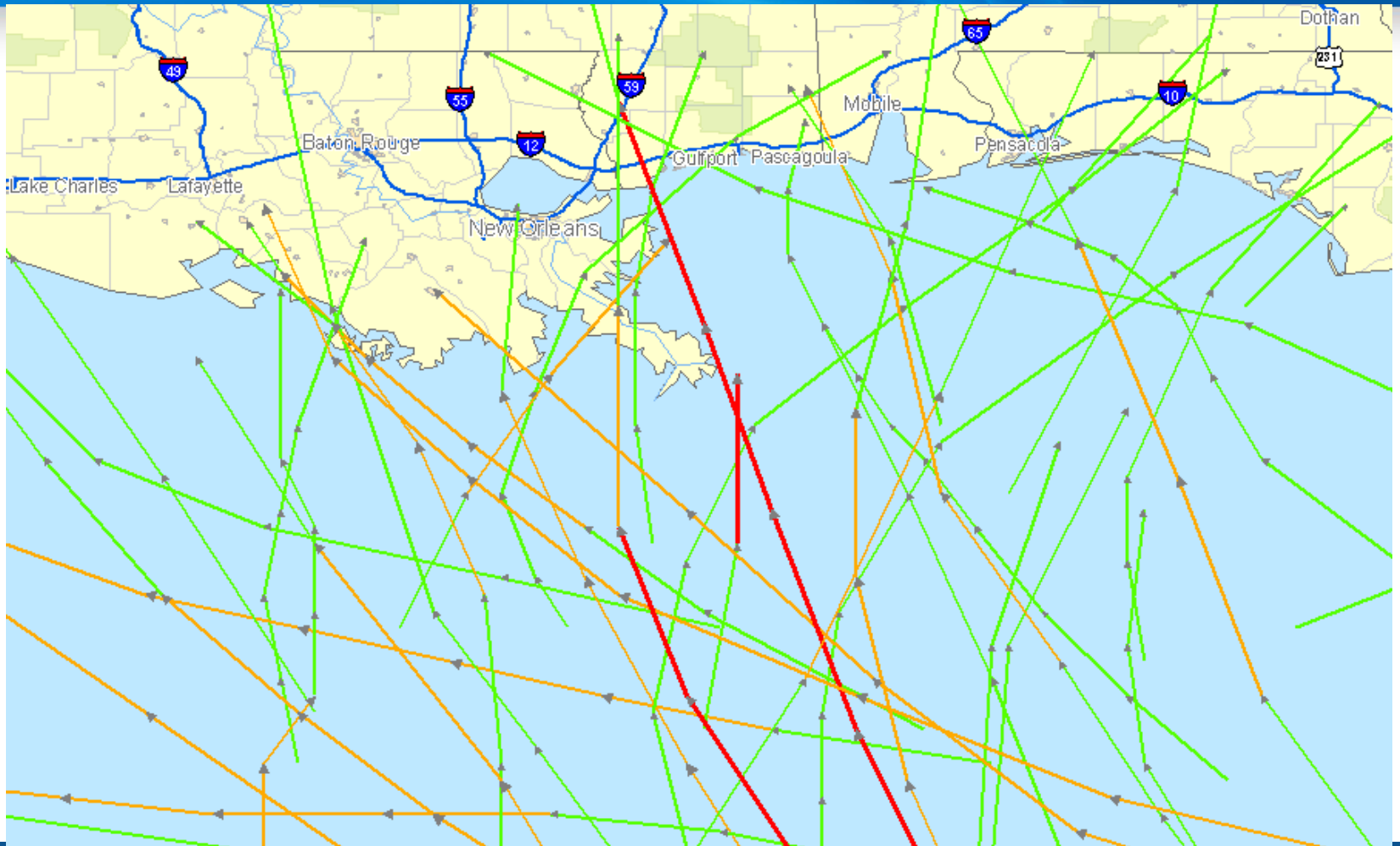




# Causes of Island Loss

- Sediment deficit
- Shoreline erosion
- Subsidence
- Sea level rise
- Dredging
- Storms

