Louisiana's Coastal Program

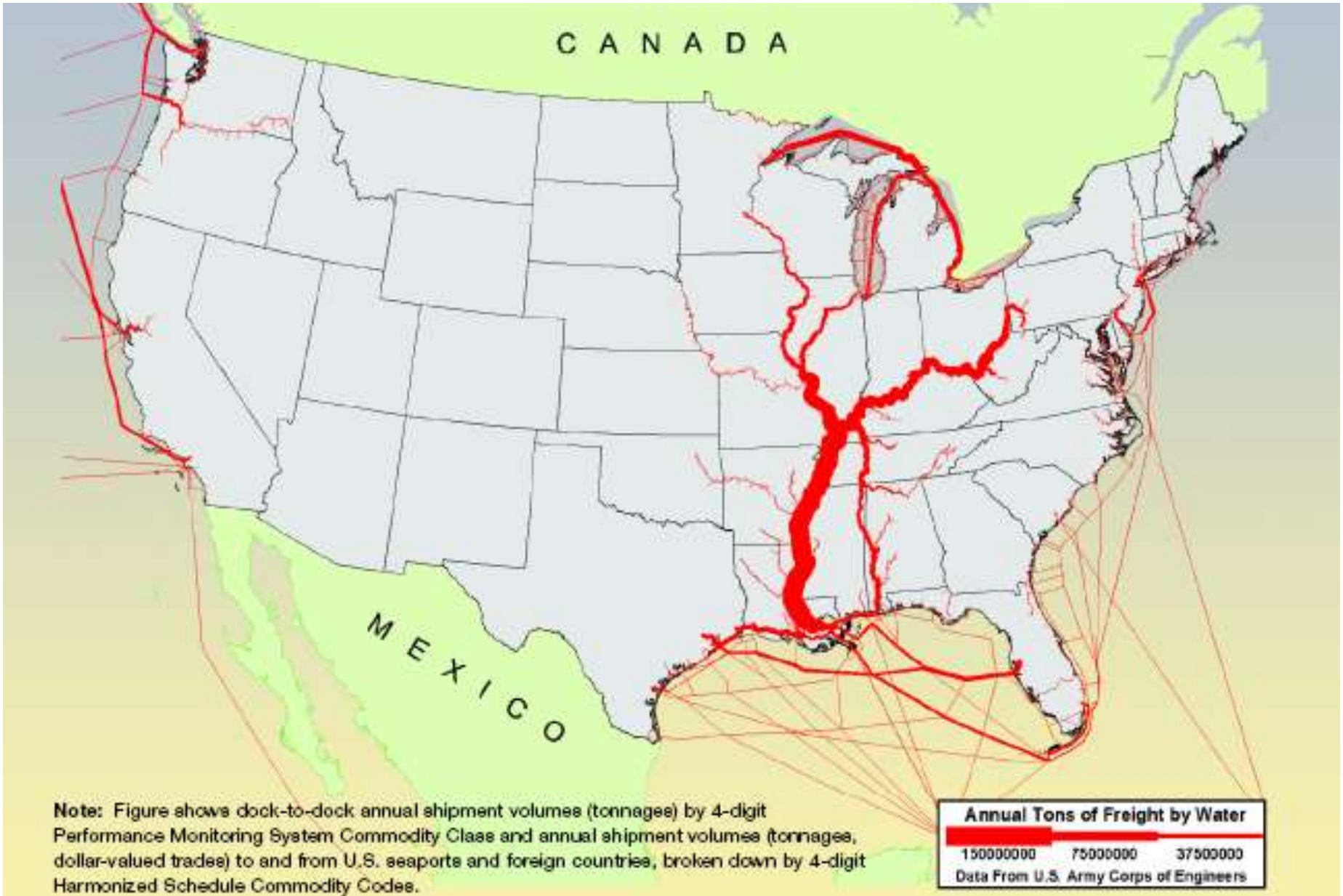
committed to **our coast**

Louisiana's National Role

Ports - Cargo

- **Top tonnage port in the nation**
- **Five of the top 15 tonnage ports in the US**
- **One of the largest cargo port complexes in the world**
- **19 percent of all domestic waterborne commerce**
- **Over 30 states depend upon Louisiana's ports for imports and exports…..**

Annual Tons of Freight by Water



U.S. Department of Transportation
Federal Highway Administration
Office of Freight Management and Operations
Freight Analysis Framework

Total Combined Truck Flows
(1998)

NEW YORK

Network Flows
(Tons)
- 0 - 2,000,000
- 2,000,000 - 5,000,000
- 5,000,000 - 10,000,000
- 10,000,000 - 25,000,000
- More Than 25,000,000

BEA to State Flows
(Tons)
- 0 - 1,000,000
- 1,000,000 - 3,000,000
- 3,000,000 - 9,000,000
- More Than 9,000,000

U.S. Department of Transportation
Federal Highway Administration
Office of Freight Management and Operations
Freight Analysis Framework

Total Combined Truck Flows
(1998)

LOS ANGELES

Network Flows
(Tons)
- 0 - 2,000,000
- 2,000,000 - 5,000,000
- 5,000,000 - 10,000,000
- 10,000,000 - 25,000,000
- More Than 25,000,000

BEA to State Flows
(Tons)
- 0 - 1,000,000
- 1,000,000 - 3,000,000
- 3,000,000 - 9,000,000
- More Than 9,000,000

U.S. Department of Transportation
Federal Highway Administration
Office of Freight Management and Operations
Freight Analysis Framework

Total Combined Truck Flows
(1998)

HOUSTON

Network Flows
(Tons)
- 0 - 2,000,000
- 2,000,000 - 5,000,000
- 5,000,000 - 10,000,000
- 10,000,000 - 25,000,000
- More Than 25,000,000

BEA to State Flows
(Tons)
- 0 - 1,000,000
- 1,000,000 - 3,000,000
- 3,000,000 - 9,000,000
- More Than 9,000,000

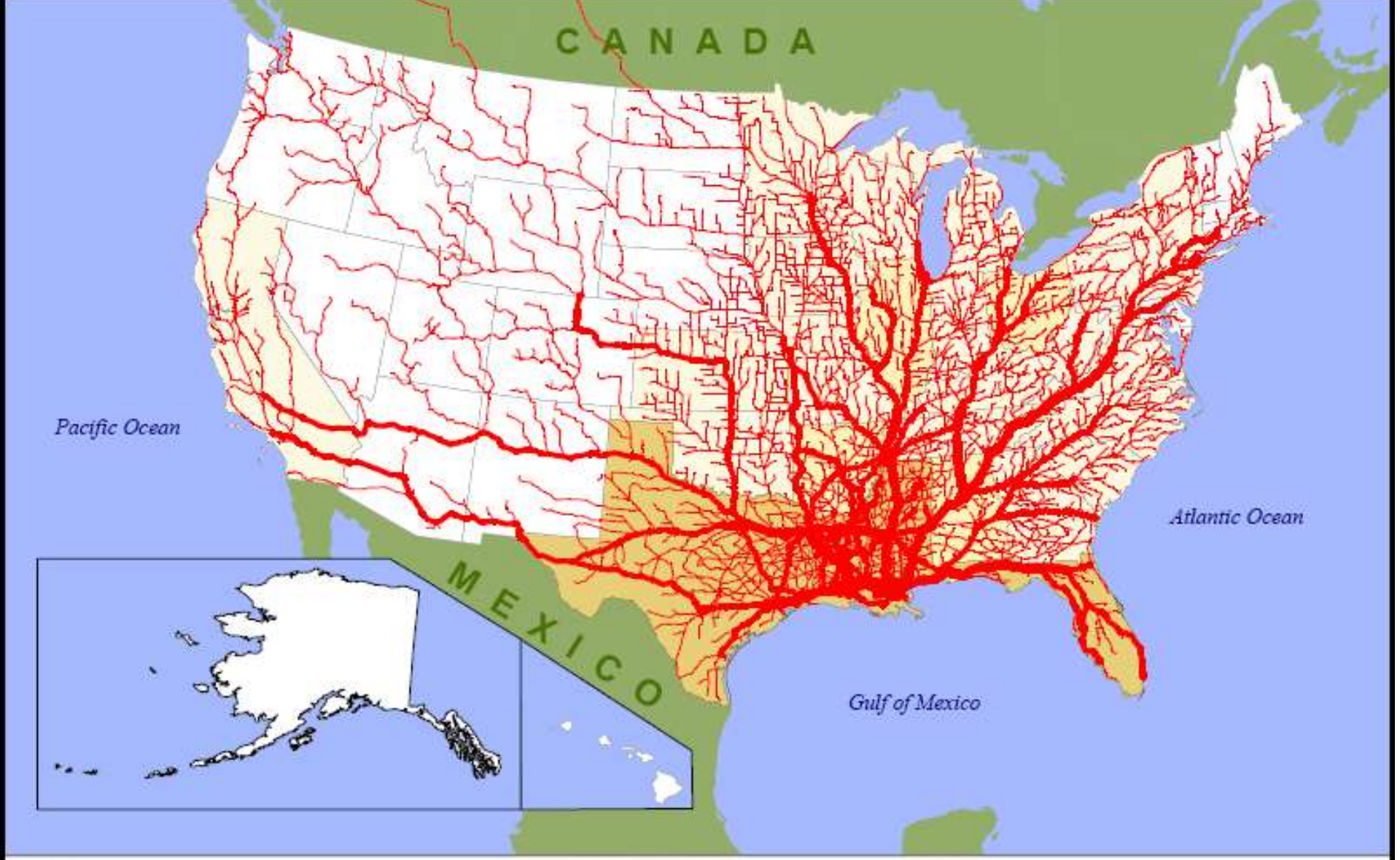
U.S. Department of Transportation
Federal Highway Administration
Office of Freight Management and Operations
Freight Analysis Framework

Total Combined Truck Flows
(1998)

NEW ORLEANS

Network Flows
(Tons)
- 0 - 2,000,000
- 2,000,000 - 5,000,000
- 5,000,000 - 10,000,000
- 10,000,000 - 25,000,000
- More Than 25,000,000

BEA to State Flows
(Tons)
- 0 - 1,000,000
- 1,000,000 - 3,000,000
- 3,000,000 - 9,000,000
- More Than 9,000,000



U.S. Department of Transportation
Federal Highway Administration
Office of Freight Management and Operations
Freight Analysis Framework

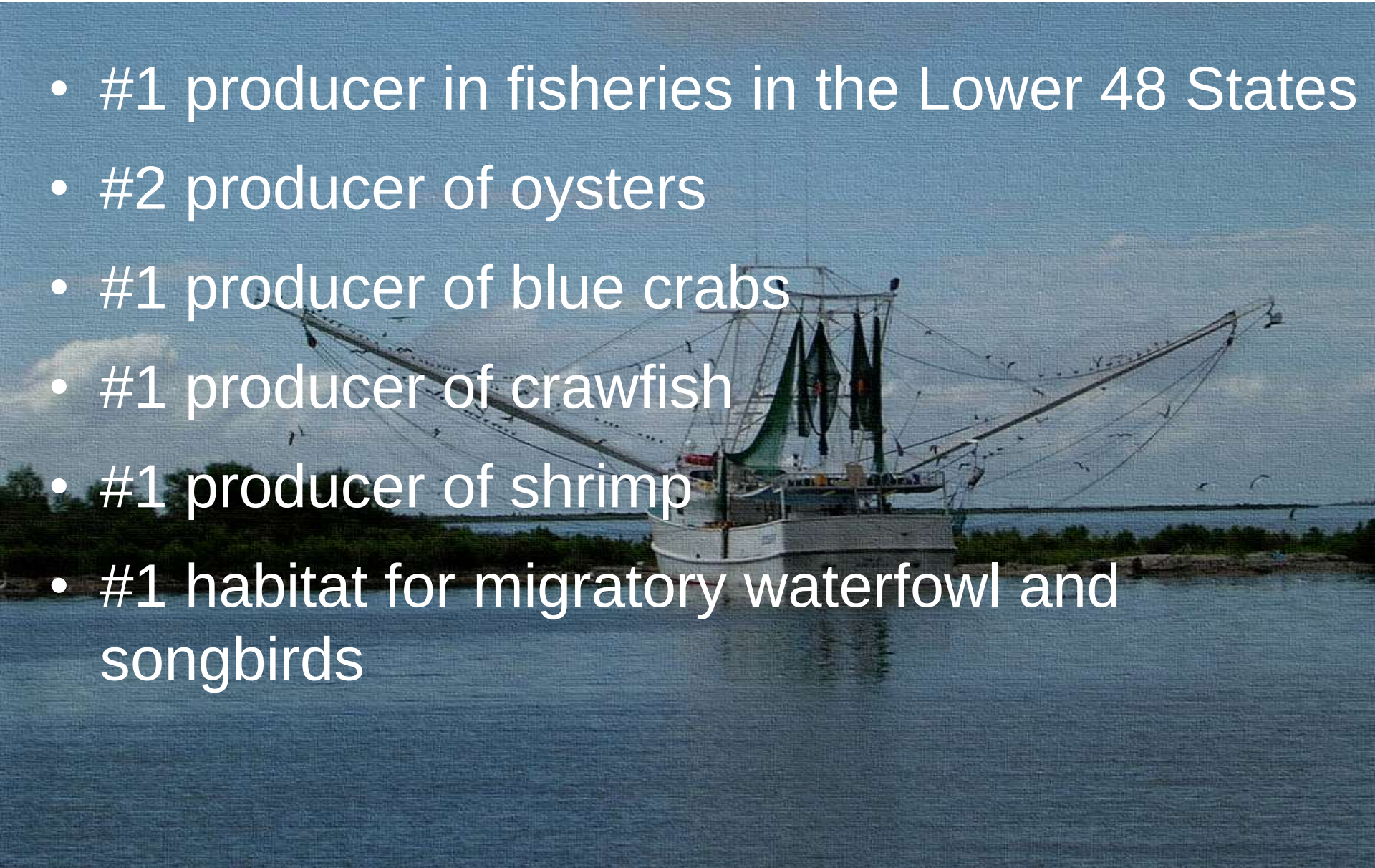
Total Combined Truck Flows
(1998)

LOUISIANA

Network Flows
(Tons)
- 0 - 500,000
- 500,000 - 1,000,000
- 1,000,000 - 10,000,000
- 10,000,000 - 50,000,000
- More Than 50,000,000

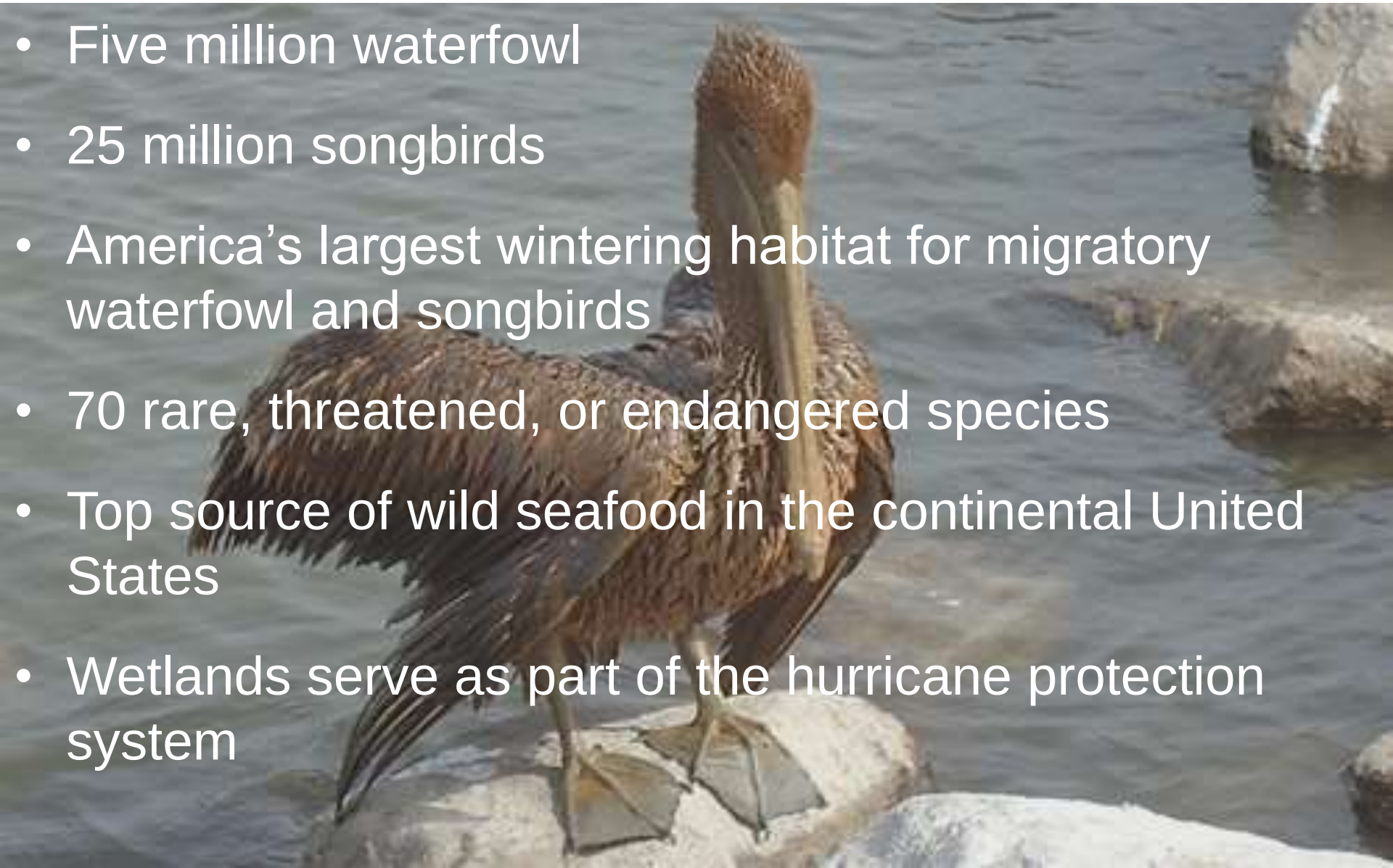
State to State Flows
(Tons)
- 0 - 1,000,000
- 1,000,000 - 5,000,000
- 5,000,000 - 10,000,000
- More Than 10,000,000

Seafood and Wildlife



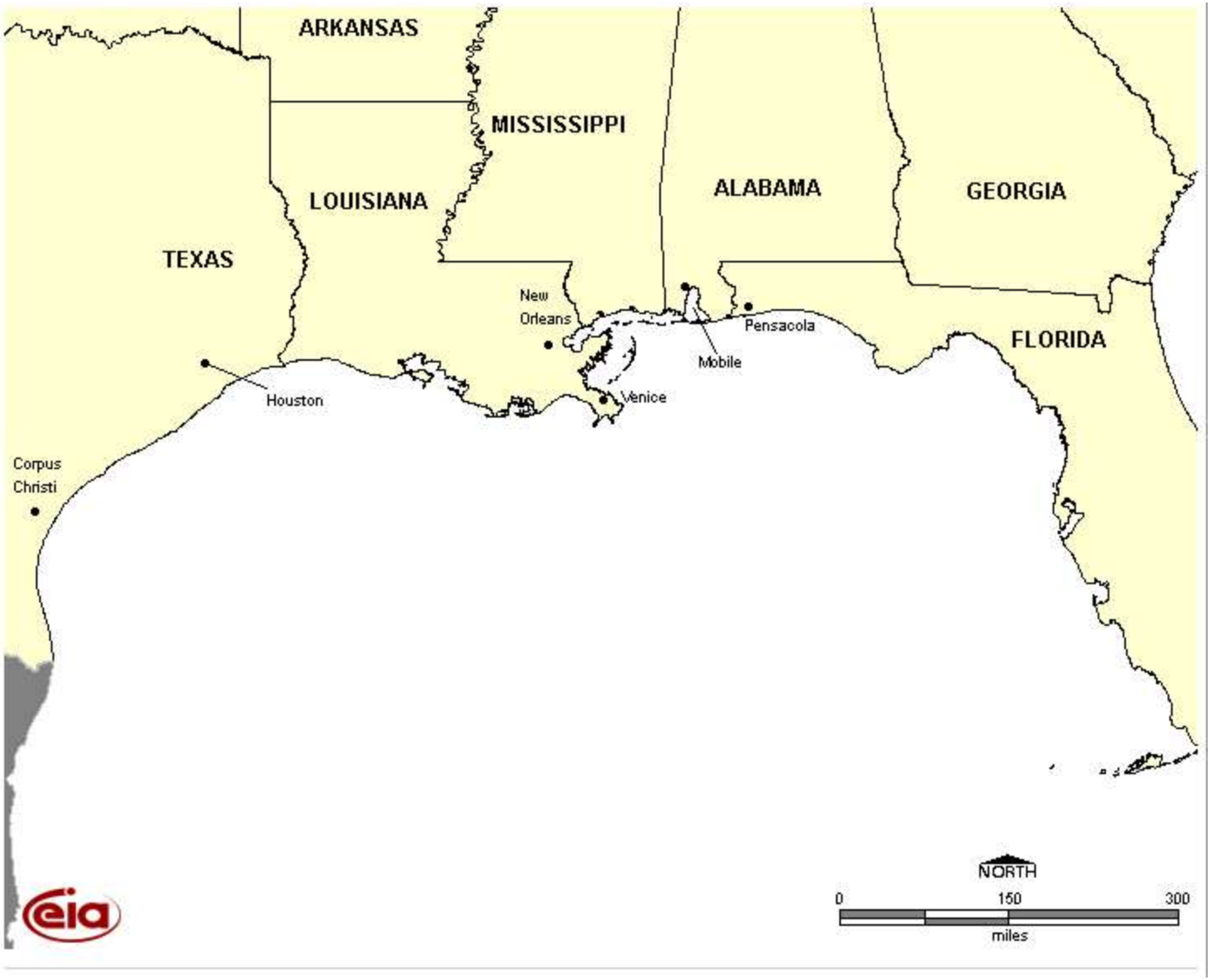
- #1 producer in fisheries in the Lower 48 States
- #2 producer of oysters
- #1 producer of blue crabs
- #1 producer of crawfish
- #1 producer of shrimp
- #1 habitat for migratory waterfowl and songbirds