# History of Storms





## Isles Dernieres

Terrebonne Bay

Caillou Bay



Raccoon Island

Coupe Colin

Whiskey Island

Whiskey Pass

Trinity Island

East Island

Gulf of Mexico

## Timbalier Islands

Cat Island Pass



Timbalier Island

Caillou Pass

Little Pass  
Timbalier

East Timbalier  
Island

Raccoon Pass

Gulf of Mexico

### Features

- 2050 Land - Projected
- 2007 Land
- 1956 Land



Terrebonne Basin Barrier Shoreline Restoration  
Image Source:  
2005 Landsat TM  
U.S. Geological Survey

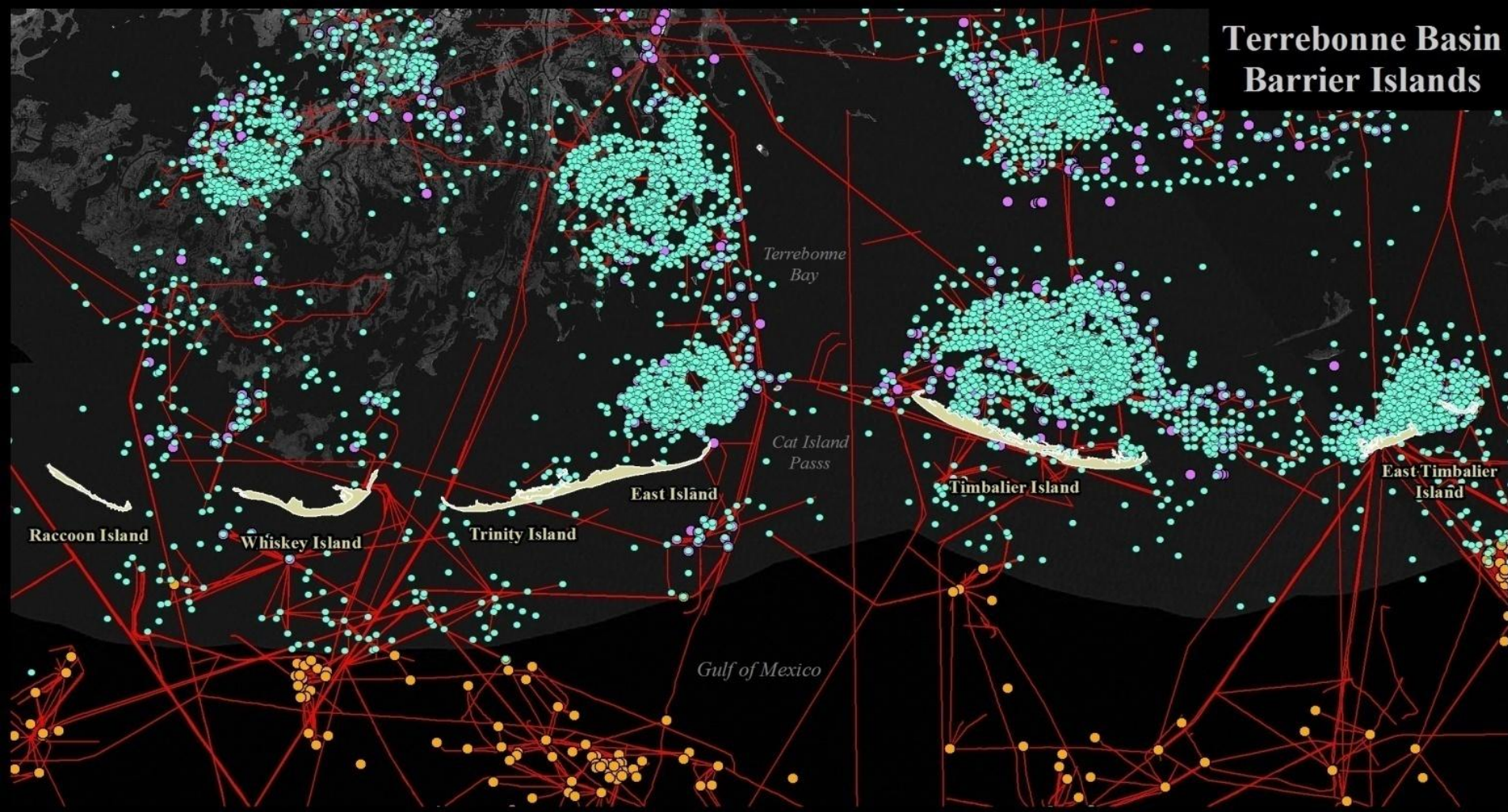


# What's at Stake?

- Critical habitat for piping plover
- 1,600 acres of Essential Fish Habitat
- 1,700 acres of supratidal habitat utilized by brown pelicans and other shore birds
- Storm surge protection
- Protection of oil and gas infrastructure



# Terrebonne Basin Barrier Islands



- Features**
- Barrier island
  - Oil and gas wells
  - Oil and gas pits
  - Oil and gas platforms
  - Oil and gas pipelines



Image Source:  
2005 Landsat TM Imagery  
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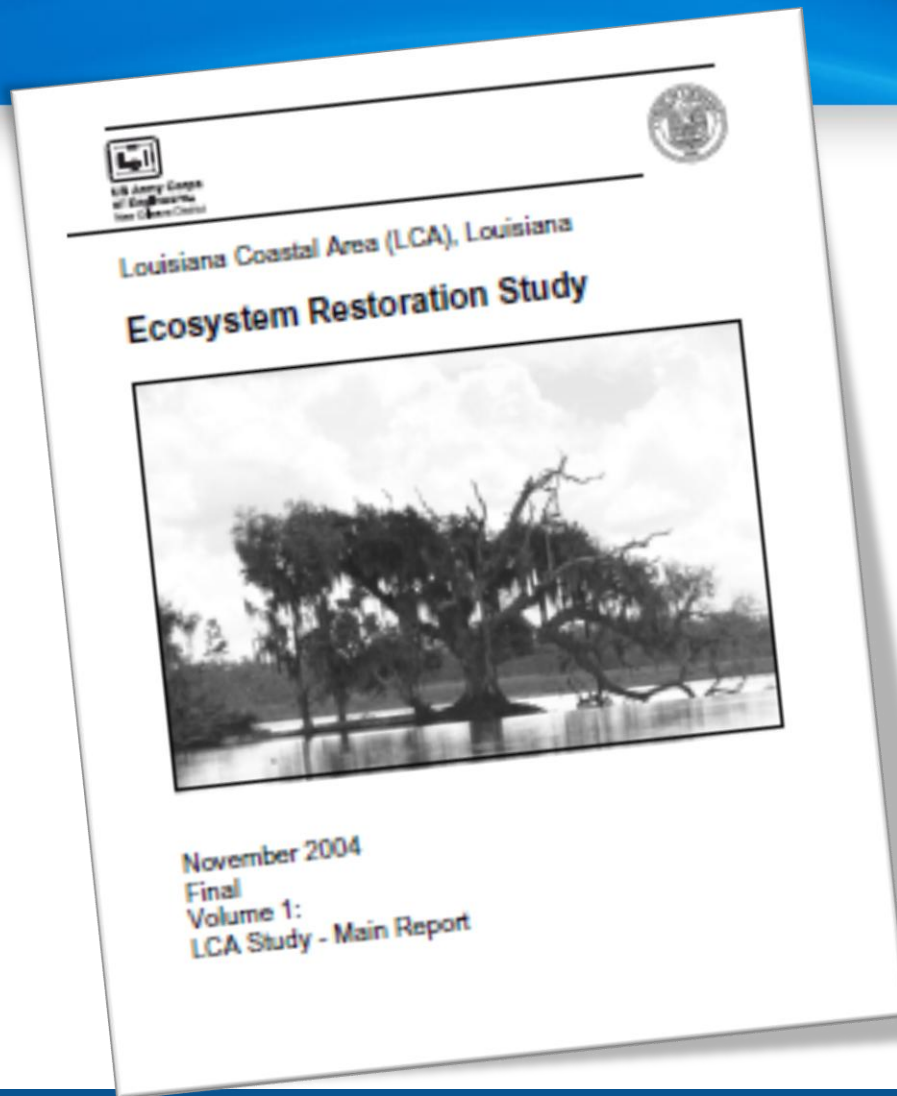