Ecosystem Services

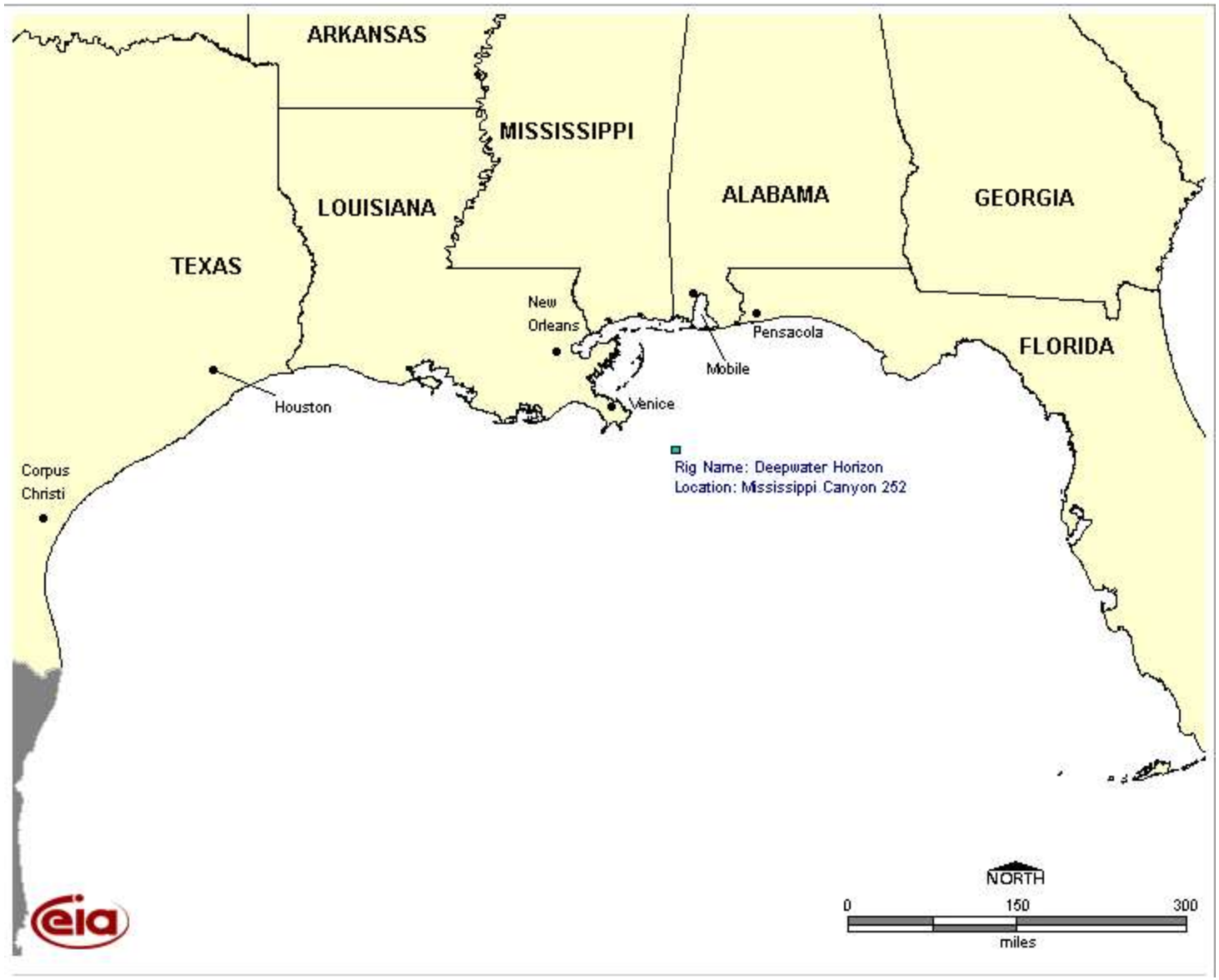


- Five million waterfowl
- 25 million songbirds
- America’s largest wintering habitat for migratory waterfowl and songbirds
- 70 rare, threatened, or endangered species
- Top source of wild seafood in the continental United States
- Wetlands serve as part of the hurricane protection system

Gulf of Mexico-Energy

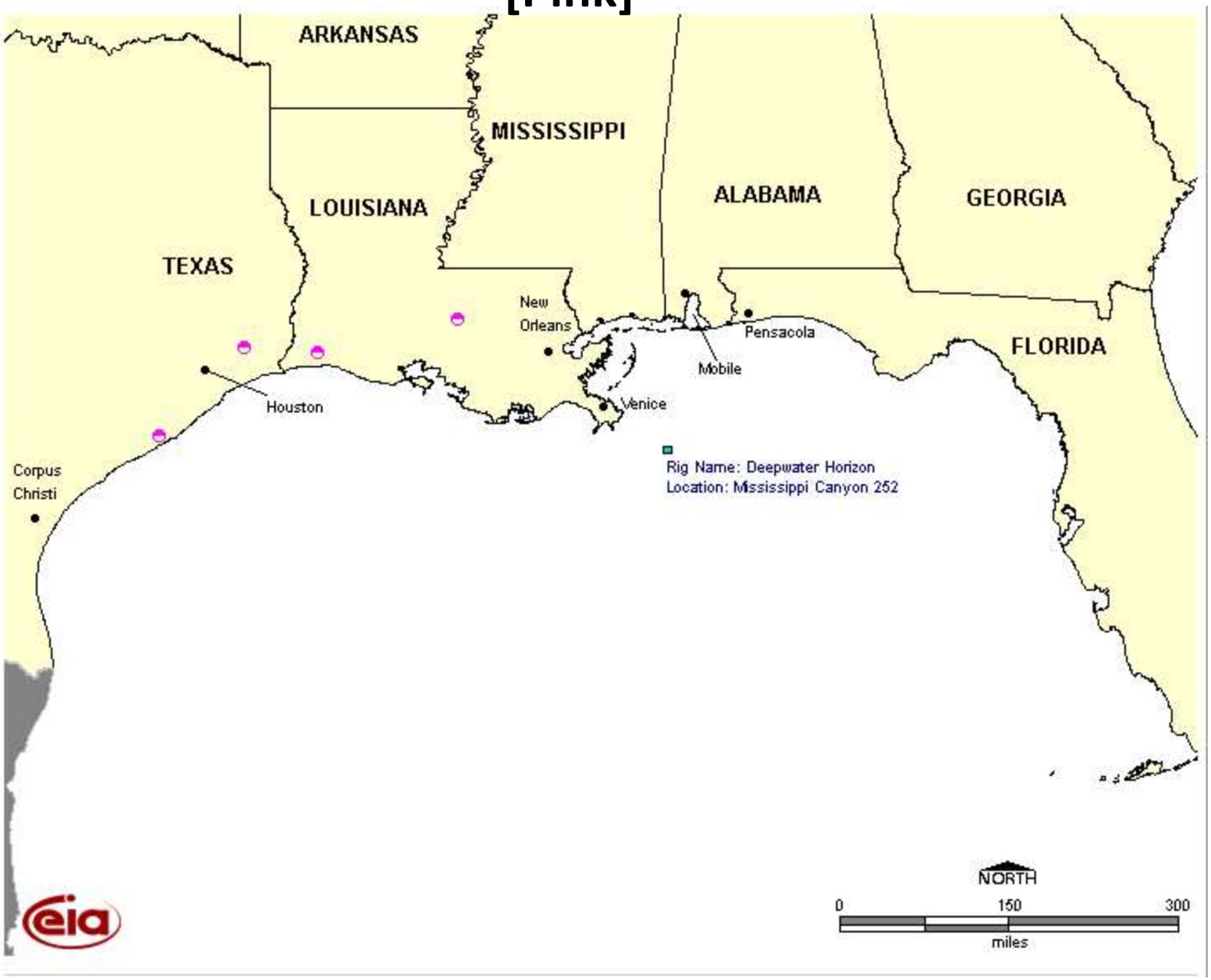


Deepwater Horizon Well Site



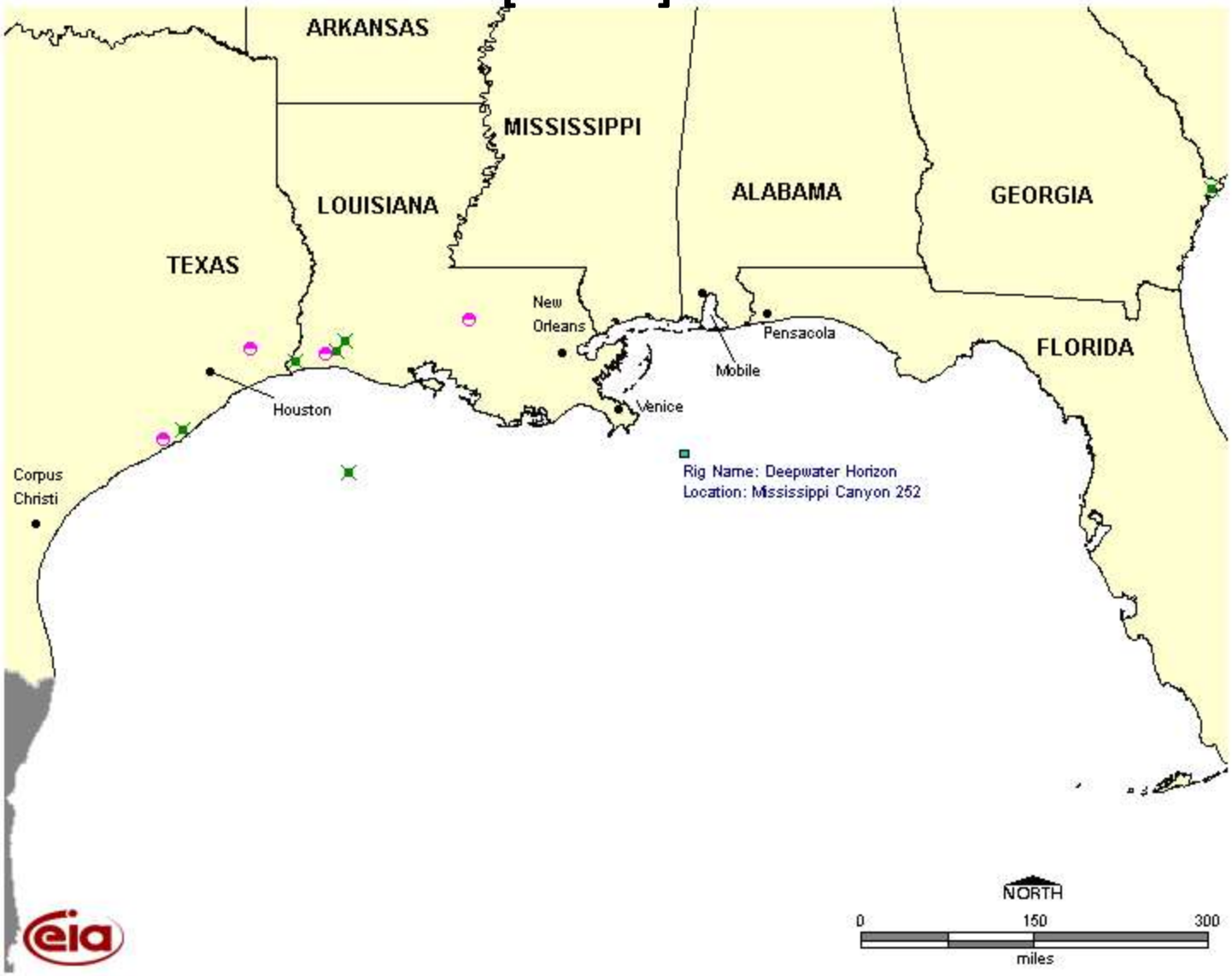
Strategic Petroleum Reserves

[Pink]



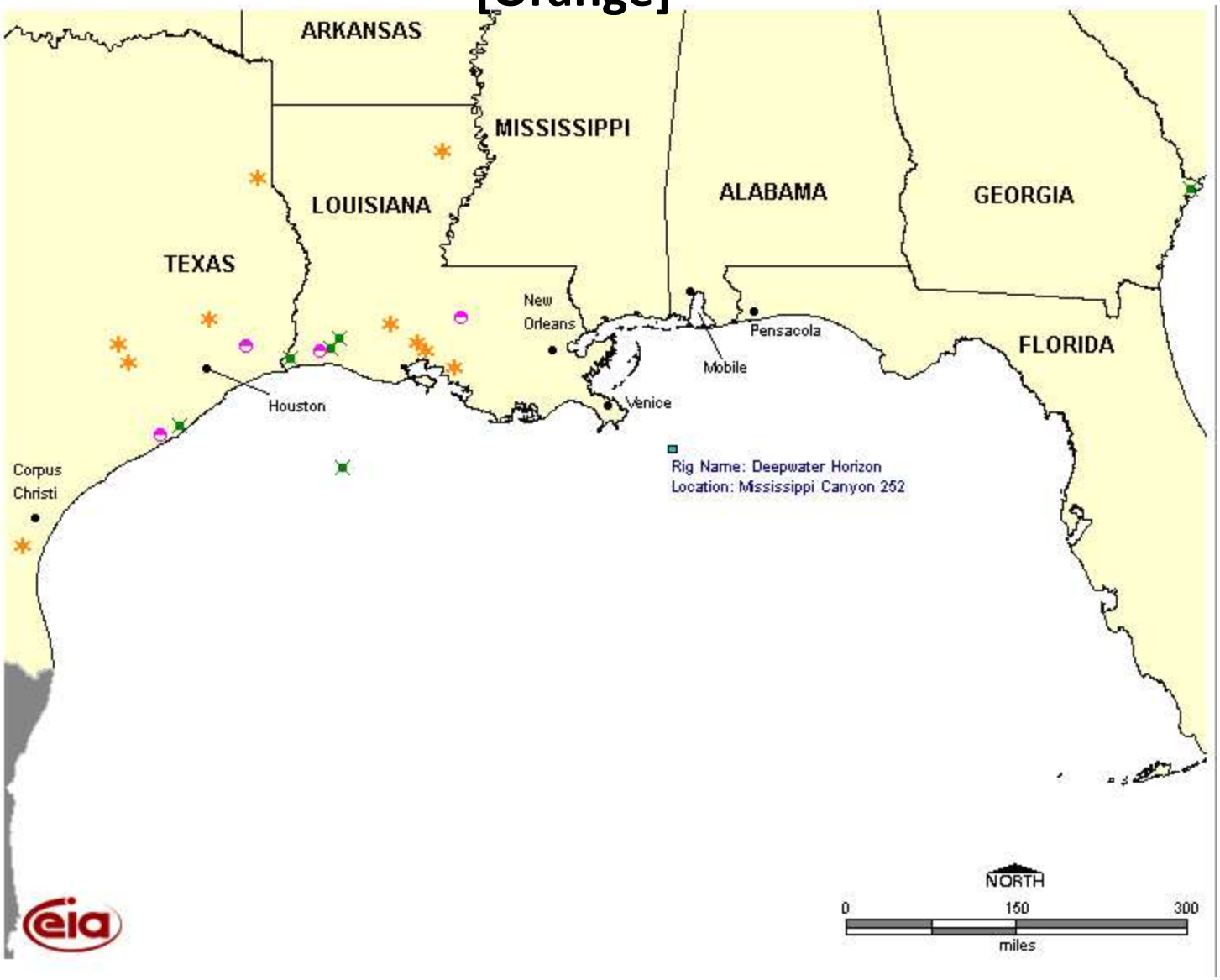
LNG Terminals

[Green]



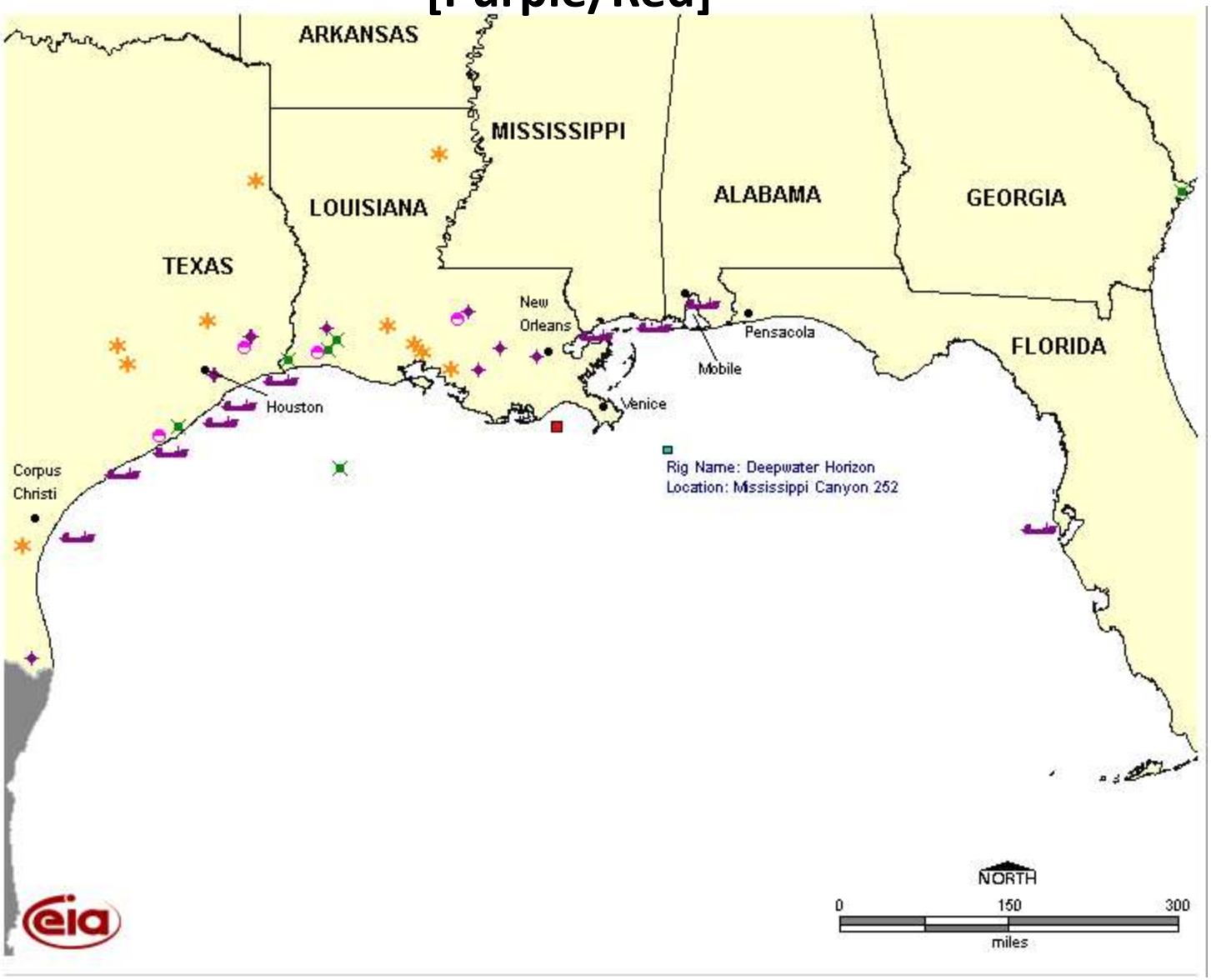
Natural Gas Market Center (Hubs)

[Orange]



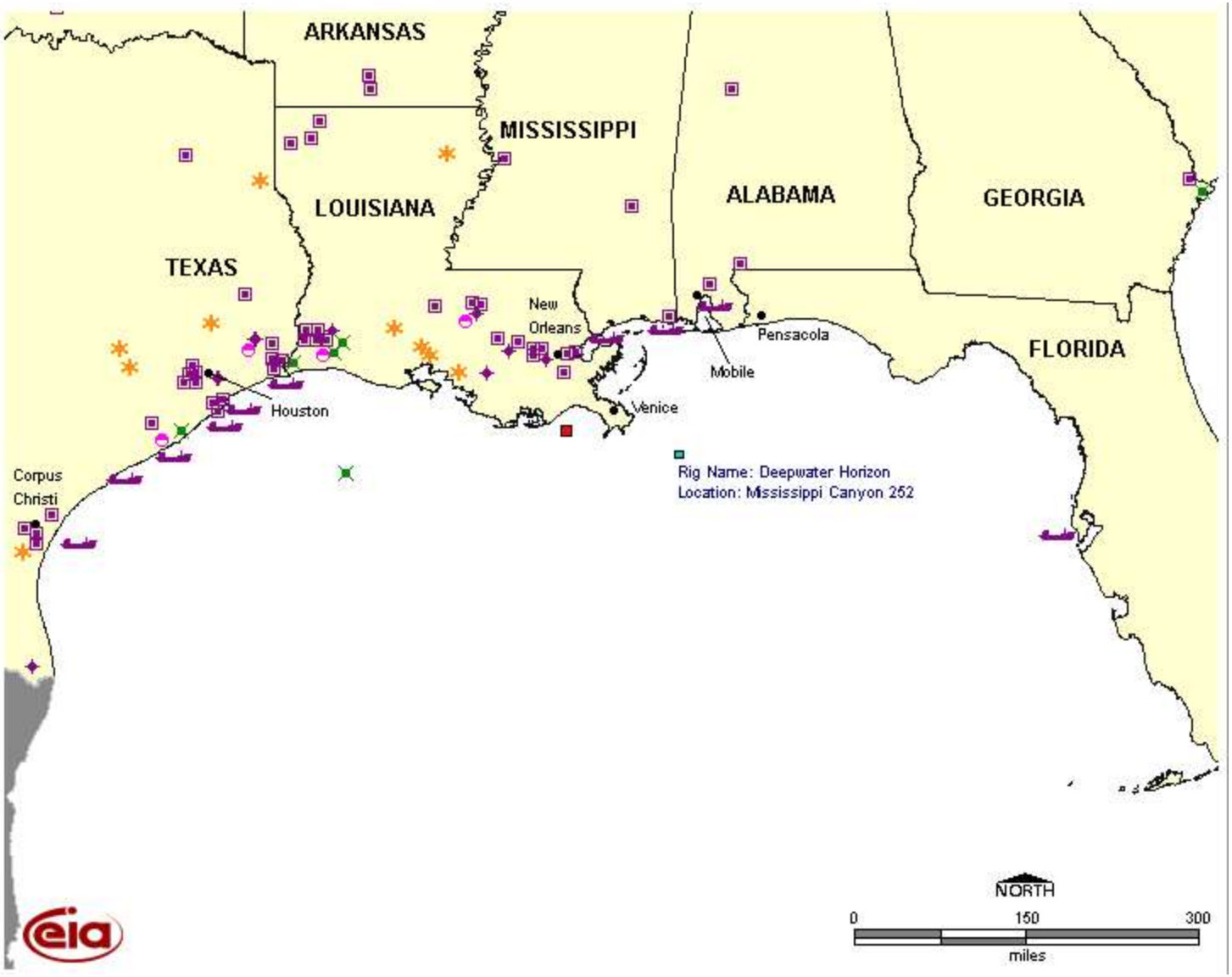
Oil Import Sites/Seaports

[Purple/Red]