# Past Restoration Projects

- Restoration efforts date back to the early 1980s
- CWPPRA has been the primary funding source
- 11 Separate projects



# Louisiana Coastal Area Plan 2004



- “this would simulate historical conditions by reducing the current number of breaches, enlarging (width and dune crest) of the Isles Dernieres, Timbalier, and East Timbalier Island”

# Authorization

## Water Resource Development Act (WRDA) of 2007 Section 7006(e)(3) - Public Law 110-114

### **SEC. 7006 CONSTRUCTION.**

#### **(e) ADDITIONAL PROJECTS**

##### **(3) PROJECTS SUBJECT TO REPORTS.—**

**(A) FEASIBILITY REPORTS.—**Not later than December 31, 2008, the Secretary shall submit to Congress feasibility reports on the following projects referred to in the restoration plan:

- (i) Multipurpose Operation of Houma Navigation Lock at a total cost of \$18,100,000\*
- (ii) Terrebonne Basin Barrier Shoreline Restoration at a total cost of \$124,600,000 #
- (iii) Small Diversion at Convent/Blind River at a total cost of \$88,000,000 #
- (iv) Amite River Diversion Canal Modification at a total cost of \$5,600,000 #
- (v) Medium Diversion at White's Ditch at a total cost of \$86,100,000
- (vi) Convey Atchafalaya River Water to Northern Terrebonne Marshes at a total cost of \$221,200,000\*

**(B) CONSTRUCTION.—**The Secretary may carry out the projects under subparagraph (A) substantially in accordance with the plans and subject to the conditions, recommended in a final report of the Chief of Engineers if a favorable report of the Chief is completed by not later than December 31, 2010.

\* Due to hydrologic interrelation, HNC and Atchafalaya projects were combined for this analysis

# State acted as technical lead for project

# USACE 6-Step Planning Process for Civil Works Projects

- Identify objectives and constraints
- Inventory existing conditions and forecast future conditions
- Formulate alternative plans
- Evaluate alternative plans
- Compare alternative plans; and
- Select the NER

# National Ecosystem Restoration Plan (NER)

- Defined as the most cost effective plan that yielded the optimal habitat benefits from restoring the geomorphic form and ecological function of the beach, dune, and marsh components of one or more barrier islands.



# Challenges

- Schedule
- Complexity
- Limited sediment resources
- Sustainability (50 years)
- High risk, high contingency costs
- Ongoing oil spill
- T&E Species
- Surrounding infrastructure
- Uncertainty associated with coastal processes

# Outline

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# “Minimum” Island Design Concept

- Minimized template ~ smallest island planform that can be constructed that will yield barrier island form and function
- Developed via SBEACH modeling; scientifically accepted island dimensions; and range of historical island lengths
- Prevents breaching when subjected to the impacts of two pairs of historic hurricanes (Katrina/Rita and Gustav/Ike) and a theoretical 50-year storm

# Design Templates

## Minimum, 5-yr, 10-yr, 25-yr Plans:

- Raccoon Island
- Whiskey Island
- Trinity Island
- East Island
- Wine Island
- Timbalier Island
- East Timbalier