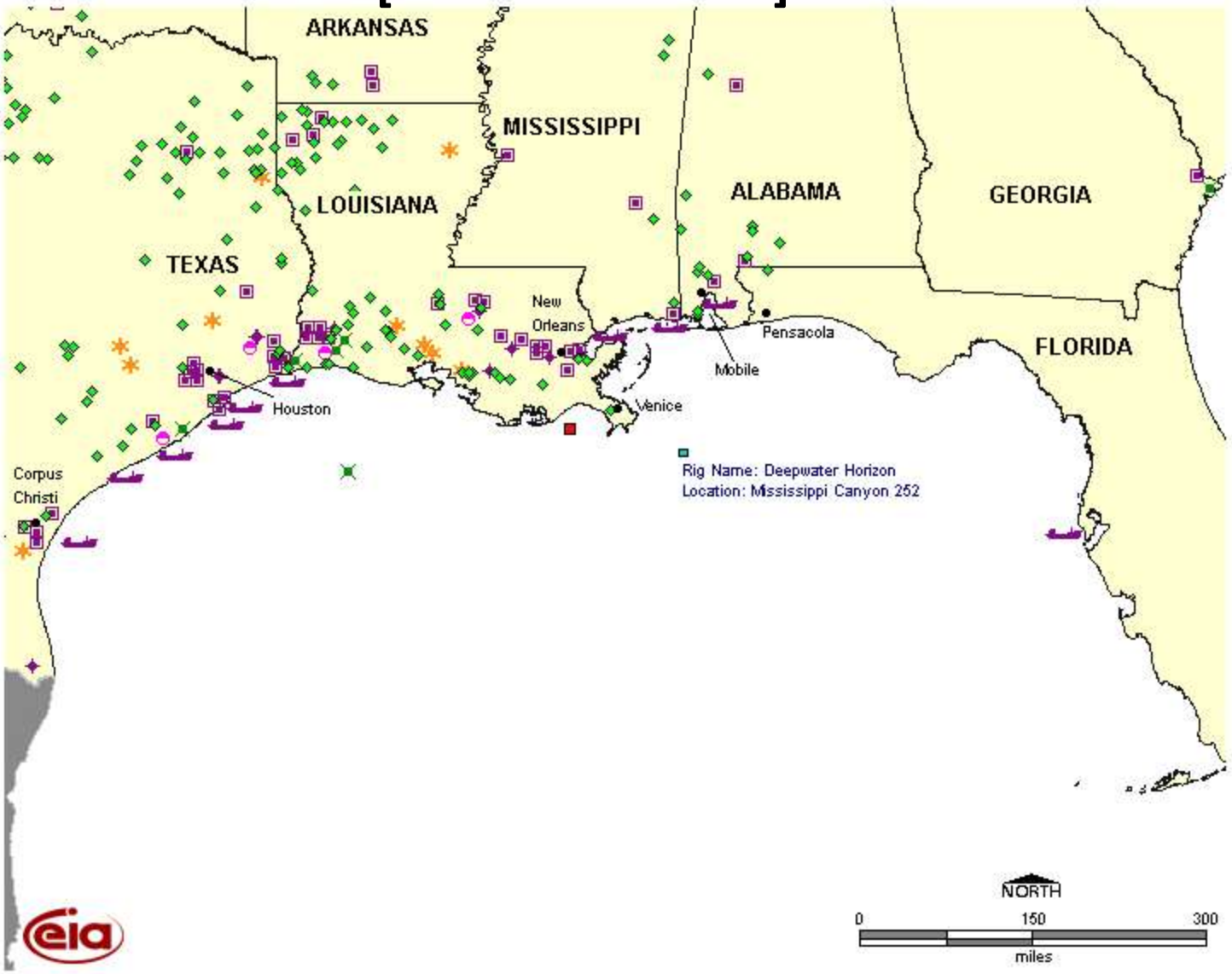
Petroleum Refineries

[Purple Squares]



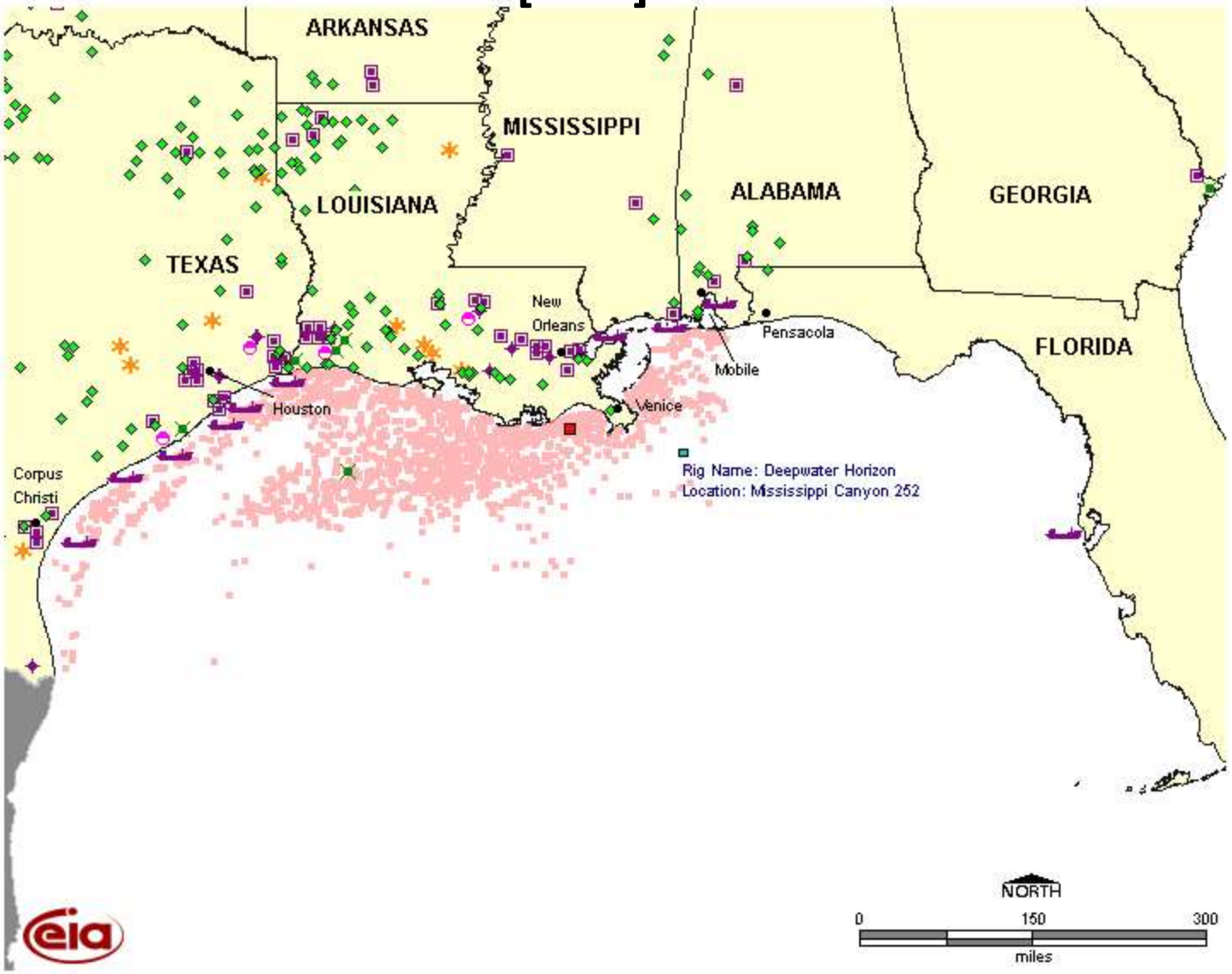
Natural Gas Processing Facilities

[Green Diamonds]

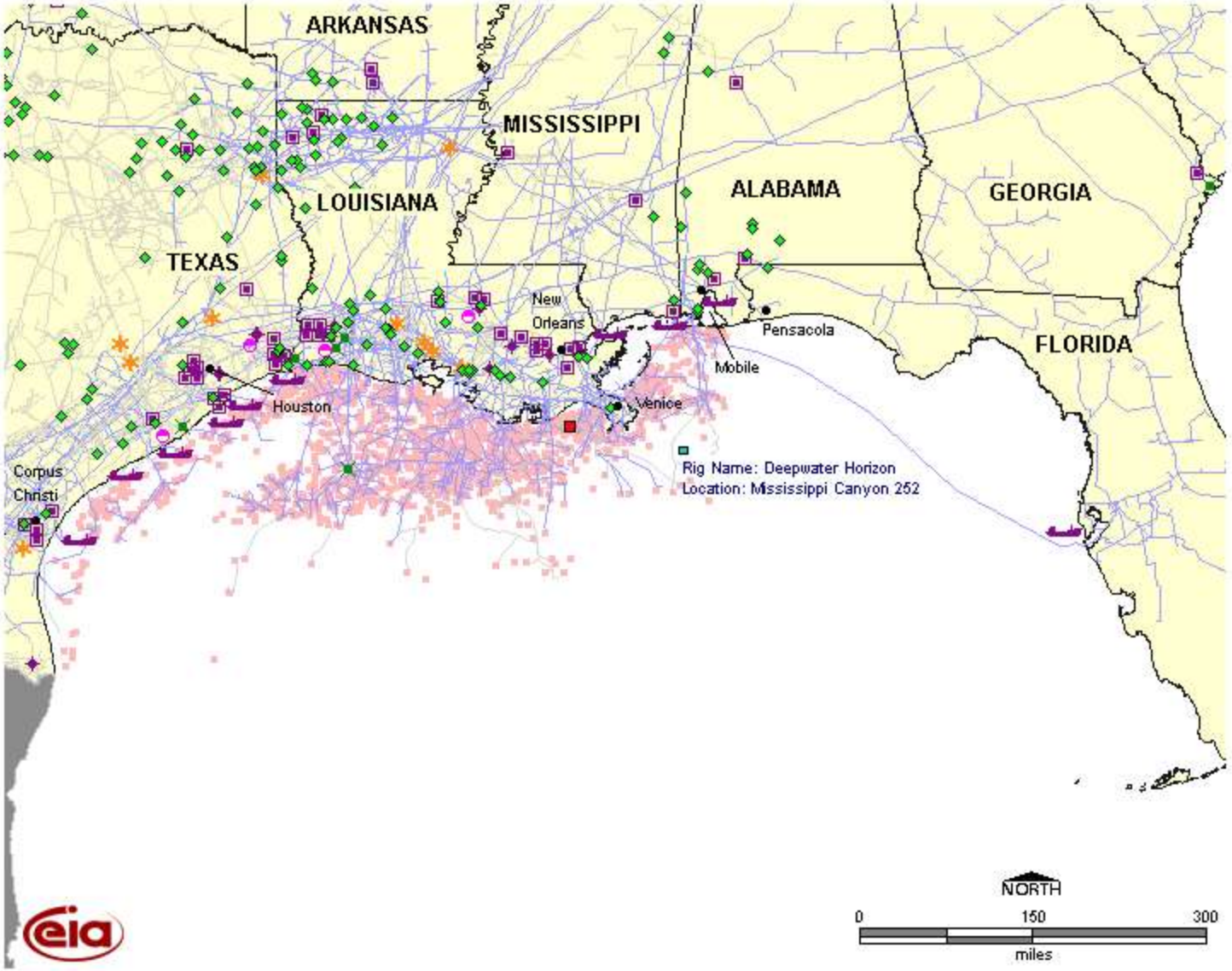


Active Offshore Oil/Gas Platforms

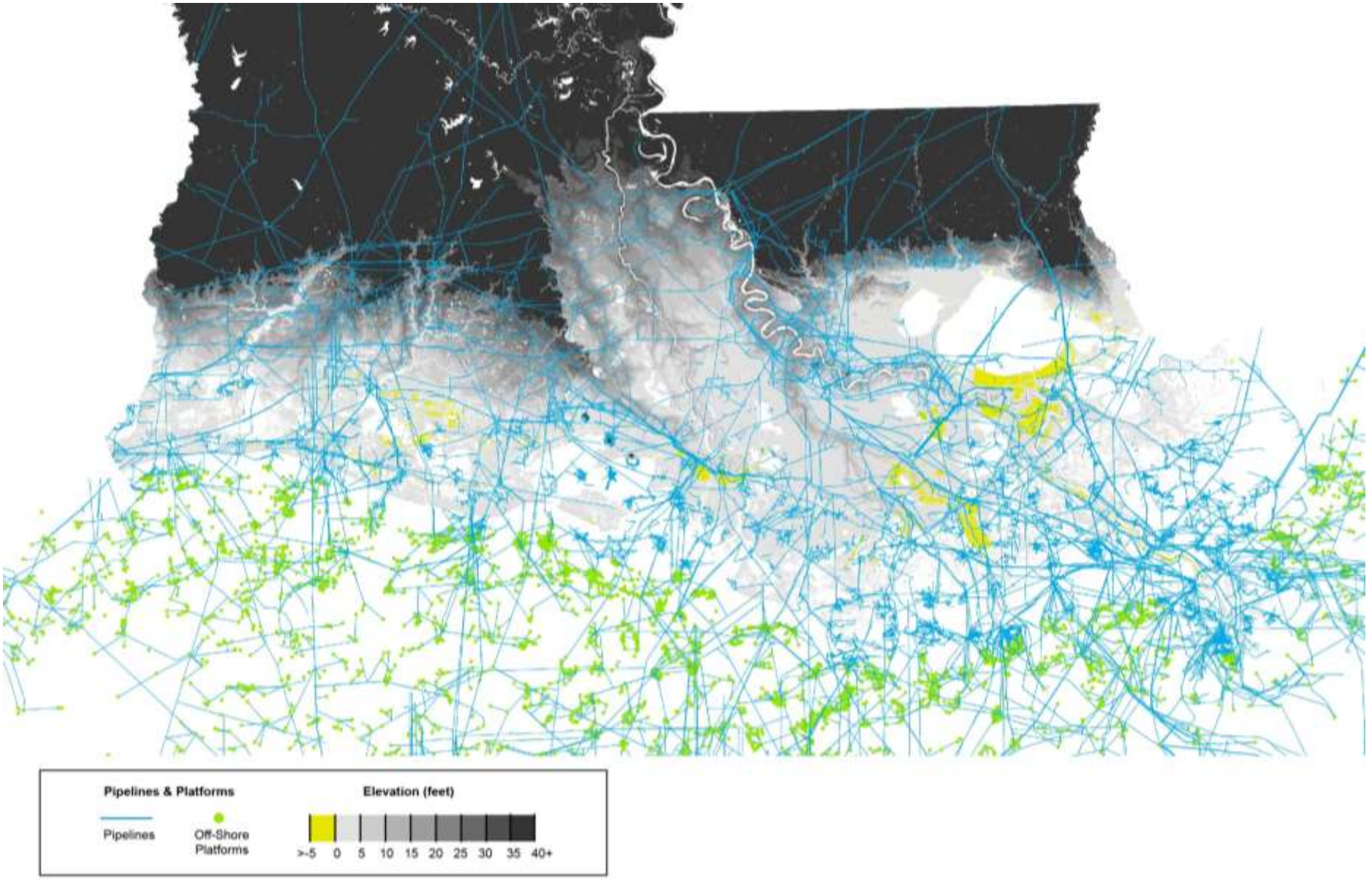
[Pink]



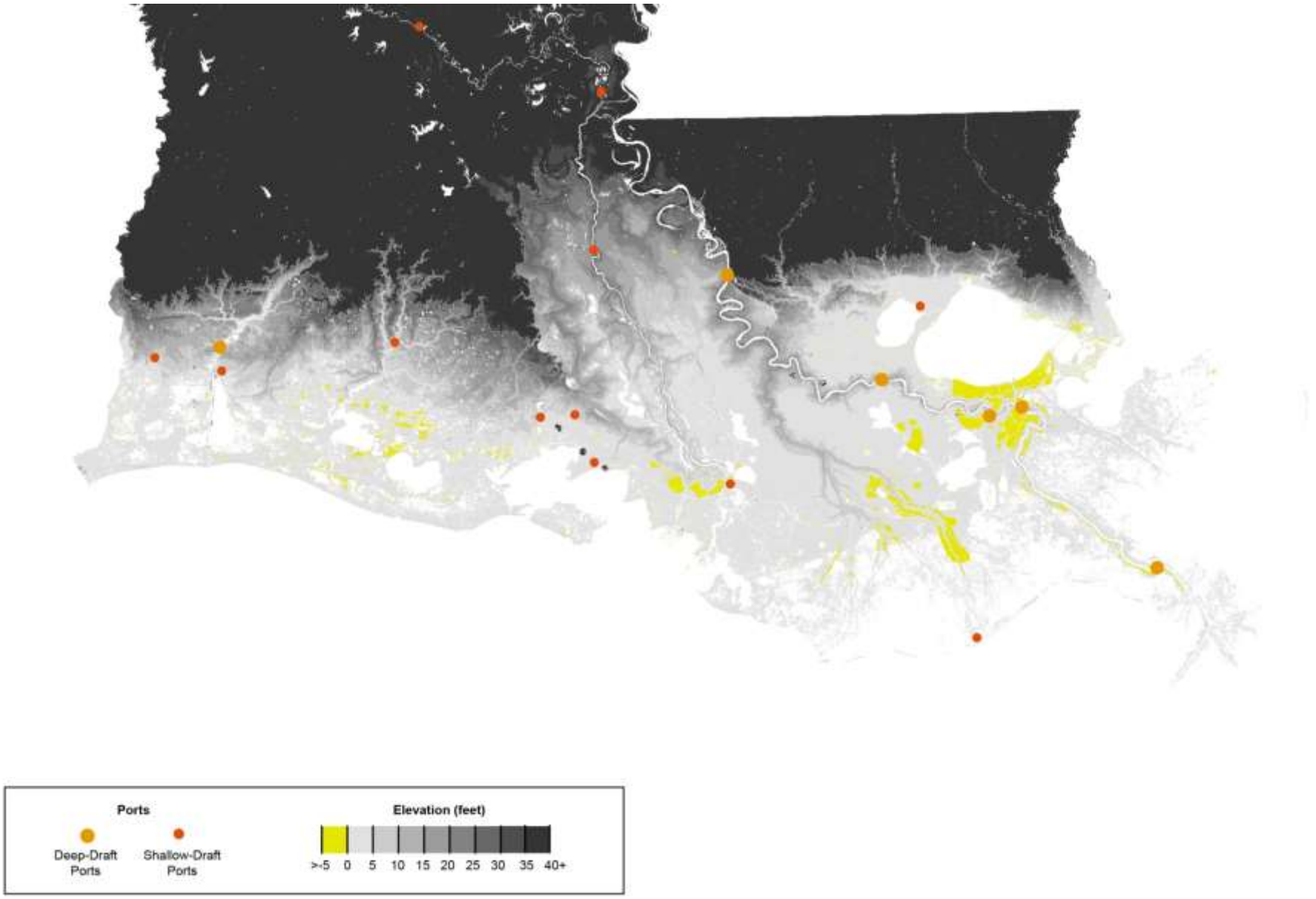
Natural Gas Gathering/Interstate Pipelines



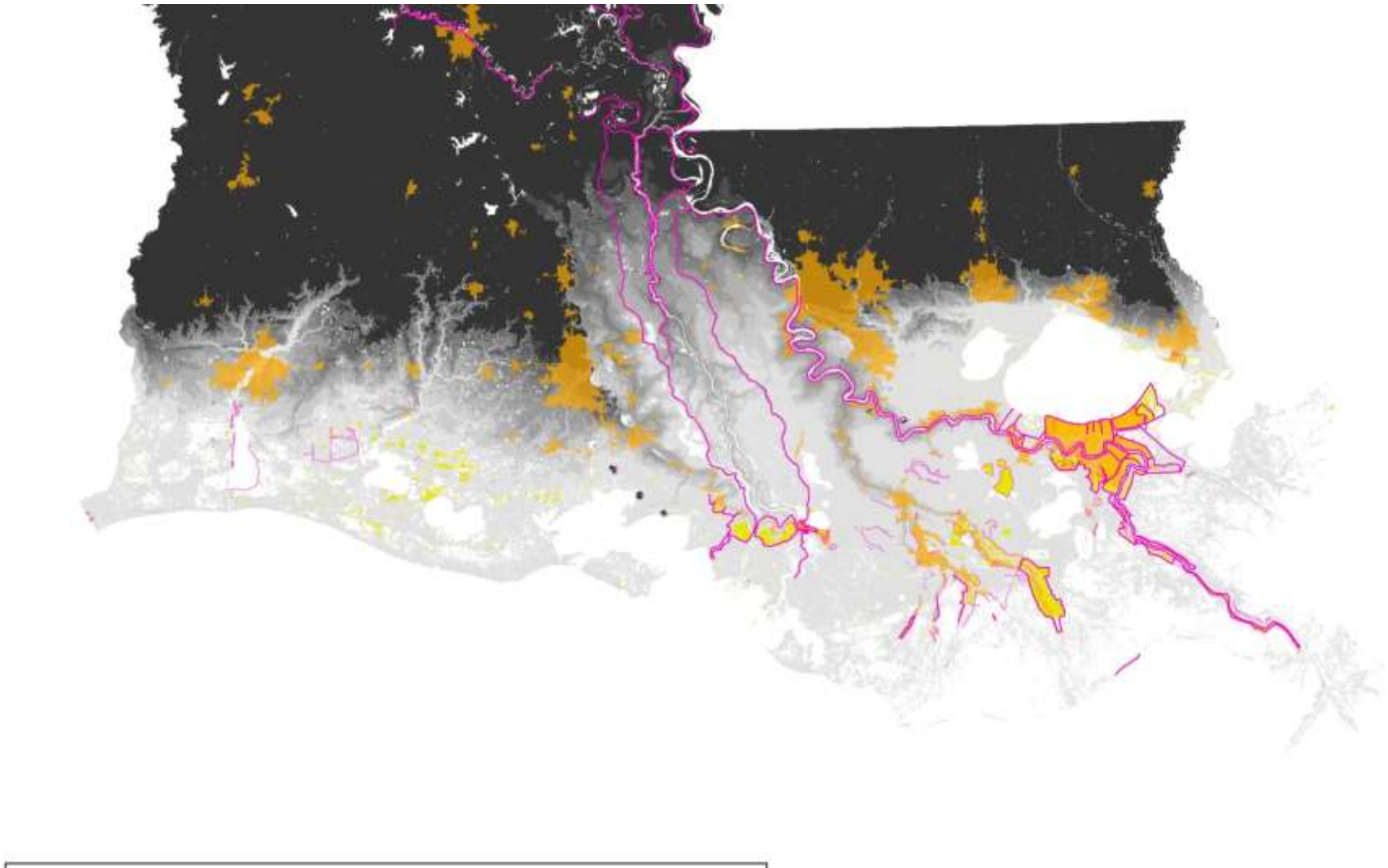
Coastal Louisiana: *oil & gas infrastructure*