# Whiskey Island



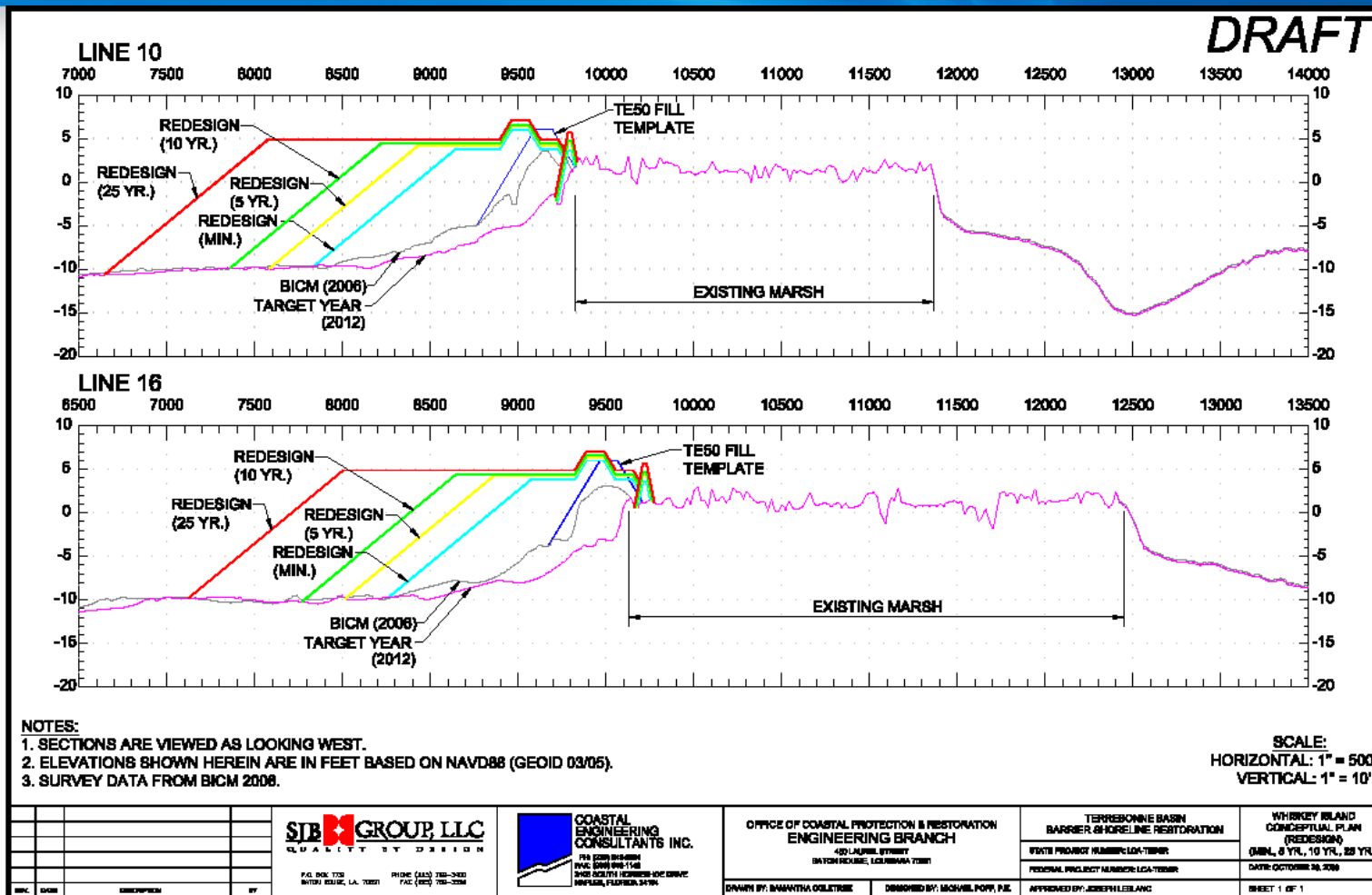
# Habitat Acres

Island	Habitat Type	Habitat Acres – FWP							
		TY0	TY1	TY5	TY10	TY20	TY30	TY40	TY50
Whiskey 5-Yr Plan	Dune	0	65	61	57	0	57	0	0
	Supratidal	377	830	328	223	84	223	84	164
	Intertidal	443	377	808	828	847	717	472	363
	<i>Total</i>	<i>820</i>	<i>1272</i>	<i>1197</i>	<i>1108</i>	<i>931</i>	<i>997</i>	<i>556</i>	<i>527</i>

## Template Adjustments:

- Elevation: SLR, subsidence, compaction
- Planform: shoreline erosion, land loss

# Fill Volumes



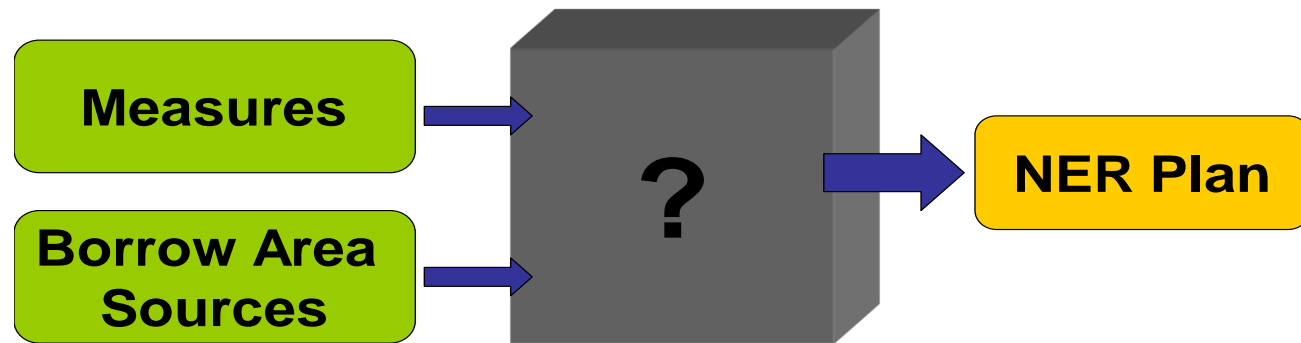
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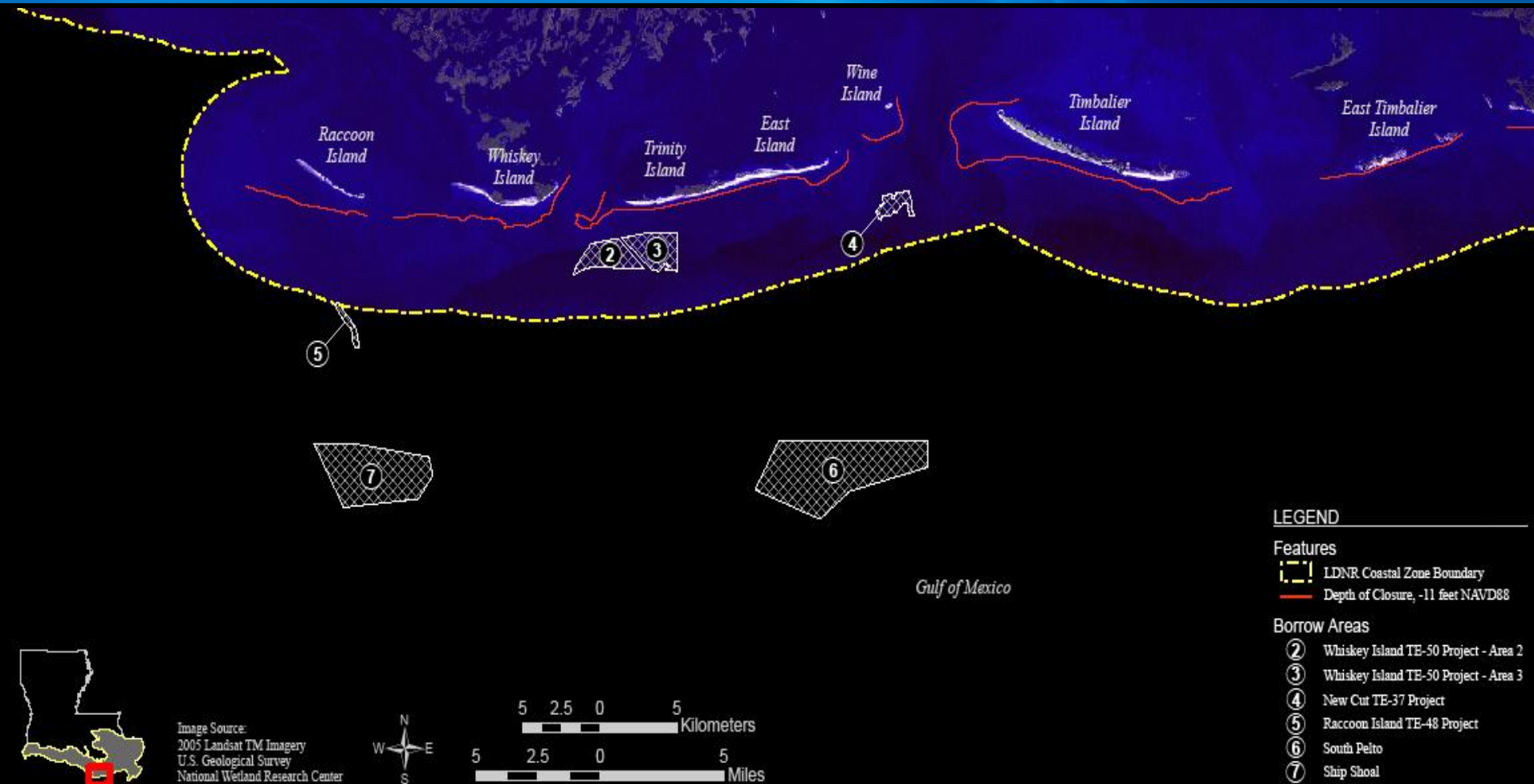
# Plan Elements