Coastal Louisiana: *port system*



Coastal Louisiana: *urban areas*

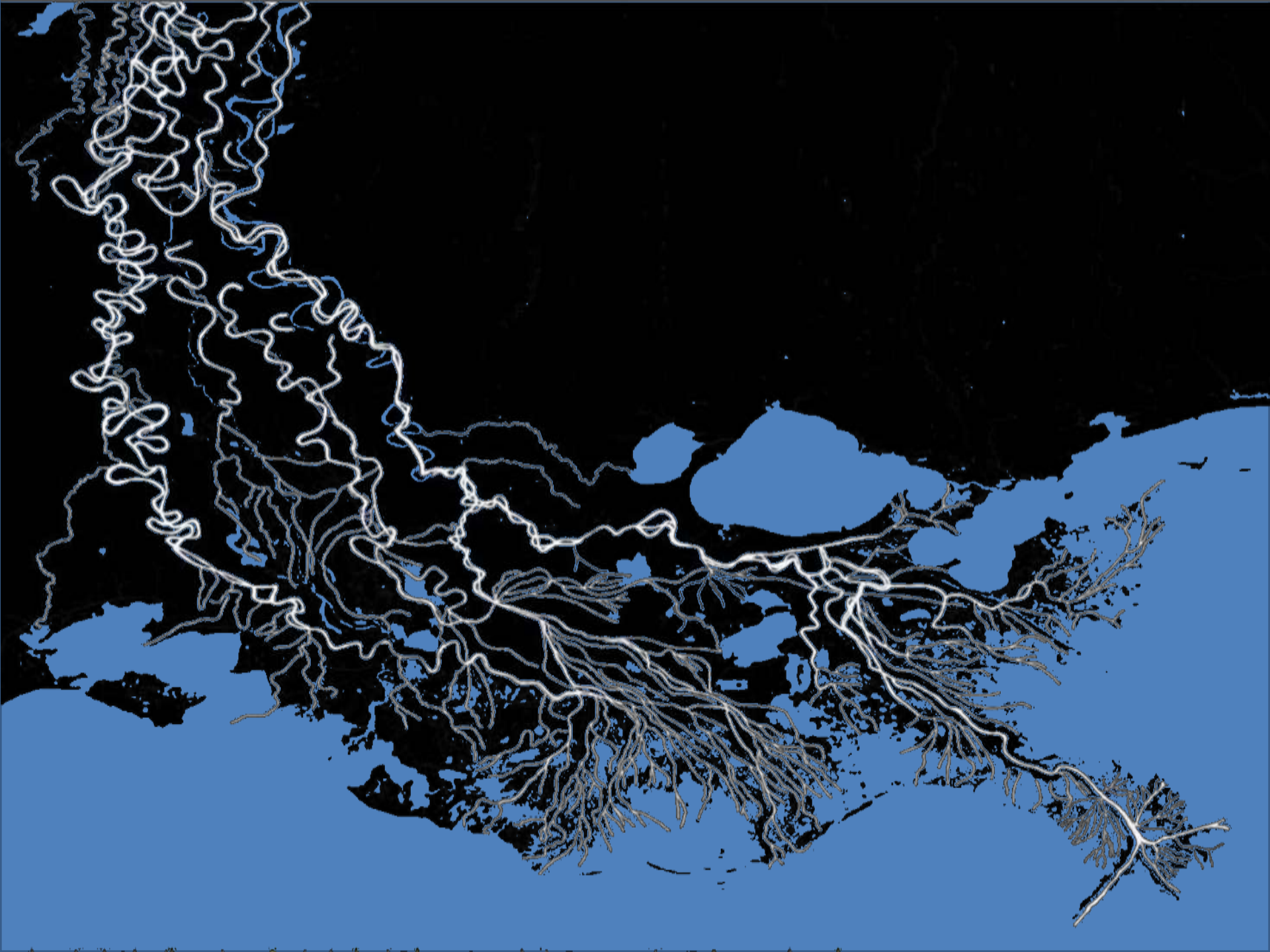


Sustainable?
Our Coastal Crisis

Louisiana is Experiencing a Coastal Crisis

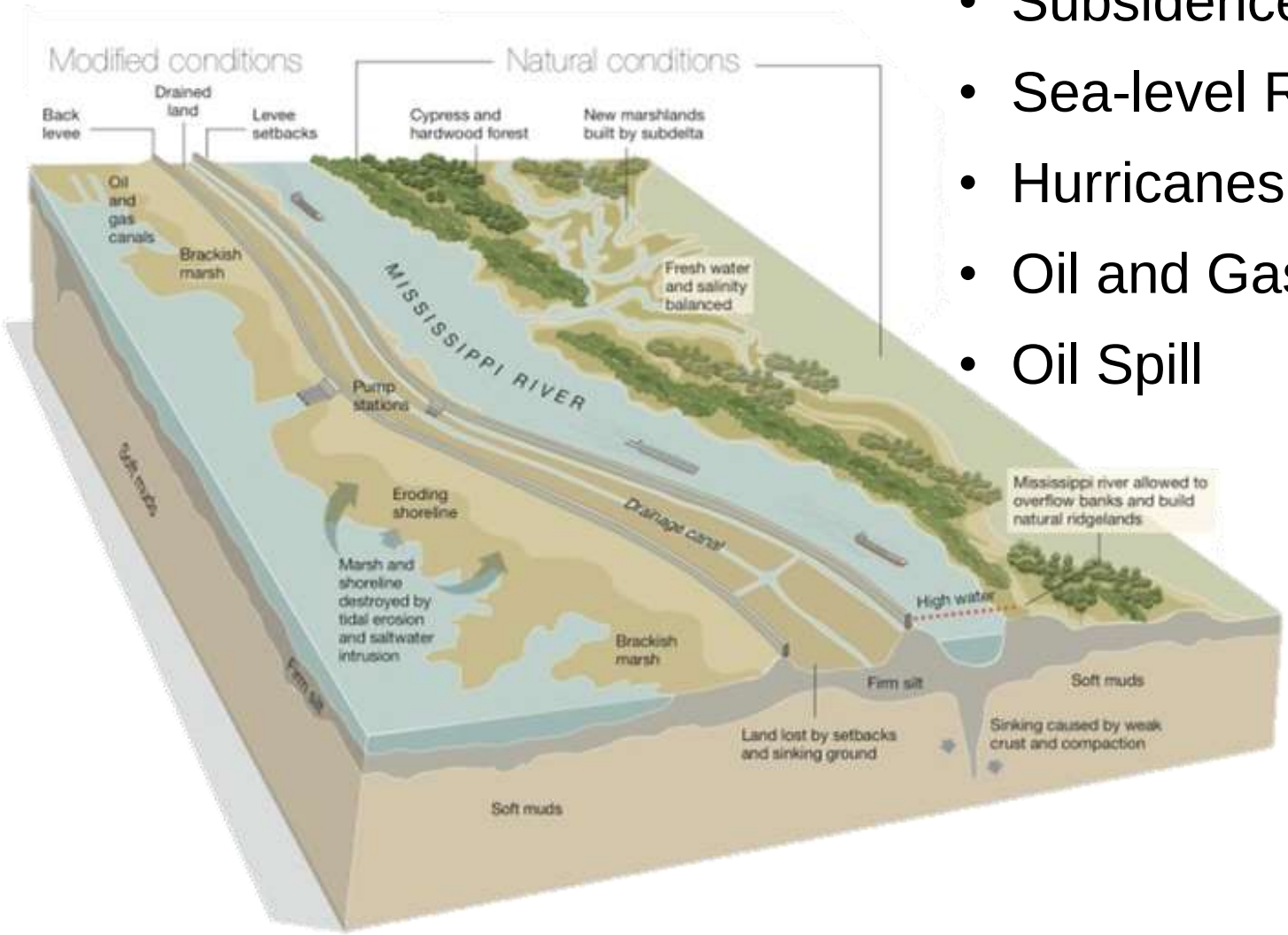
1,883 square miles lost since the 1930s

Currently losing over **16** square miles per year

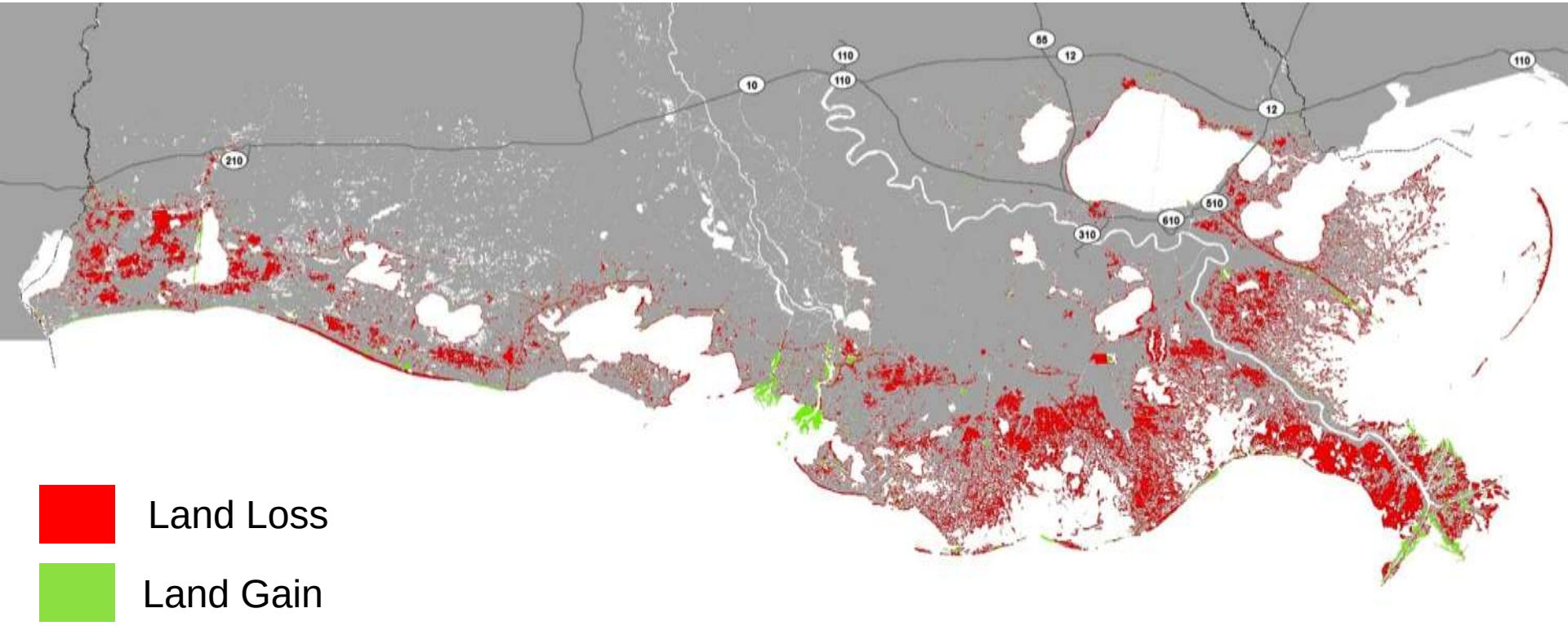


Main Causes of Land Loss

- Levees/Dams
- Subsidence
- Sea-level Rise
- Hurricanes
- Oil and Gas Infrastructure
- Oil Spill



Land Area Change in Coastal LA 1932 – 2010 SURVEY THE SCENE

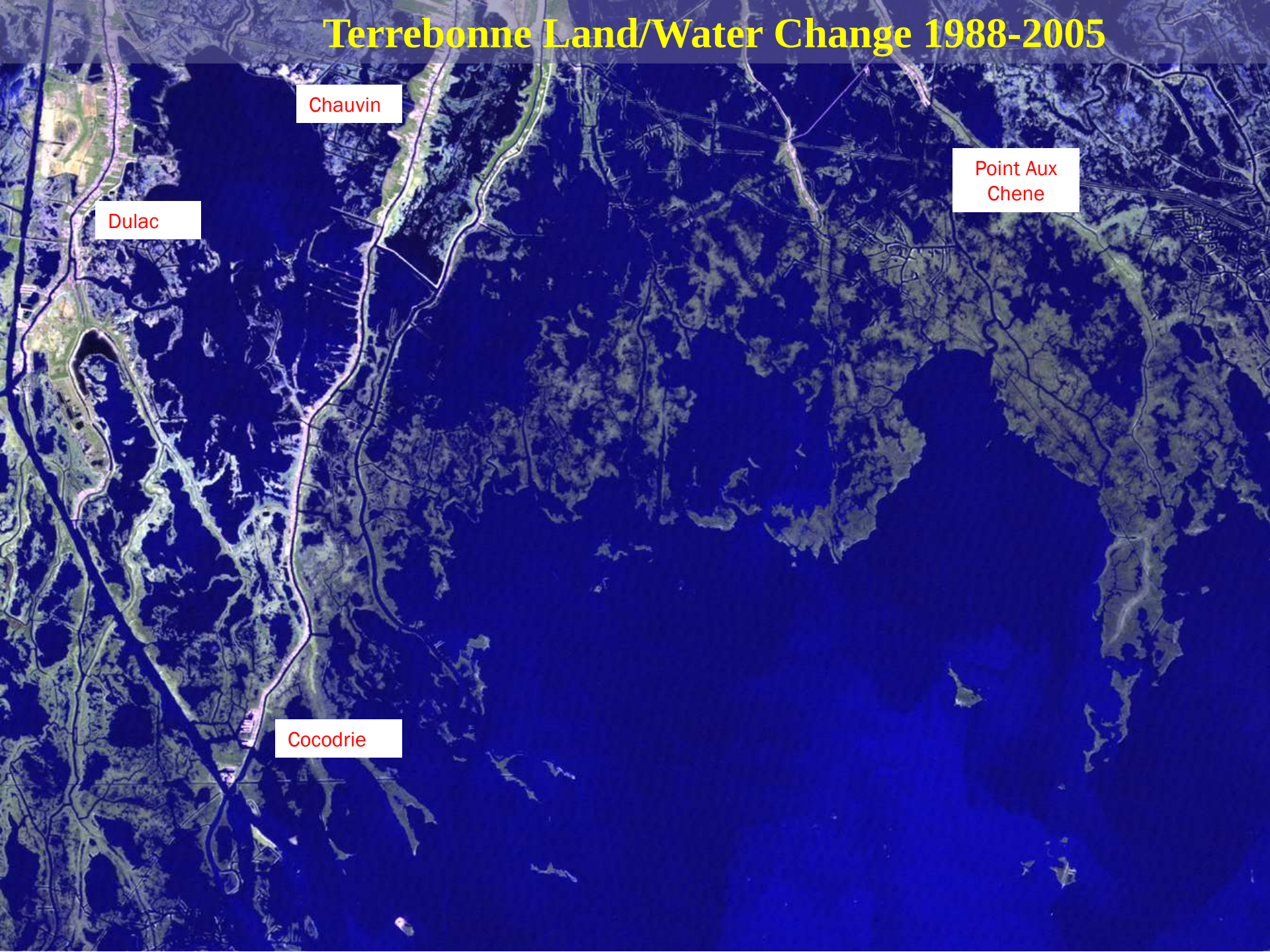


Historic Land-Water Change from 1932-2010

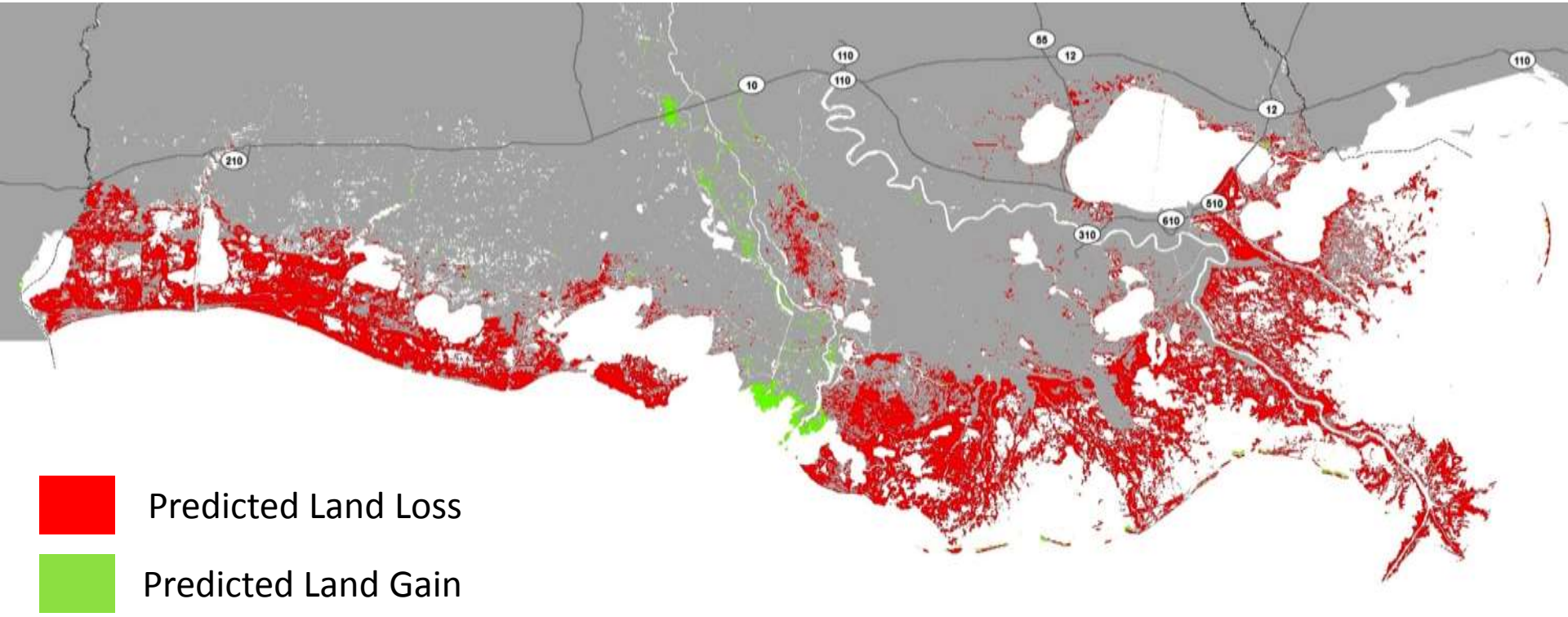
Approx. 1,900 sq. mi. (492,100 ha.)

Couvillion et al (USGS), 2011

Terrebonne Land/Water Change 1988-2005



HOW BAD IS IT- Future Without Action

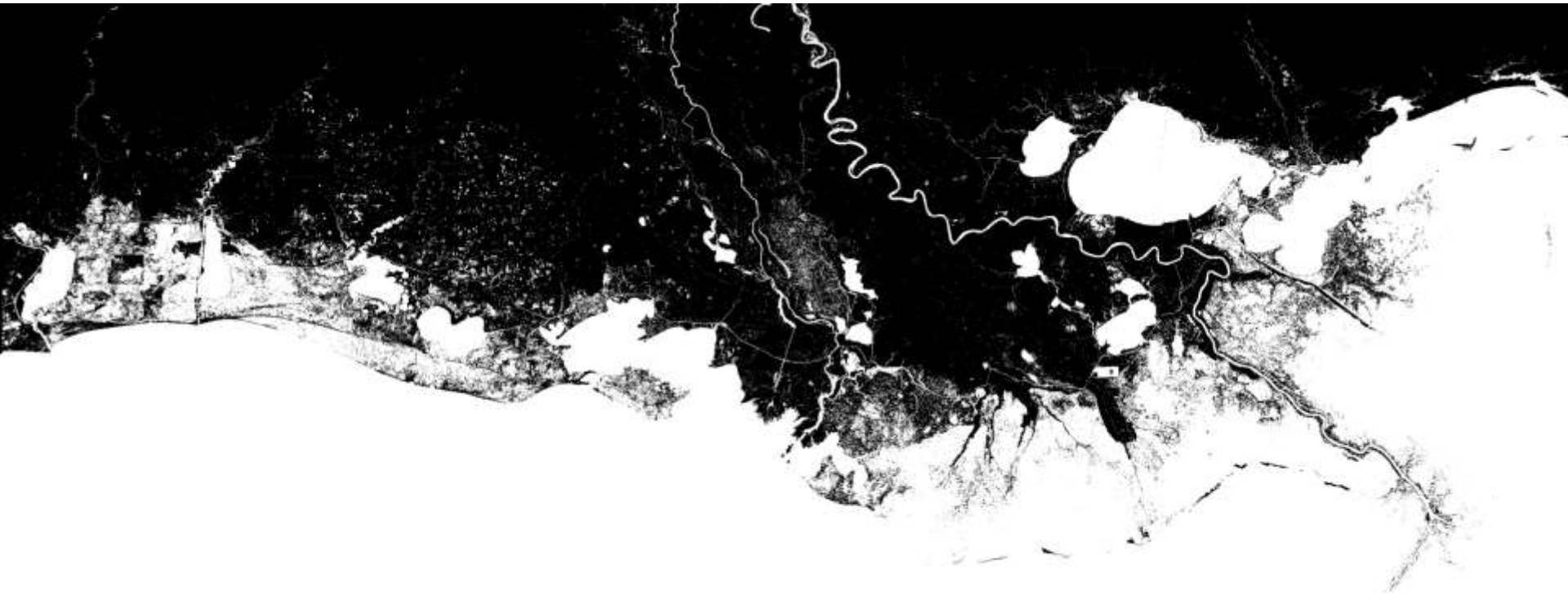


More Extreme- Potential to lose an additional 1,765 square miles (455,000 ha.) of land over the next 50 years.

Utilized 0.45 m of sea level rise over 50 years, Subsidence rates 0 to 25 mm per year

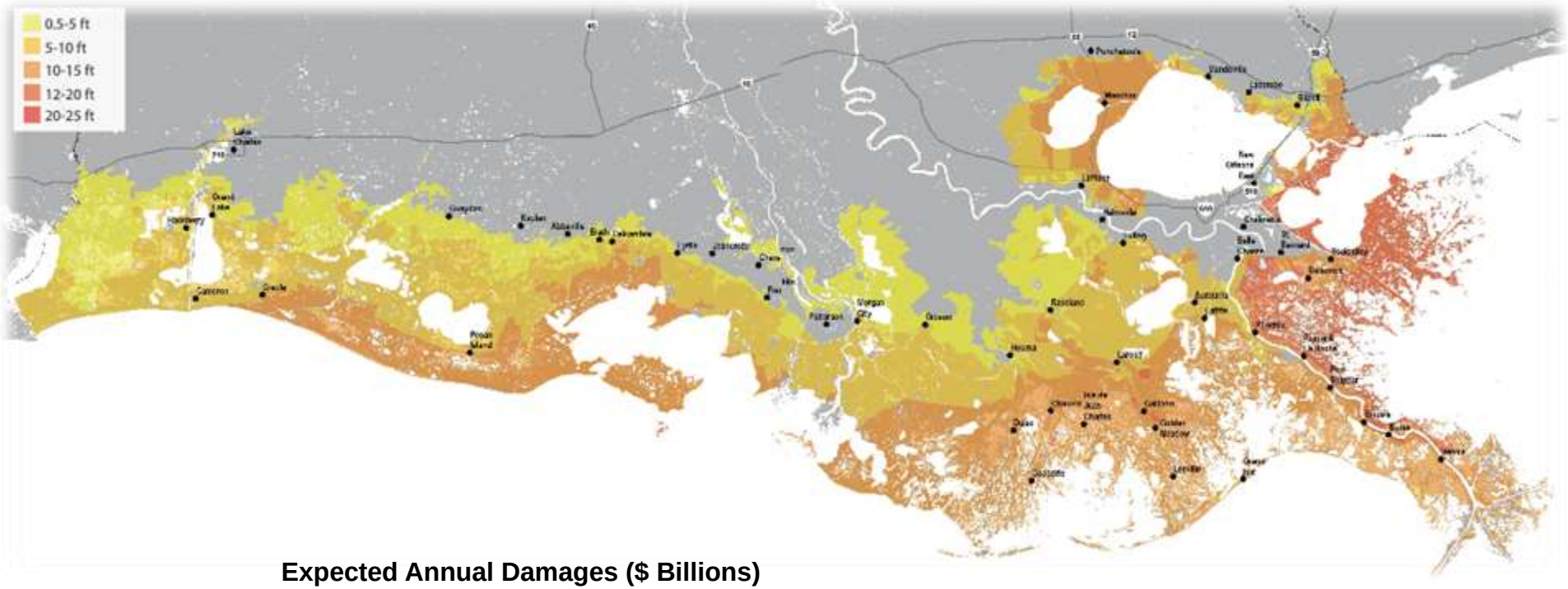
Our Coastal Crisis Will Continue

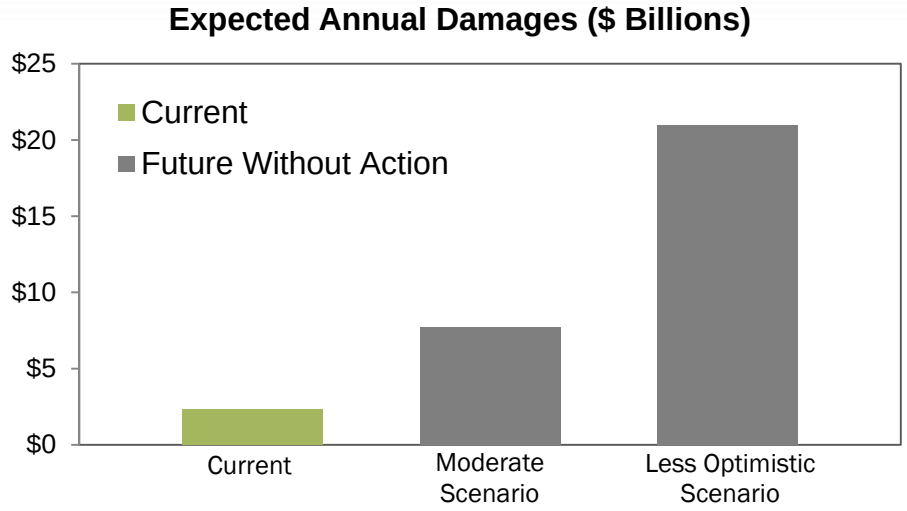
Current 2020 2030 2040 2050 2060



With No Action Over the Next 50 Years

Increasing Vulnerability to Livelihoods

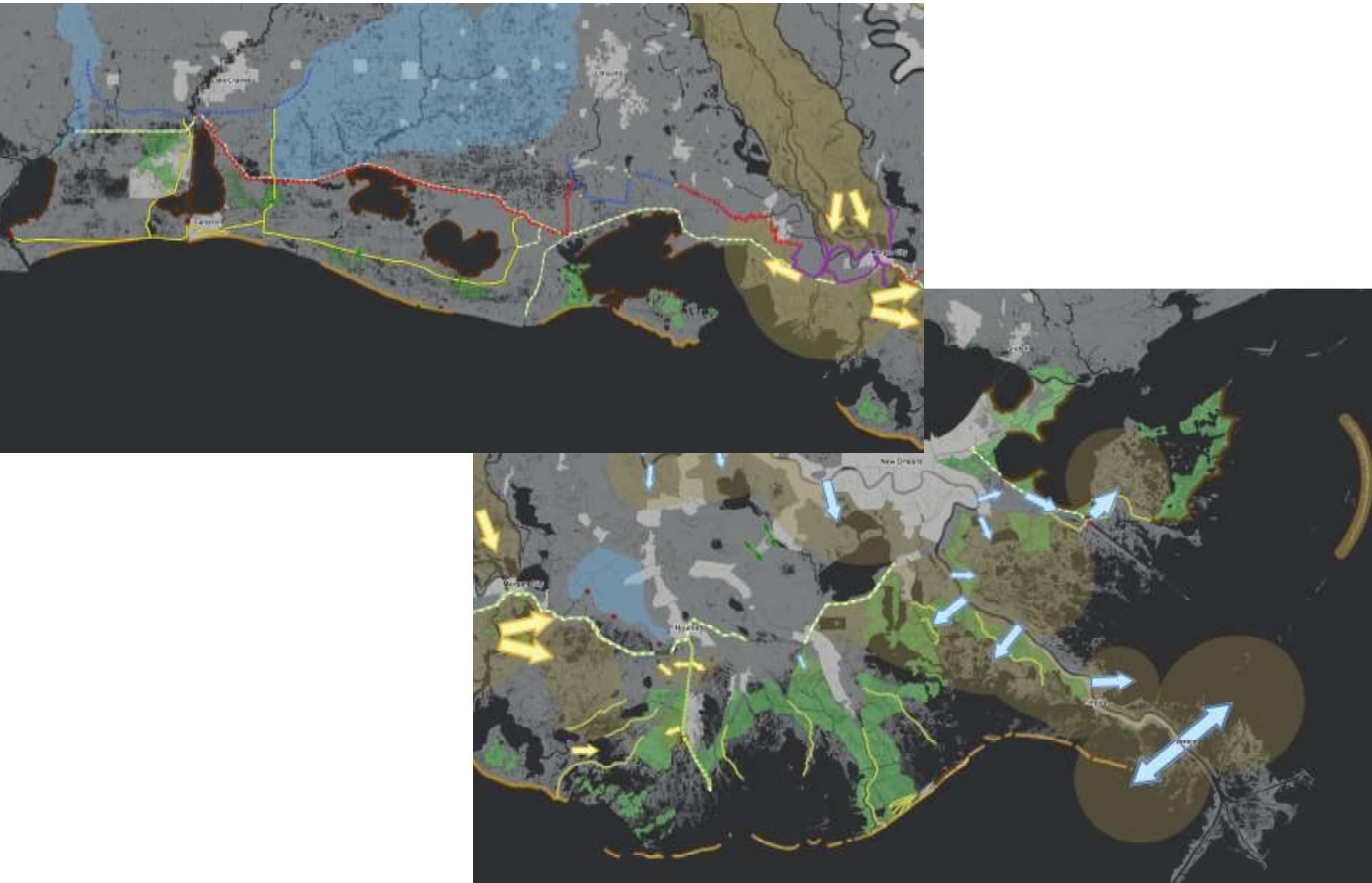




Could experience **10x** more damages than today

Louisiana's Coastal Master Plan

Building on the 2007 Master Plan



Master Plan Objectives

Flood Protection

Reduce economic losses from storm-based flooding

Natural Processes

Promote a sustainable ecosystem by harnessing the processes of the natural system

Coastal Habitats

Provide habitats suitable to support an array of commercial and recreational activities coast wide

Cultural Heritage

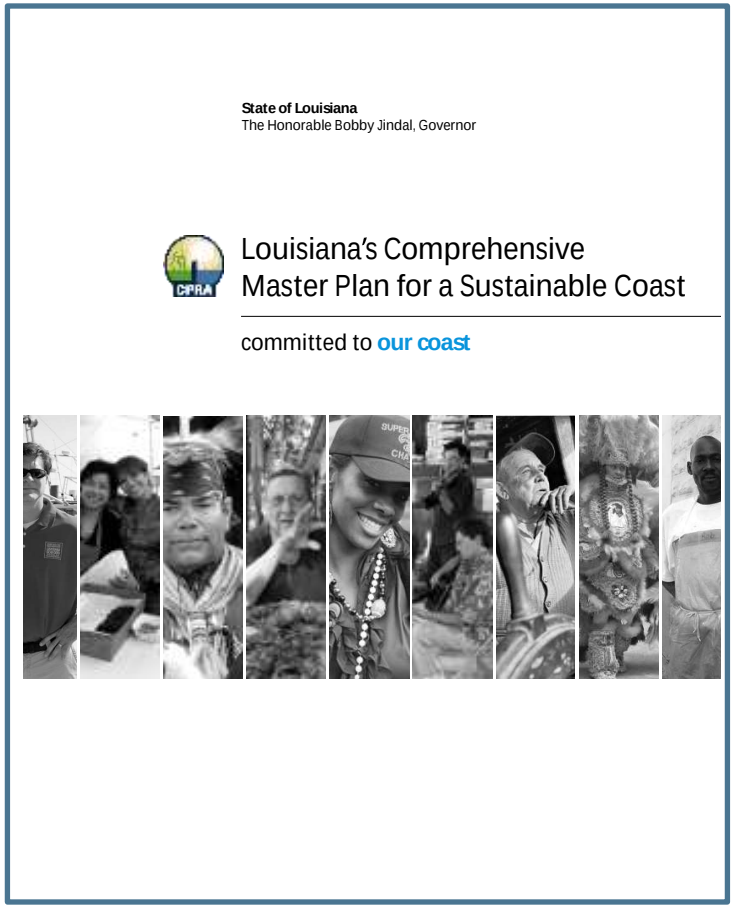
Sustain Louisiana's unique heritage and culture

Working Coast

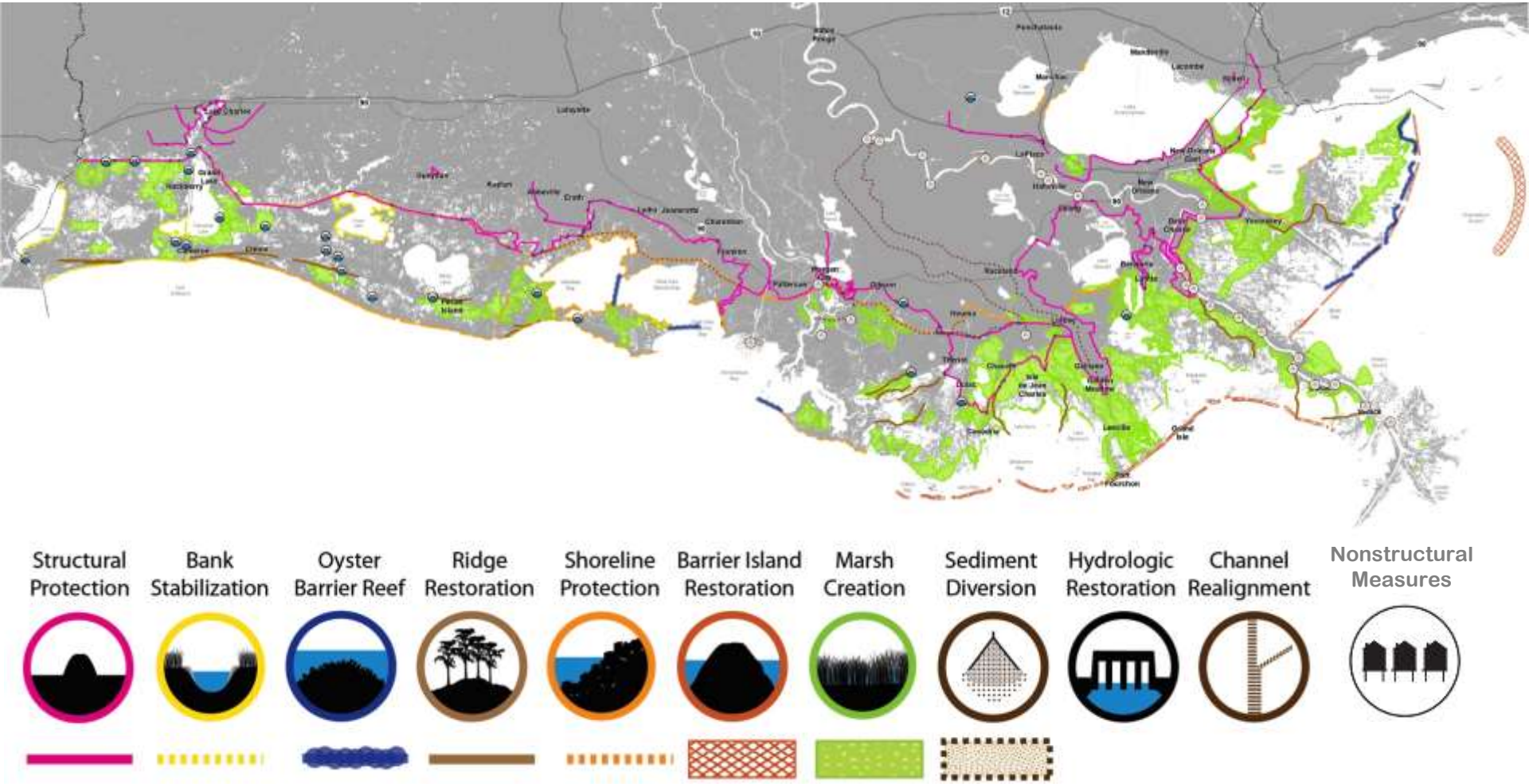
Support regionally and nationally important businesses and industries

2012 Coastal Master Plan

- Built on world class science and engineering
- Evaluated hundreds of existing project concepts
- Incorporated extensive public input and review
- Resource constrained
  - **Funding**, water, sediment
- Identified investments that will pay off, not just for us, but for our children and grandchildren



Evaluation of Hundreds of Existing Projects



Nearly 400 Projects Evaluated Across the Coast

Restoration Projects:

Barrier Island Restoration

Hydrologic Restoration

Marsh Creation

Oyster Barrier Reefs

Ridge Restoration

Shoreline Protection

Bank Stabilization

Channel Realignment

Sediment Diversion

Protection Projects:
Structural Protection Projects

Earthen Levee

Concrete Wall

Floodgate

Pumps

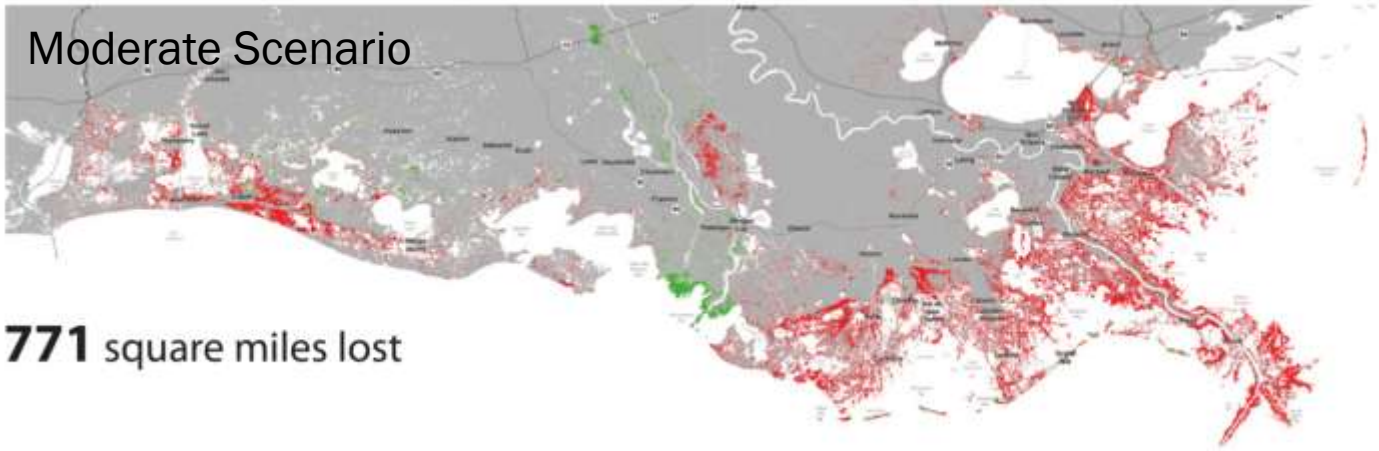
Protection Projects:
Nonstructural Protection Projects

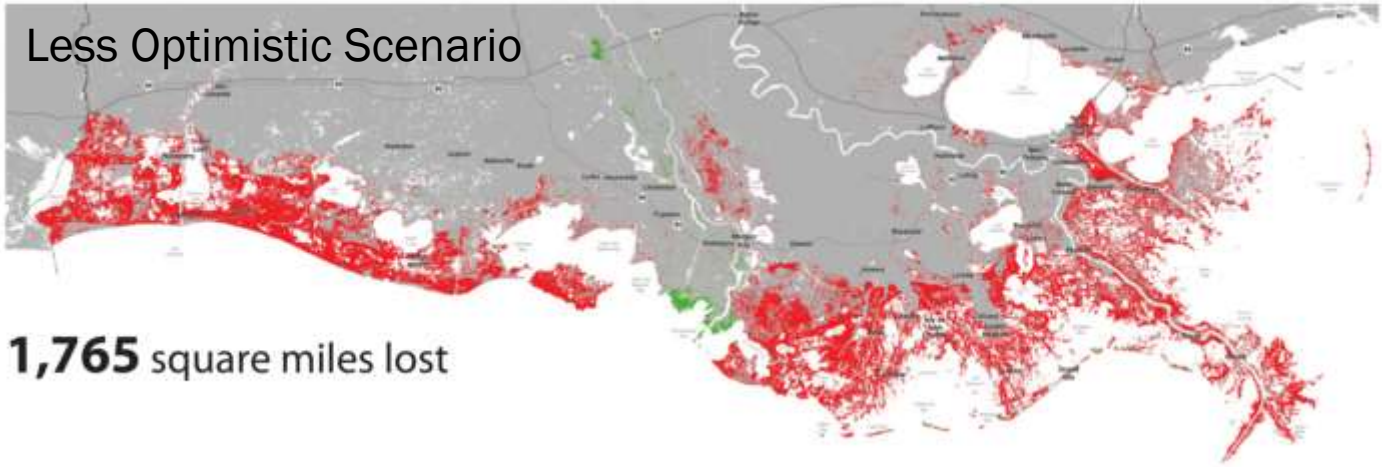
Elevated Housing

Floodproofing

Voluntary Acquisition

Future Scenarios

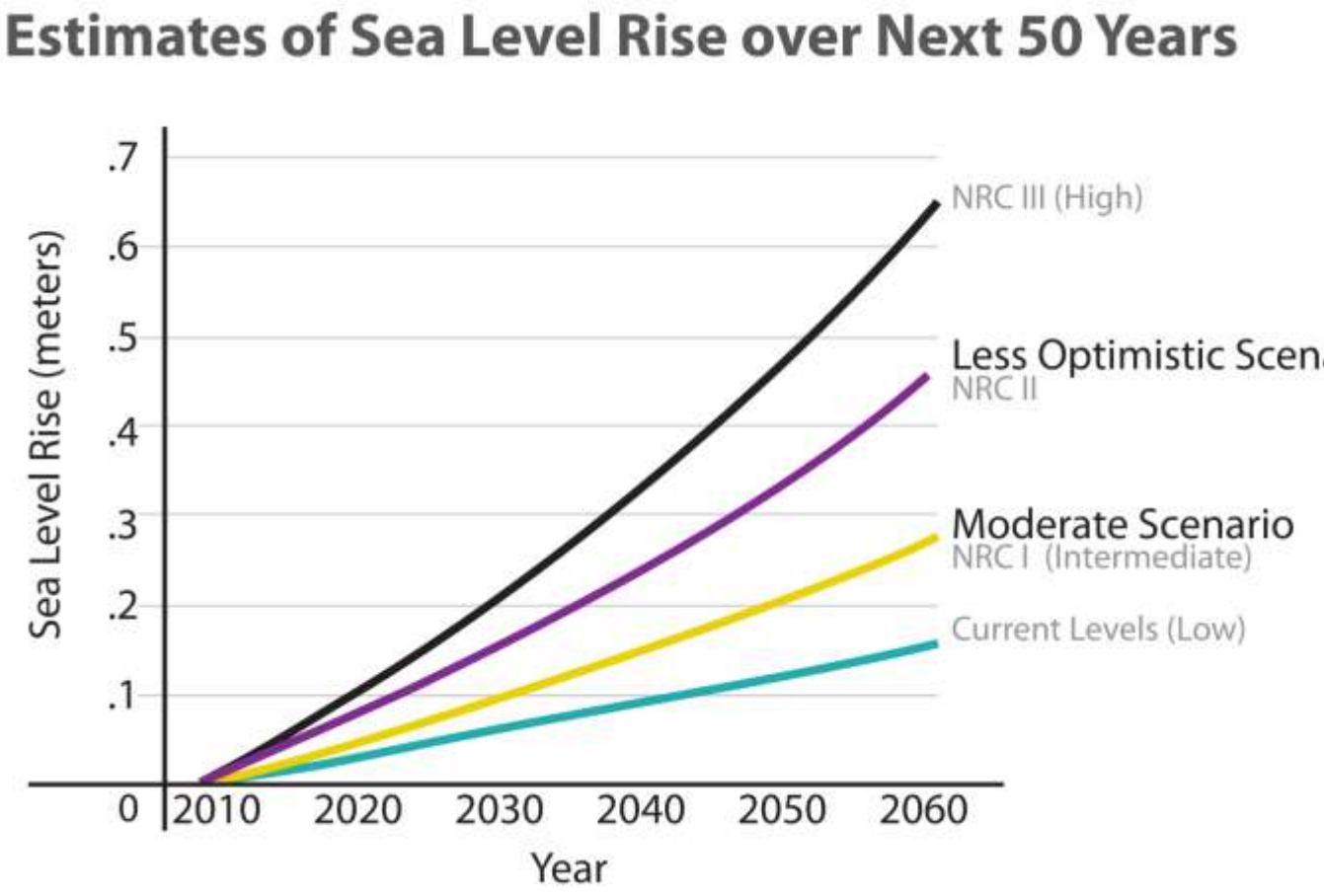




Factors Accounted for by Our Scenarios

- Sea Level Rise
- Subsidence
- Storm Intensity
- Storm Frequency
- River Discharge / Sediment Load
- River Nutrient Concentration
- Rainfall
- Evapotranspiration
- Marsh Collapse Threshold