- 7 Islands
  - Min, 5,10, 25-year Plans
  - 6 Borrow Areas
- = *Millions of Possible Alternatives*



# Pre-Screening

- Screened borrow area/island combinations
- Paired the most appropriate borrow areas to each measure
- Reduced the number of possible combinations



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- **Benefits**
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# Benefits

- Utilized the WVA Model
- Habitat Zones: Dune, Supratidal, Intertidal
- Island Evolution over 50-Year Period of Analysis
  - Shoreline erosion
  - Sea level rise
  - Subsidence and compaction
  - Overwash and migration
- Compute Weighted Average Scores: Benefit Acres evolved over time \* Suitability Index = “measurement of quality”

# Costs

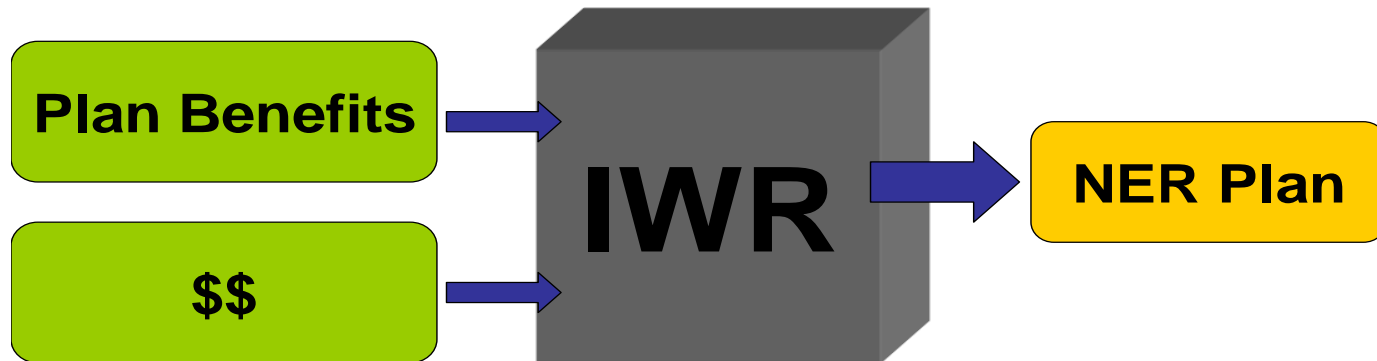
- mob/demob
- surveying
- access channel
- marsh fill
- containment dikes
- beach and dune fill
- breakwater/terminal groin
- sea turtle relocation
- inspection/construction admin