Variation in Sea Level Rise (Eustatic)

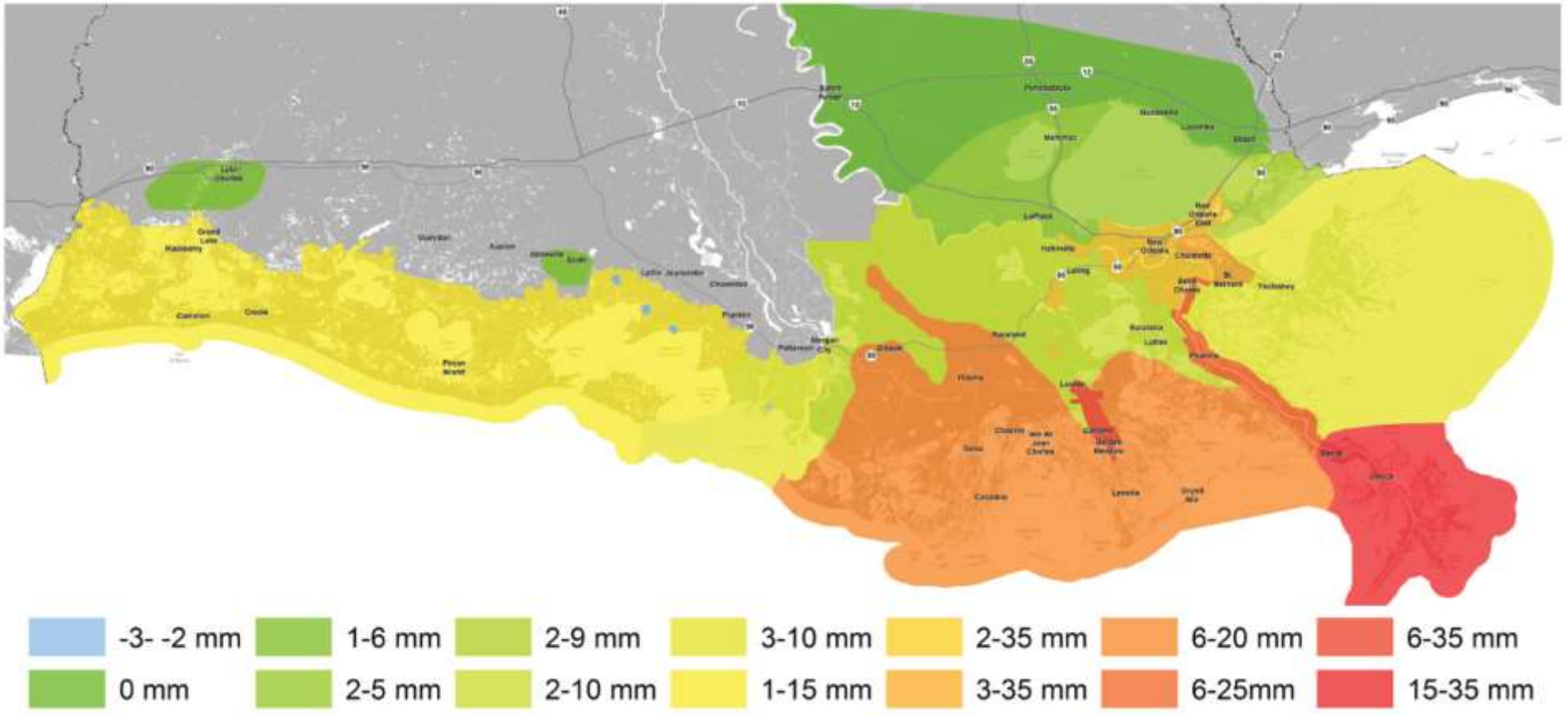


0.45 m over 50 years

0.27 m over 50 years

On-going analysis is incorporating new research and evaluating a scenario of 0.78 m over 50 years

Variation in Subsidence Rates



Subsidence Advisory Panel Members: Louis Britsch, PhD, PG, USACE-MVN; Roy Dokka, PhD, LSU; Joseph Dunbar, PG, USACE-ERDC; Mark Kulp, PhD, UNO; Michael Stephen, PhD, PG, CEC; Kyle Straub, PhD, Tulane; Torbjorn Tornqvist, PhD, Tulane

Science and Engineering Board

Ecosystem Science / Coastal Ecology

- William Dennison, PhD, University of Maryland
- Edward Houde, PhD, University of Maryland
- Katherine Ewel, PhD, University of Florida

Engineering

- Robert Dalrymple, PhD, PE, Johns Hopkins University
- Jos Dijkman, MsC, PE, Dijkman Delft

Geosciences

- Charles Groat, PhD, University of Texas at Austin

Social Science and Risk

- Greg Baecher, PhD, PE, University of Maryland
- Philip Berke, PhD, University of North Carolina – Chapel Hill

Climate Change

- Virginia Burkett, PhD, U.S. Geological Survey

Environmental/Natural Resource Economics

- Edward Barbier, PhD, University of Wyoming

Technical Advisory Committees

Predictive Models

- Steve Ashby, PhD, USACE Eng. Res. Dev. Center
- John Callaway, PhD, University of San Francisco
- Fred Sklar, PhD, South Florida Water Mgmt. District
- Si Simenstad, MS, University of Washington

Planning Tool

- John Boland, PhD, PE, John Hopkins
- Ben Hobbs, PhD, John Hopkins
- Len Shabman, PhD, Virginia Tech

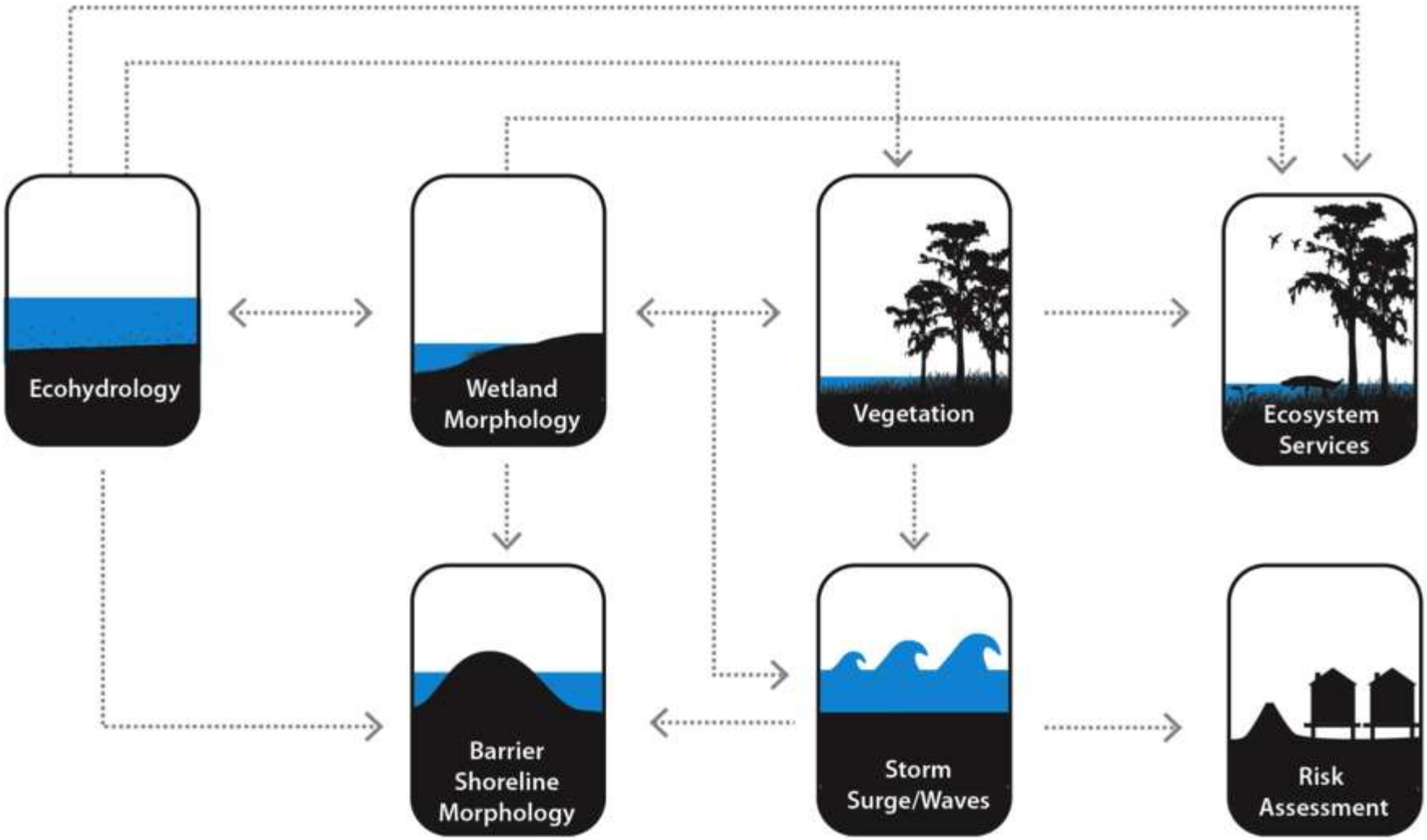
Cultural Heritage

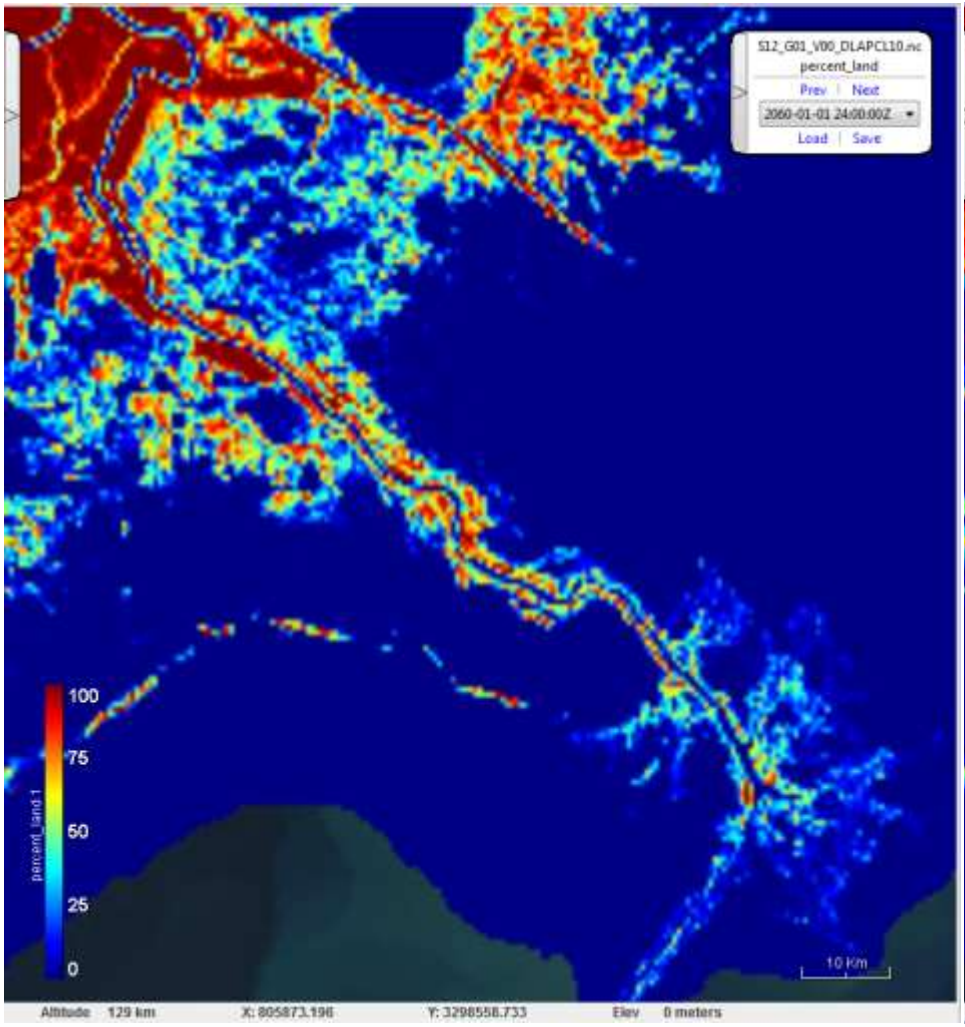
- Don Davis, PhD, Louisiana State University
- Maida Owens, LA Dept. of Culture, Recreation, and Tourism
- Carl Brasseaux, PhD, University of Louisiana Lafayette

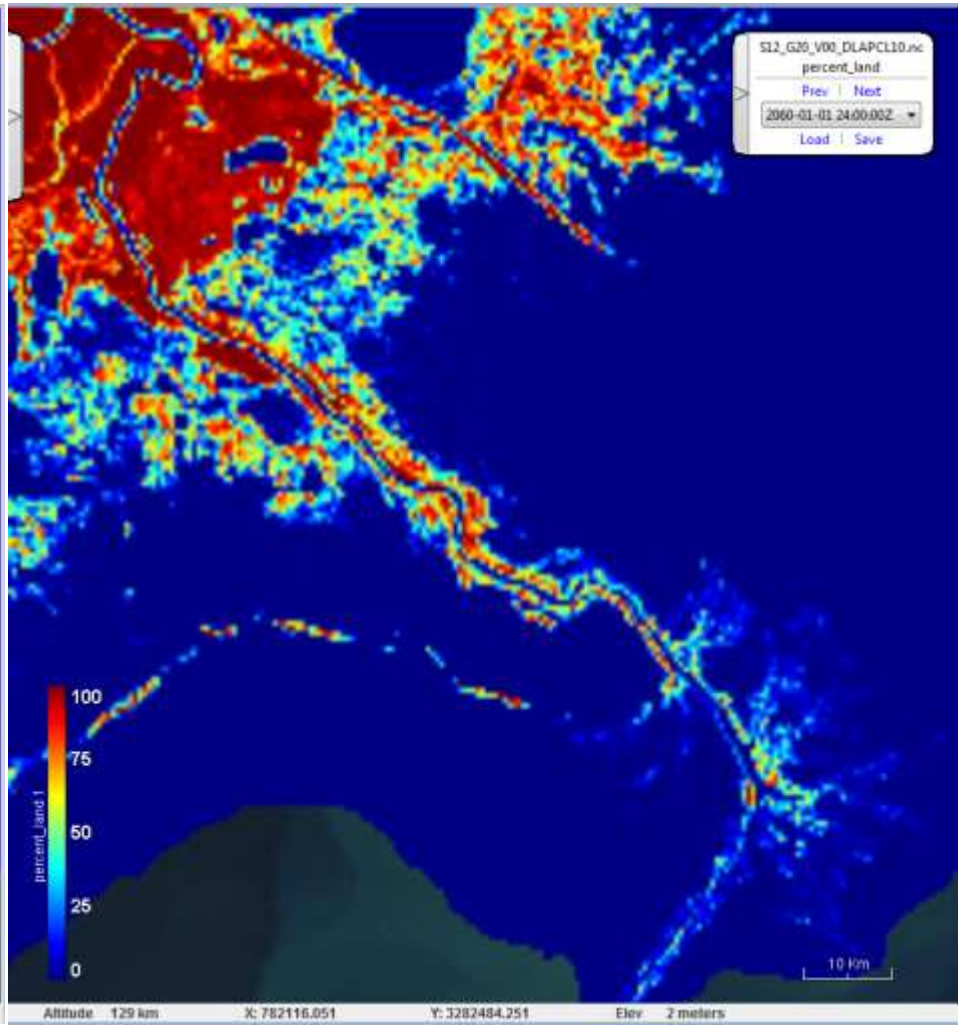
Predictive Models Team

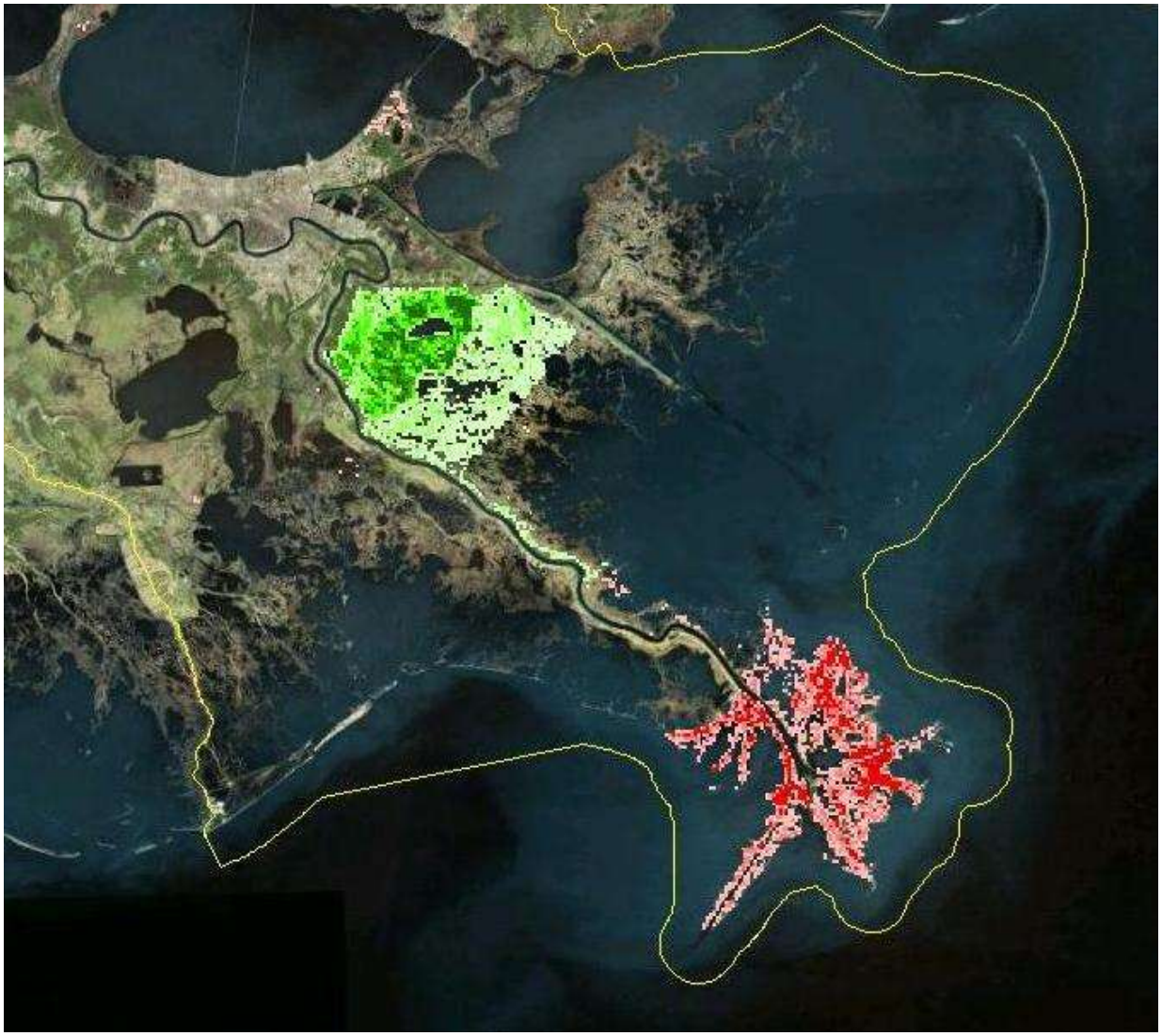
Predictive Model	Lead
Ecohydrology	Ehab Meselhe, PhD, PE, ULL + 9 members
Vegetation	Jenneke Visser, PhD, ULL + 8 members
Wetland Morphology	Greg Steyer, PhD, USGS + 6 members
Barrier Island Morphology	Mark Kulp, PhD, UNO + 6 members
Ecosystem Services	Andy Nyman, PhD, LSU + 8 members
Storm Surge	Joe Suhayda, PhD, Arcadis + 3 members
Storm Damage/Risk	Jordan Fischbach, PhD, RAND + 7 members
Data Integration	Craig Conzelmann and USGS team
Uncertainty Analysis	Emad Habib, PhD, ULL
Technical Advisor	Denise Reed, PhD, UNO

Using New Tools, Breaking New Ground



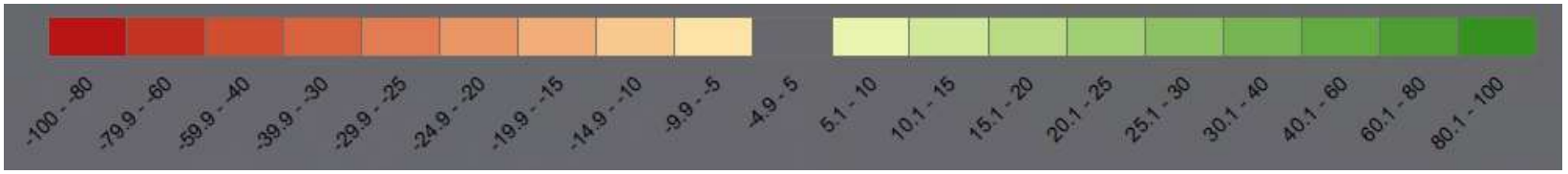

S12_G01_V00_DLAPCL10.nc
percent_land
Prev | Next
2060-01-01 24:00:00Z
Load | Save
100
75
50
25
0
percent_land 1
10 Km
Altitude 129 km
X: 805873.196
Y: 3298558.733
Elev 0 meters


S12_G20_V00_DLAPCL10.nc
percent_land
Prev | Next
2060-01-01 24:00:00Z
Load | Save
100
75
50
25
0
percent_land 1
10 Km
Altitude 129 km
X: 782116.051
Y: 3282484.251
Elev 2 meters



Year 50 Change in Percent Land Compared to FWOA

Scenario B

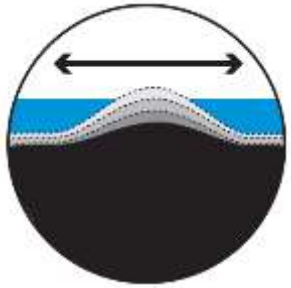


Grounded in Science

Risk Reduction

Expected Annual Damages

Restoration



Land Area

Decision Criteria and Ecosystem Services

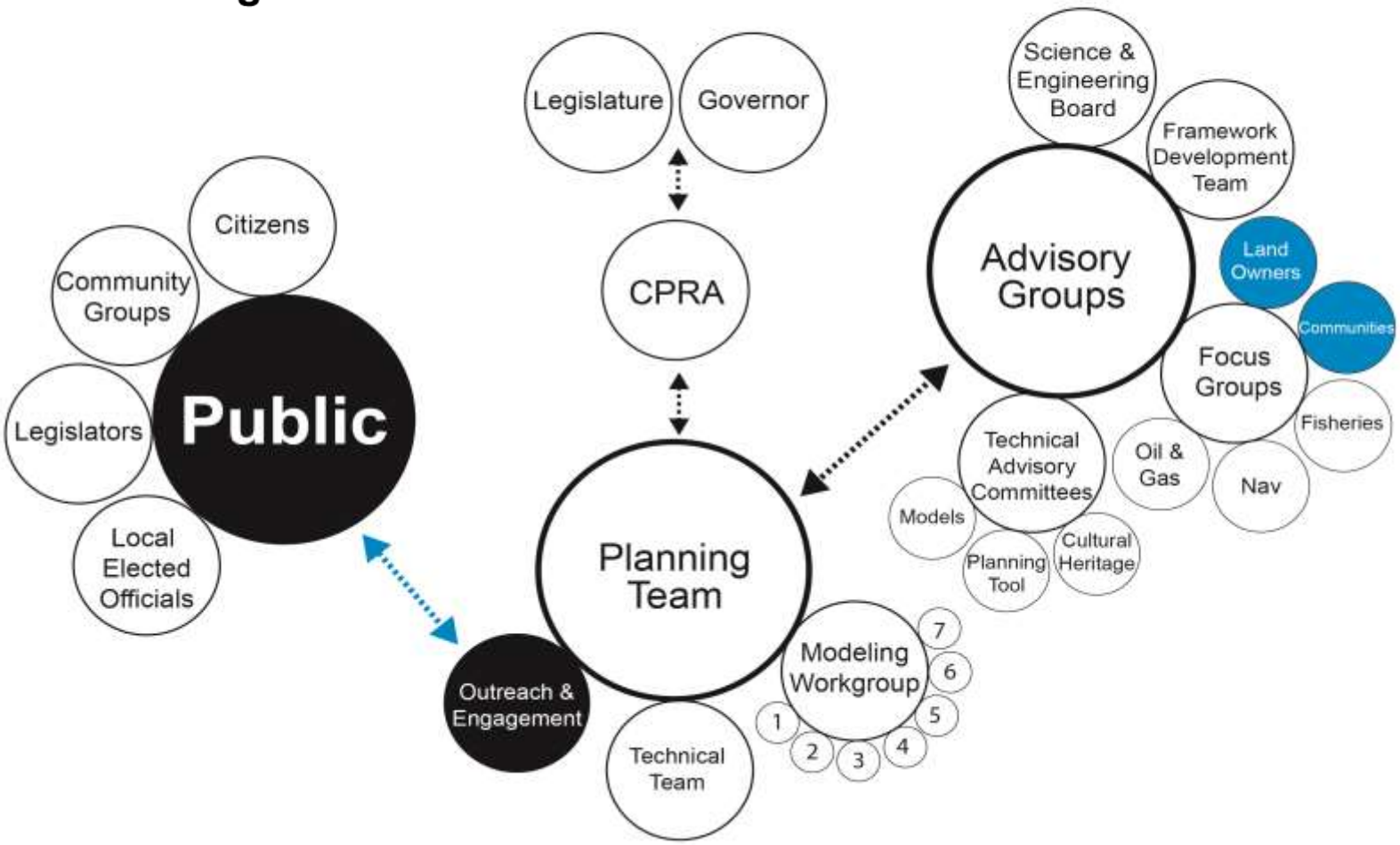
- Distribution of flood risk across socioeconomic groups
- Flood protection of historic properties
- Flood protection of strategic assets
- Operation and maintenance costs
- Sustainability
- Support for navigation
- Use of natural processes
- Support for cultural heritage
- Support for oil & gas

- Oyster
- Shrimp
- Freshwater Availability
- Alligator
- Waterfowl
- Saltwater Fisheries
- Freshwater Fisheries
- Carbon Sequestration
- Nitrogen Removal
- Agriculture/Aquaculture
- Other Coastal Wildlife
- Nature-Based Tourism

Responsive to the Needs of Our Coastal Communities

Outreach and Engagement Groups

Incorporating Citizen & Stakeholder Knowledge into the Planning Process



Framework Development Team

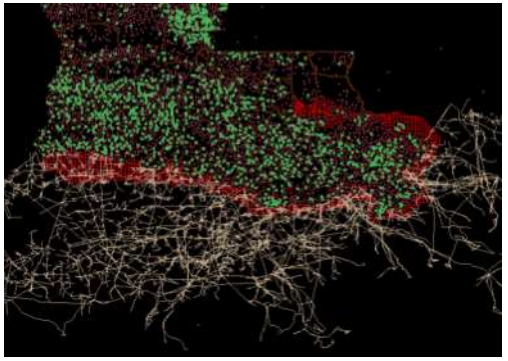
Over 30 Federal, State, NGO, Academic, Community, and Industry Organizations

Focus Groups

- Key industries are impacted by land loss and large scale protection and restoration efforts

- Created three focus groups:
  - Navigation
  - Fisheries
  - Oil and Gas

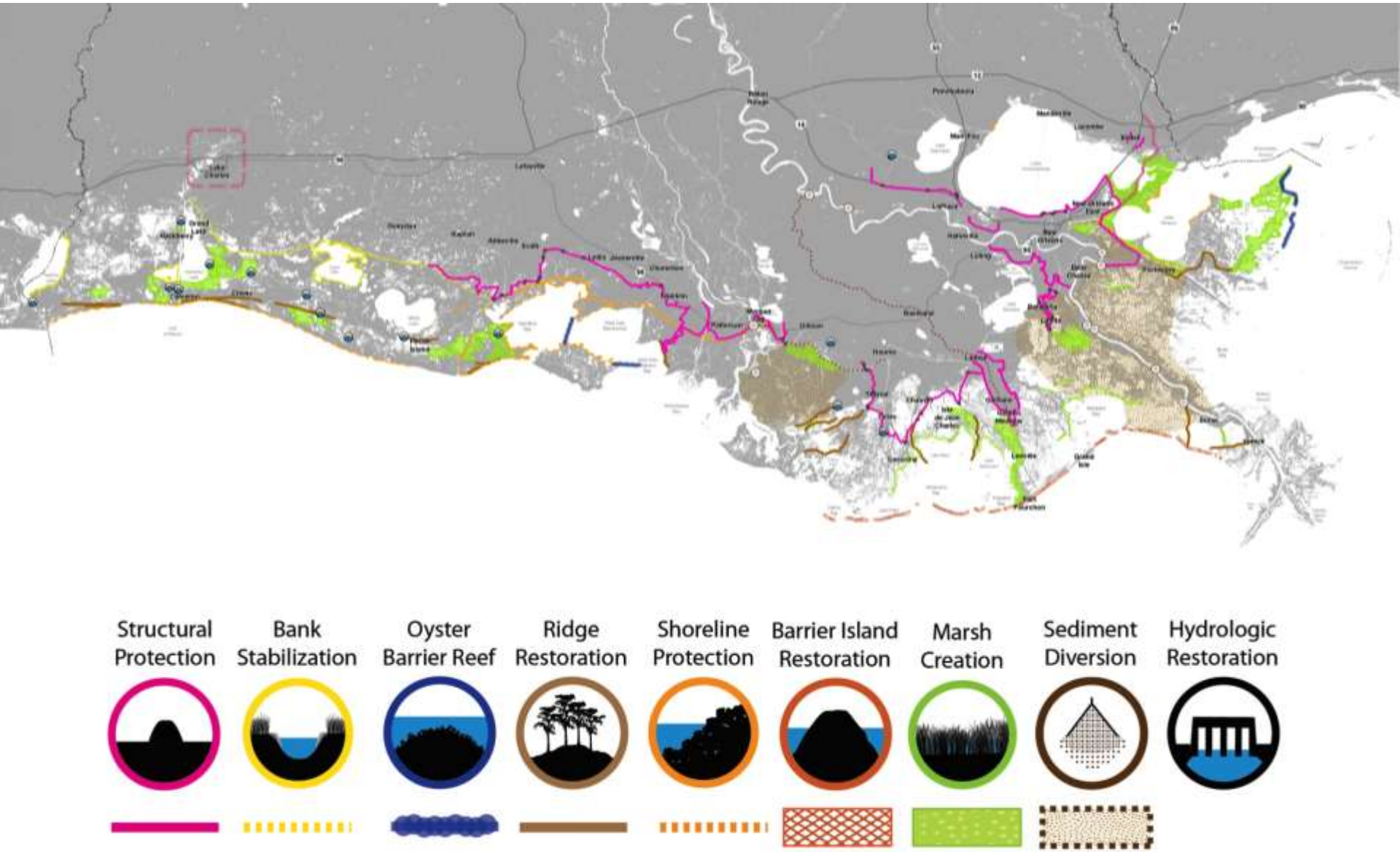
- Expanding membership to:
  - Landowners
  - Community groups



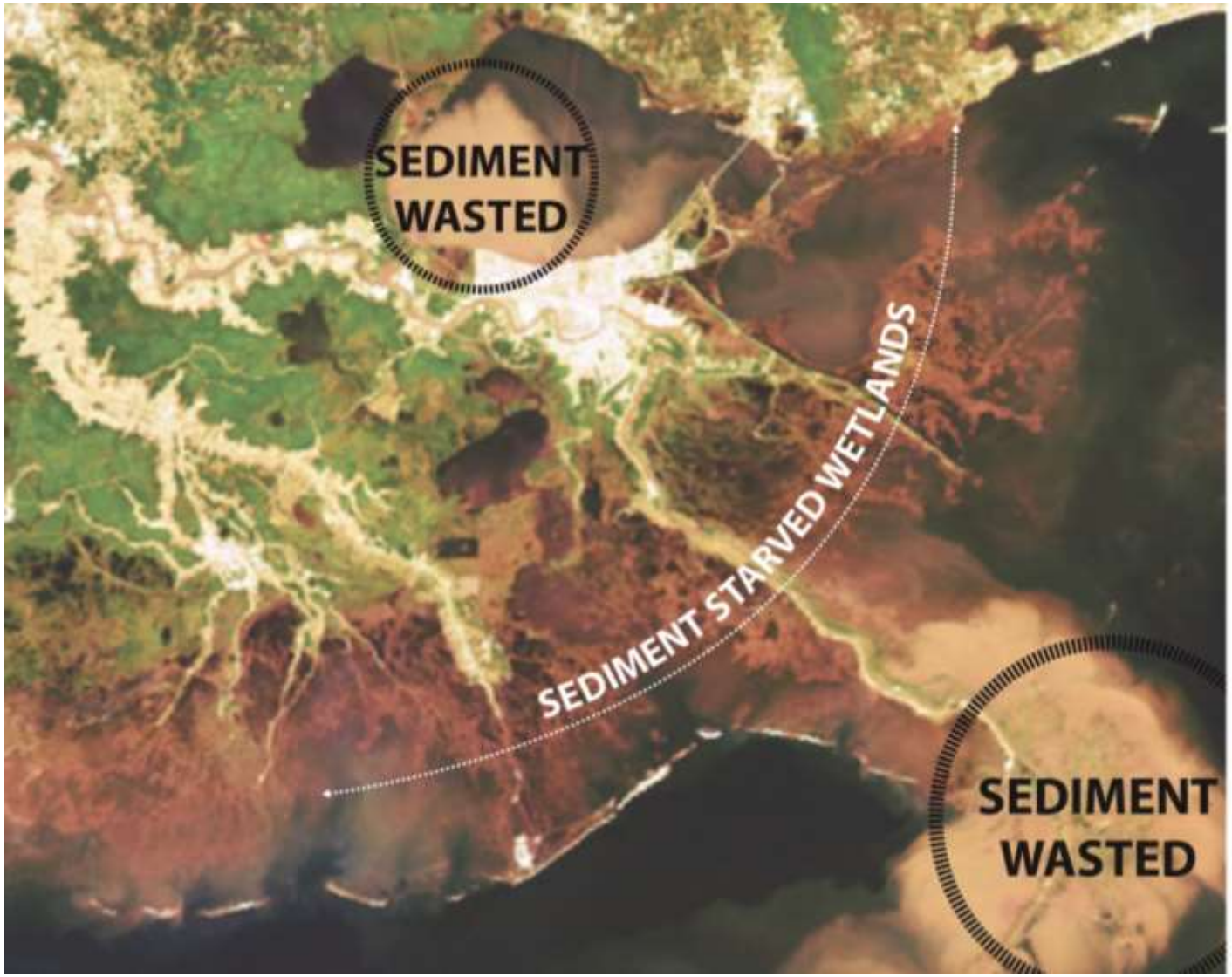
Extensive Public Outreach and Review

Extensive Public Outreach and Review

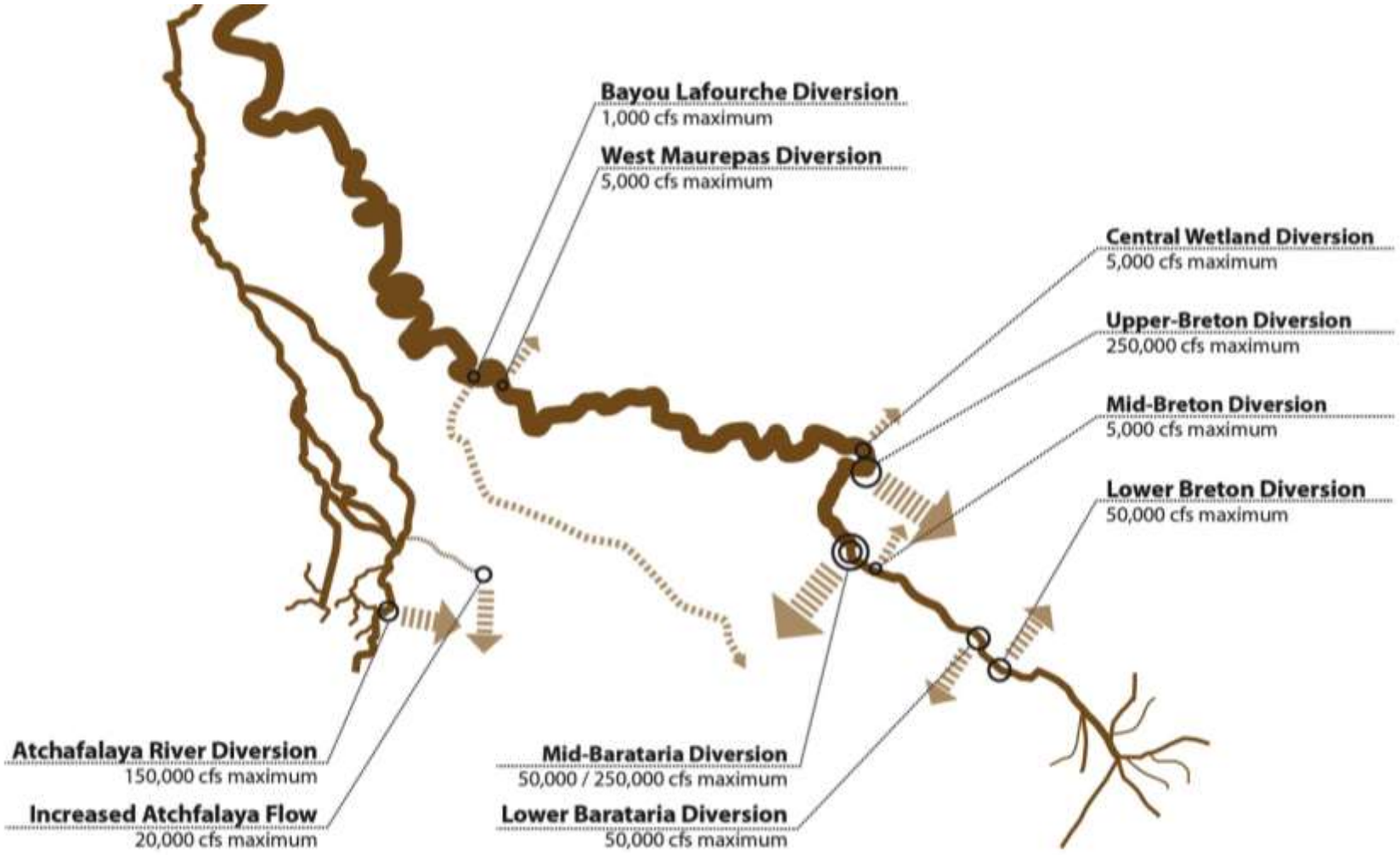
Louisiana's 2012 Comprehensive Master Plan for a Sustainable Coast