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# IWR Model

- Combines solutions and calculates the additive benefit of each combination
- Cost Effectiveness / Incremental Cost Analysis



Initial output: 244,000 Combinations  
360 Cost effective plan alternatives

# Results of Final IWR Iteration





# Final Array of Alternatives

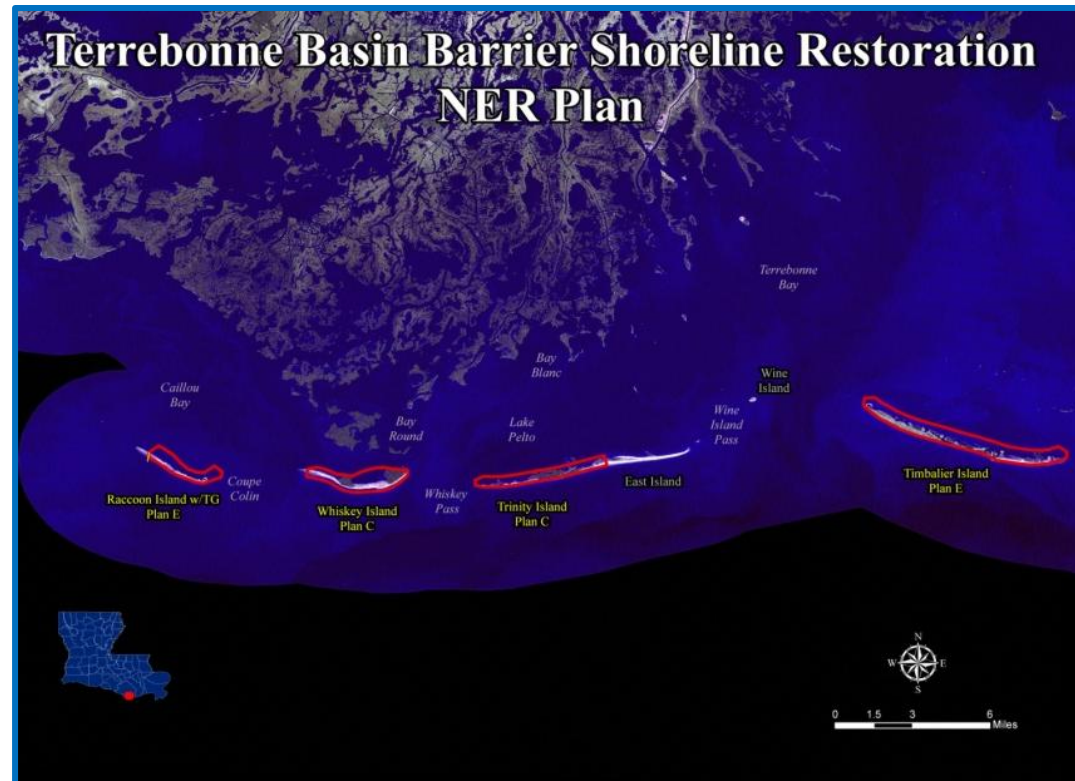
- Alternative 1: No action
- Alternative 2: Timbalier (25-Yr)
- Alternative 3: Whiskey (5-Yr)/Timbalier (25-Yr)
- Alternative 4: Whiskey (5-Yr)/Trinity (5-Yr)/Timbalier (25-Yr)
- Alternative 5: Raccoon with TG (25-Yr)/Whiskey (5-Yr)/Trinity (5-Yr)/Timbalier (25-Yr)
- Alternative 11: Whiskey (5-Yr)

# Recommended Plan

- Cost \$689M
- Restores 5,840 acres
- Includes periodic renourishment

## Option B:

- Single-island component, Whiskey Island, cost \$119 M
- Restores 1,272 acres
- Recommended additional Congressional action to allow construction of the full NER plan



# Whiskey 5 -Year Plan

Creates 469 acres of habitat



# Questions?



# Raccoon 25 -Year Plan

Creates 554 acres of habitat



# Trinity 5-Year Plan

Creates 585 acres of habitat



# Timbalier 25-Year Plan

Creates 1,675 acres of habitat