Keystone of the 2012 Master Plan: Reconnecting the River

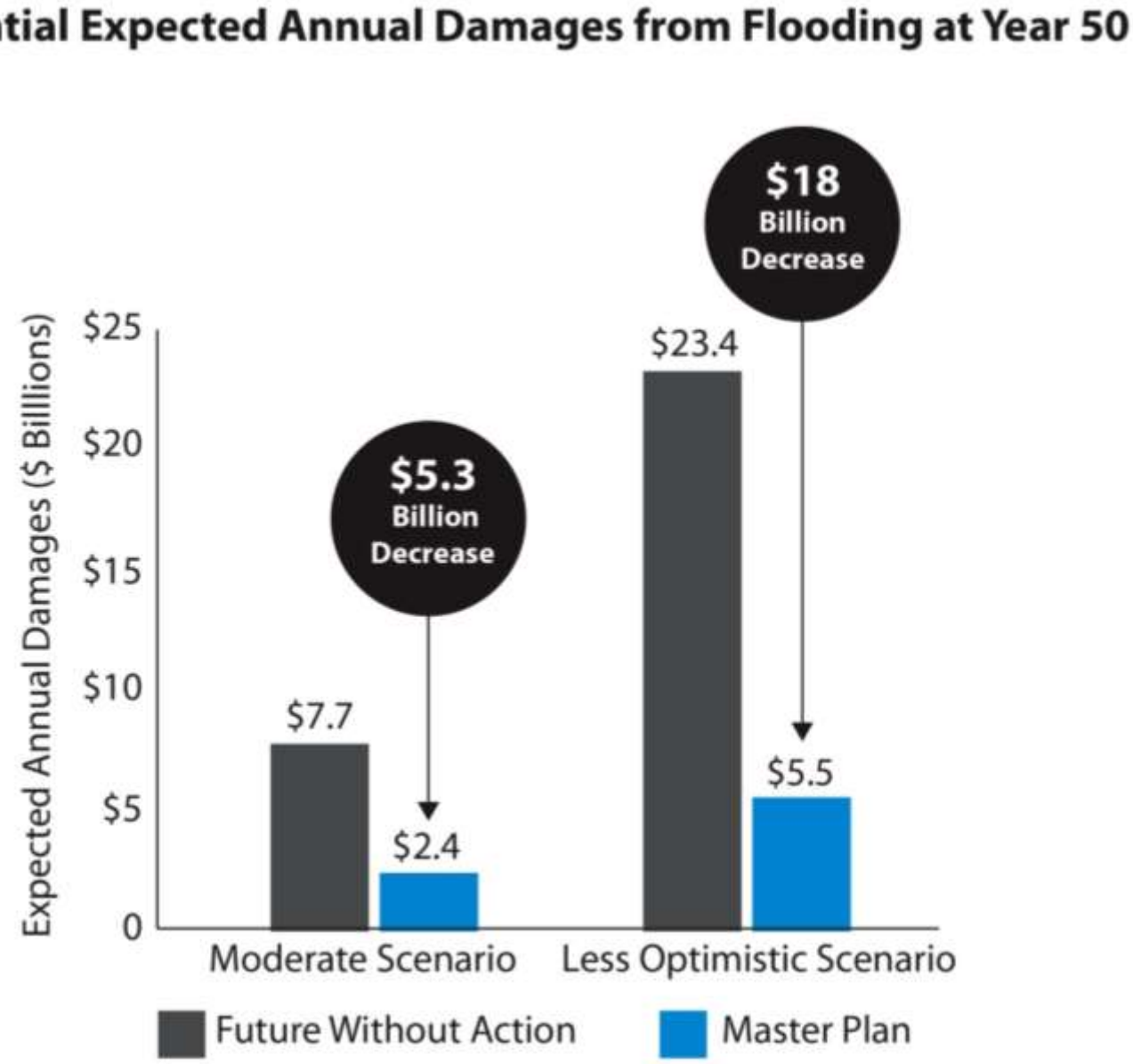


Keystone of the 2012 Master Plan: Reconnecting the River

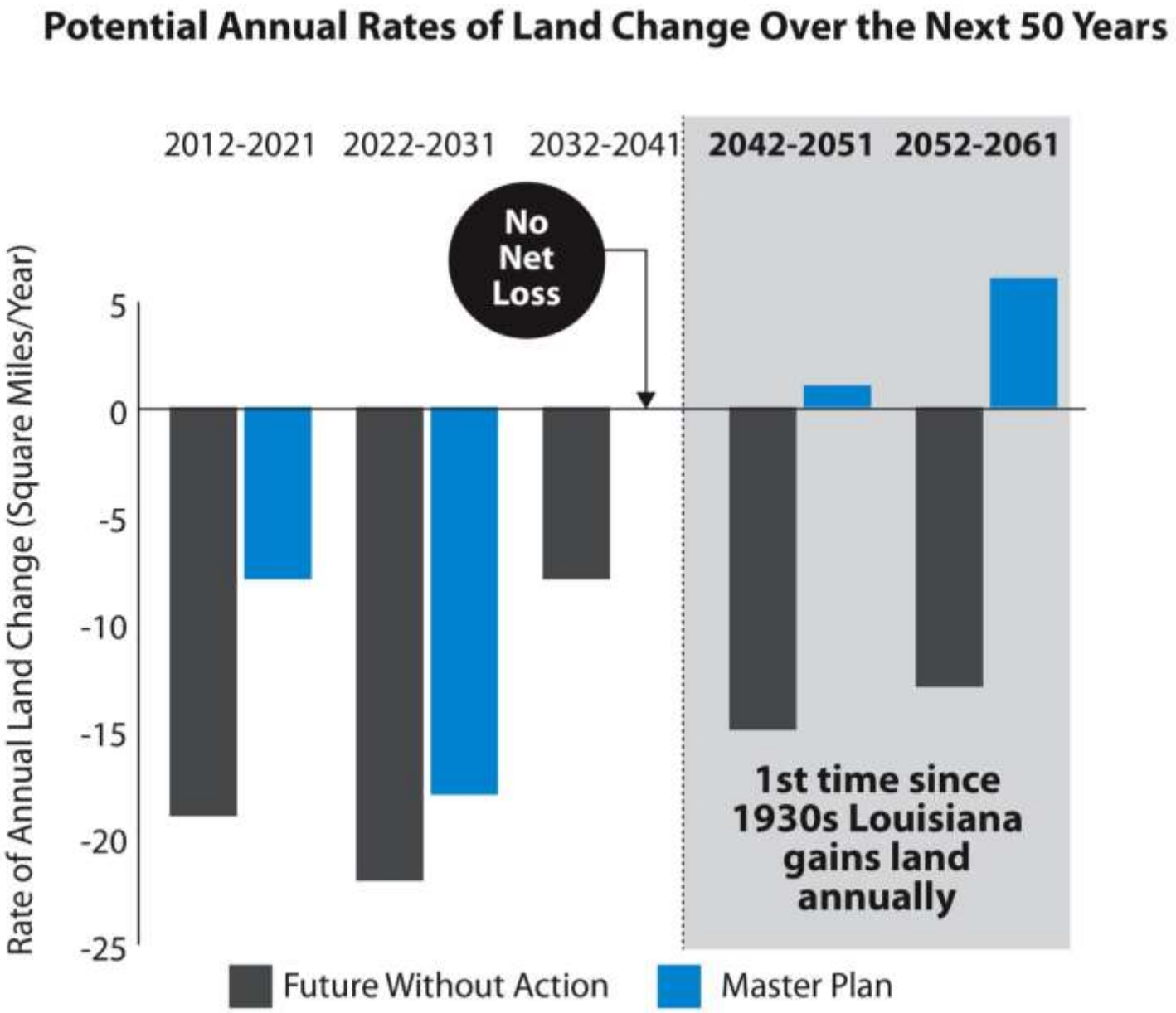


The projects in the plan would use up to 50% of the Mississippi River's peak flow for sediment diversions, in addition to using water and sediment from the Atchafalaya River.

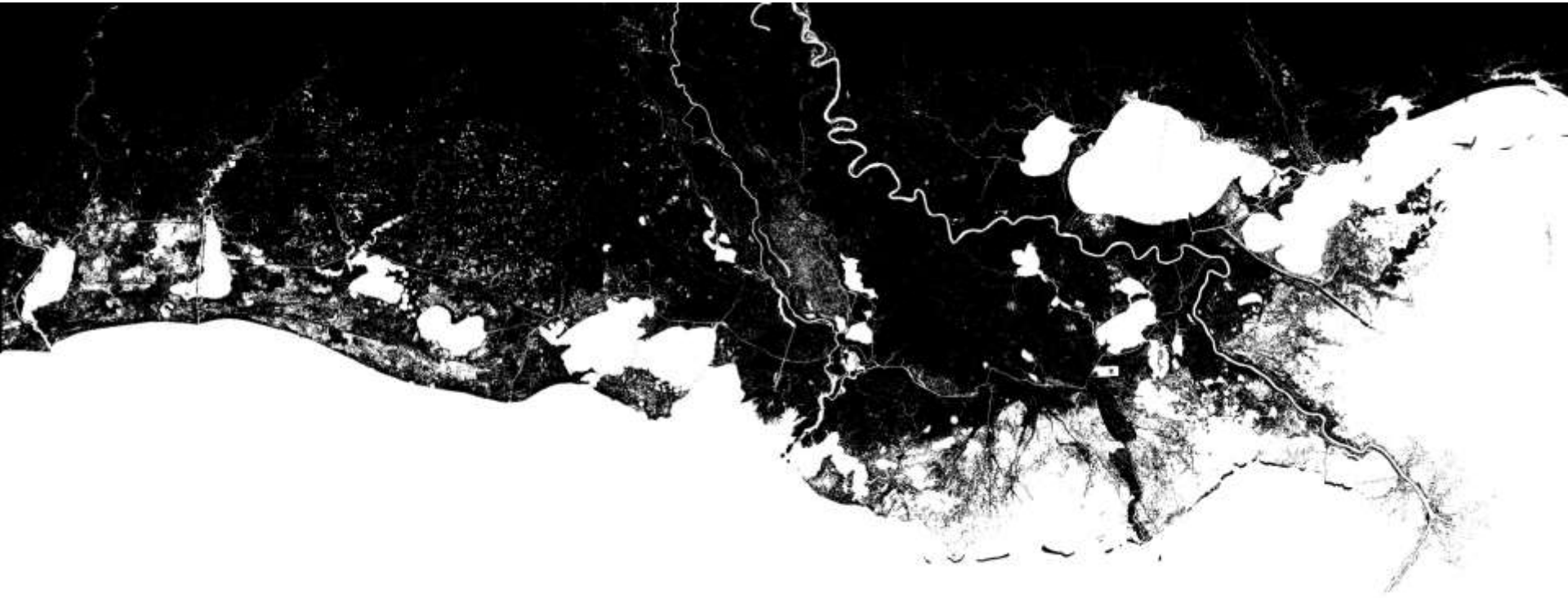
What the Master Plan Delivers



What the Master Plan Delivers



What the Master Plan Delivers



2061: Future With Master Plan

Expanded Small Scale Physical Model

Small Scale Physical Model (SSPM)

Why Physical Modelling?

- Tool capable of producing qualitative results; used to complement various computer modelling efforts.
- Model scenarios can be run very quickly
  - 100 years in 100 hours
- Visualization
- Low cost

Small Scale Physical Model (SSPM)

SSPM Background and History

2002-2003: Construction and Initial Calibration (France)

2003-2004: Model Reassembly and Operations (LSU)

2004-2009: Model operated and maintained by CPRA and LSU

2010-2011: CPRA assessed the future of the SSPM

2011-2014: Design of the Expanded Small Scale Physical Model

Expanded Small Scale Physical Model

Geometric Scaling

Horizontal - 1:12,000 versus 1:6000

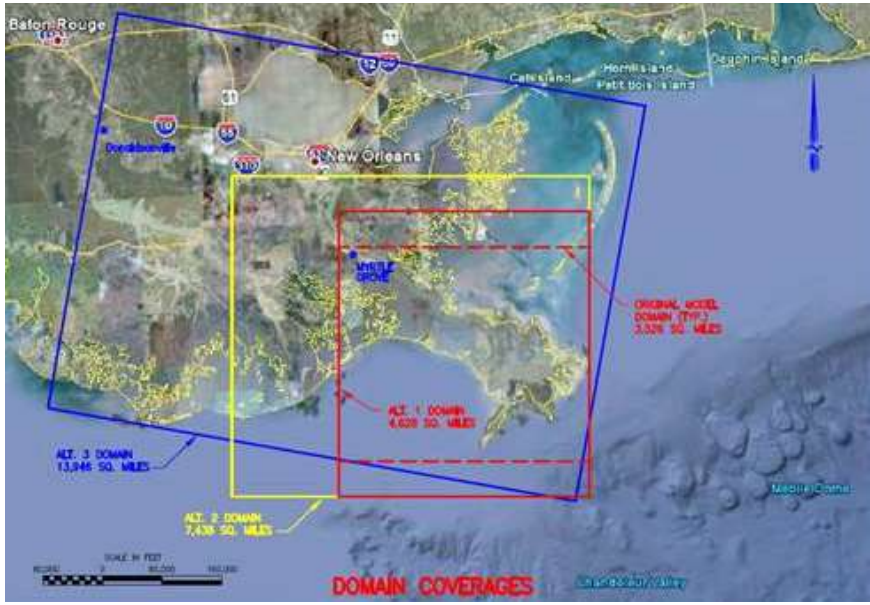
Vertical - 1:500 versus 1:400

Distortion - 24 versus 15

Domain

Myrtle Grove to GOM versus
Donaldsonville to GOM

4600 Sq. mi versus 14,000 Sq. mi



Expanded Small Scale Physical Model

Design Overview

- **Model domain covers over 14,000 Sq. miles of Coastal Louisiana:**
  - RM 179 to the GOM
  - Includes Lake Pontchartrain; Barataria Basin; most of Terrebonne Basin
- **3D model surface created using multiple datasets:**
  - USACE Hydrographic Surveys
  - CPRA MR Multi-Beam Data
  - LIDAR
  - NOAA Nautical Charts
- **216 - 5 ft. X 10 ft. X 1 ft. High Density Foam Panels**
  - Dimensionally stable closed cell material
  - Easy to machine; durable
  - Density = 20 lb/cu. ft.; Weight = 1000 lbs per panel

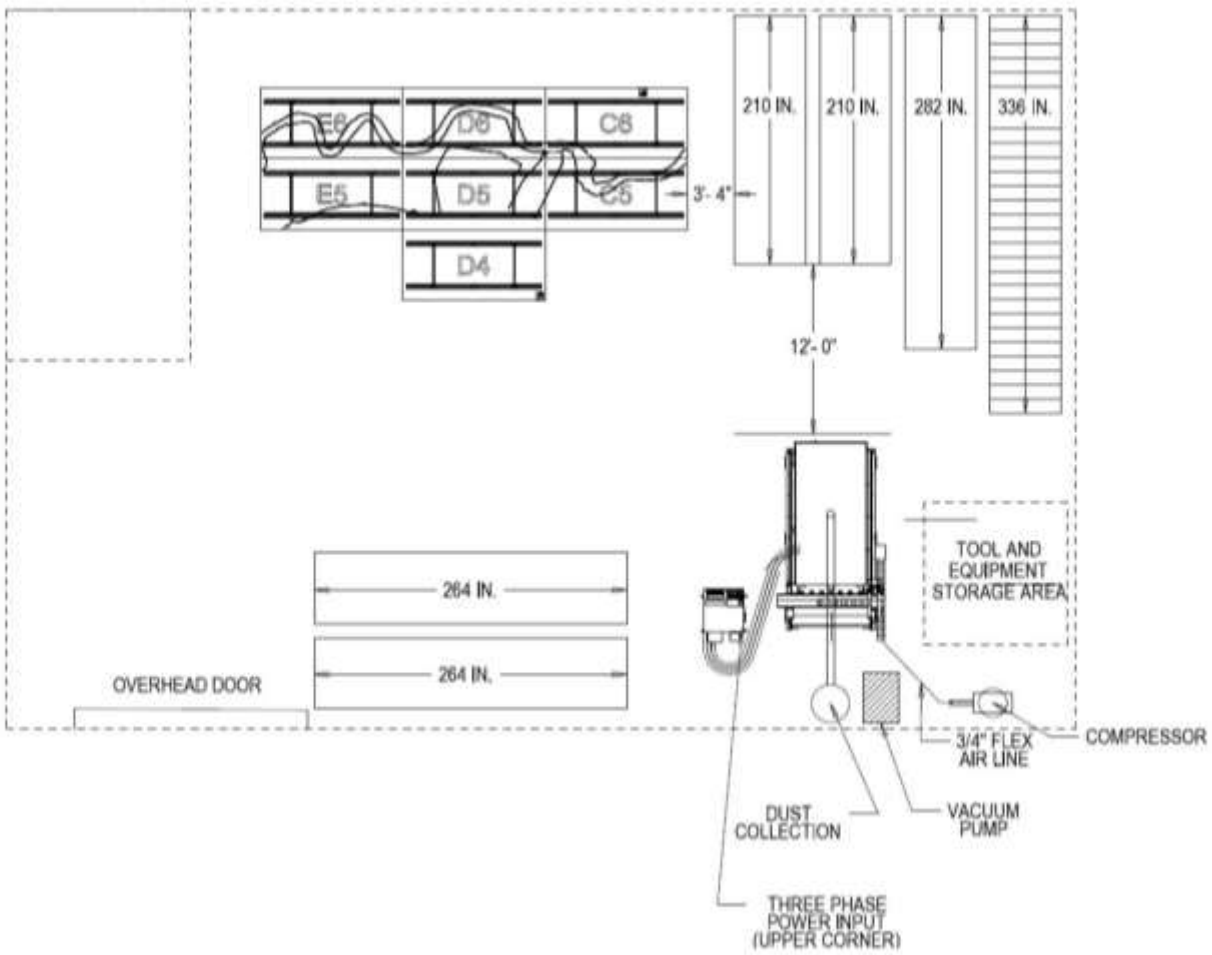
Expanded Small Scale Physical Model

Construction Overview

- **Model bed to be constructed using CNC Router**
- **Additional equipment:**
  - Vacuum/air handling system
  - Jack supports frame bed
  - Laser Scanner/Optical Level
  - GeoMagic Software
- **‘Guinea Pig’ Model**
  - Seven panel test model
  - Domain – from Bonne Carre Spillway to New Orlean East
  - Results will be compared to actual 2011 Bonne Carre data
- **Full Model Panel Routing**
  - Routing of 216 panels will take place at Forte Lab
  - Panels will be routed and stored until Facility is complete

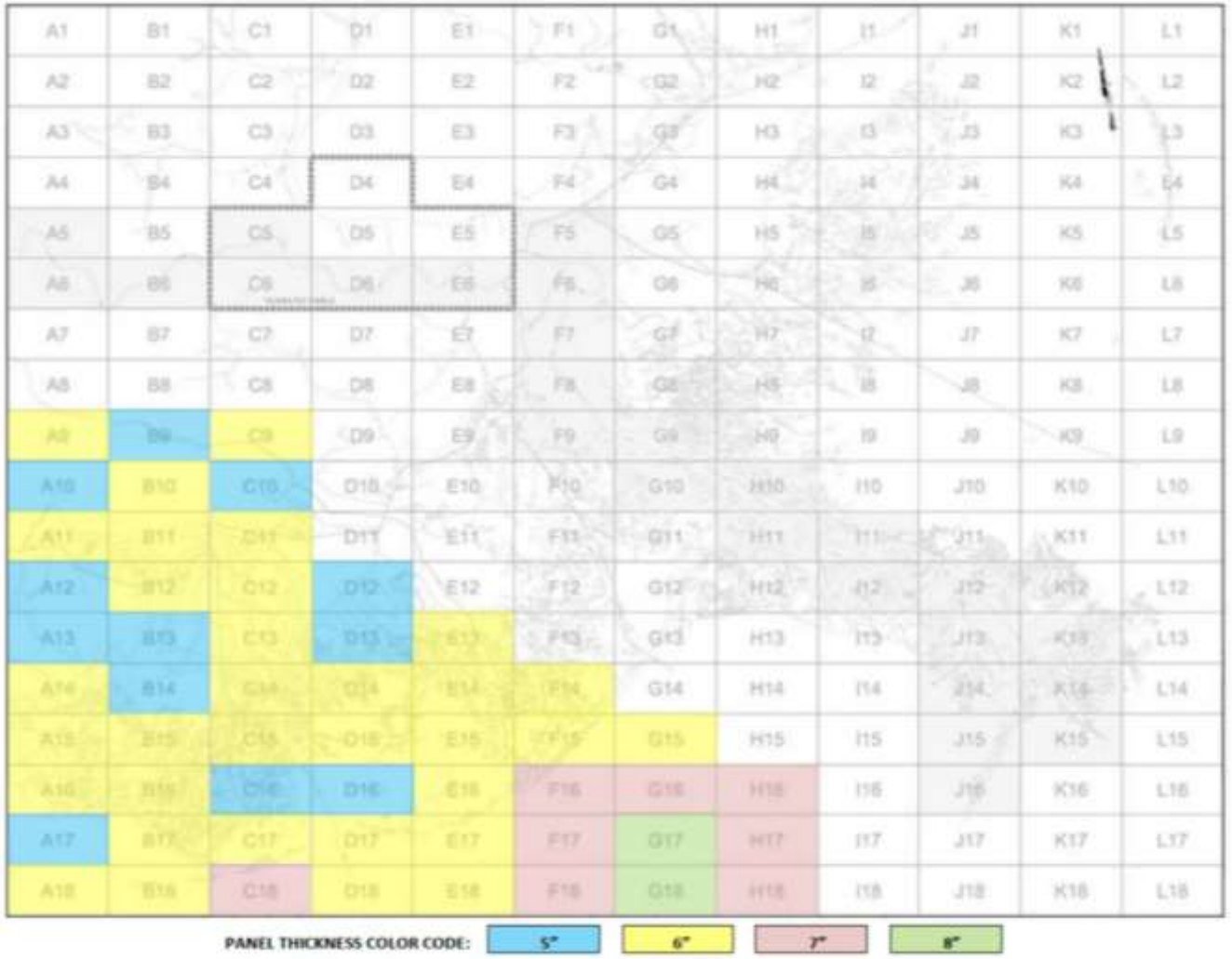
Expanded Small Scale Physical Model

Construction Overview



Expanded Small Scale Physical Model

Construction Overview



Expanded Small Scale Physical Model

Construction Overview

Expanded Small Scale Physical Model

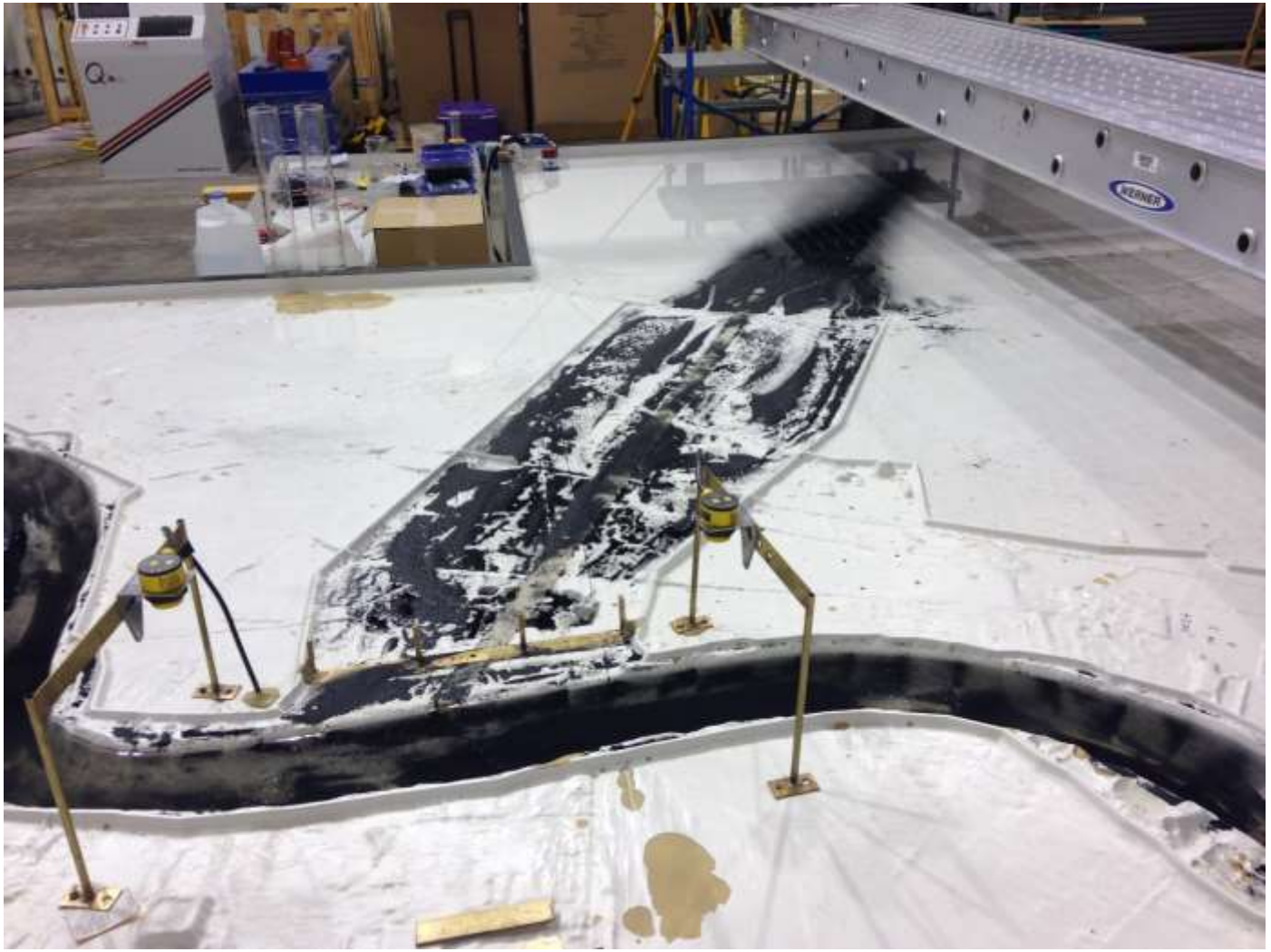
Construction Overview

Expanded Small Scale Physical Model

‘Guinea Pig Model’

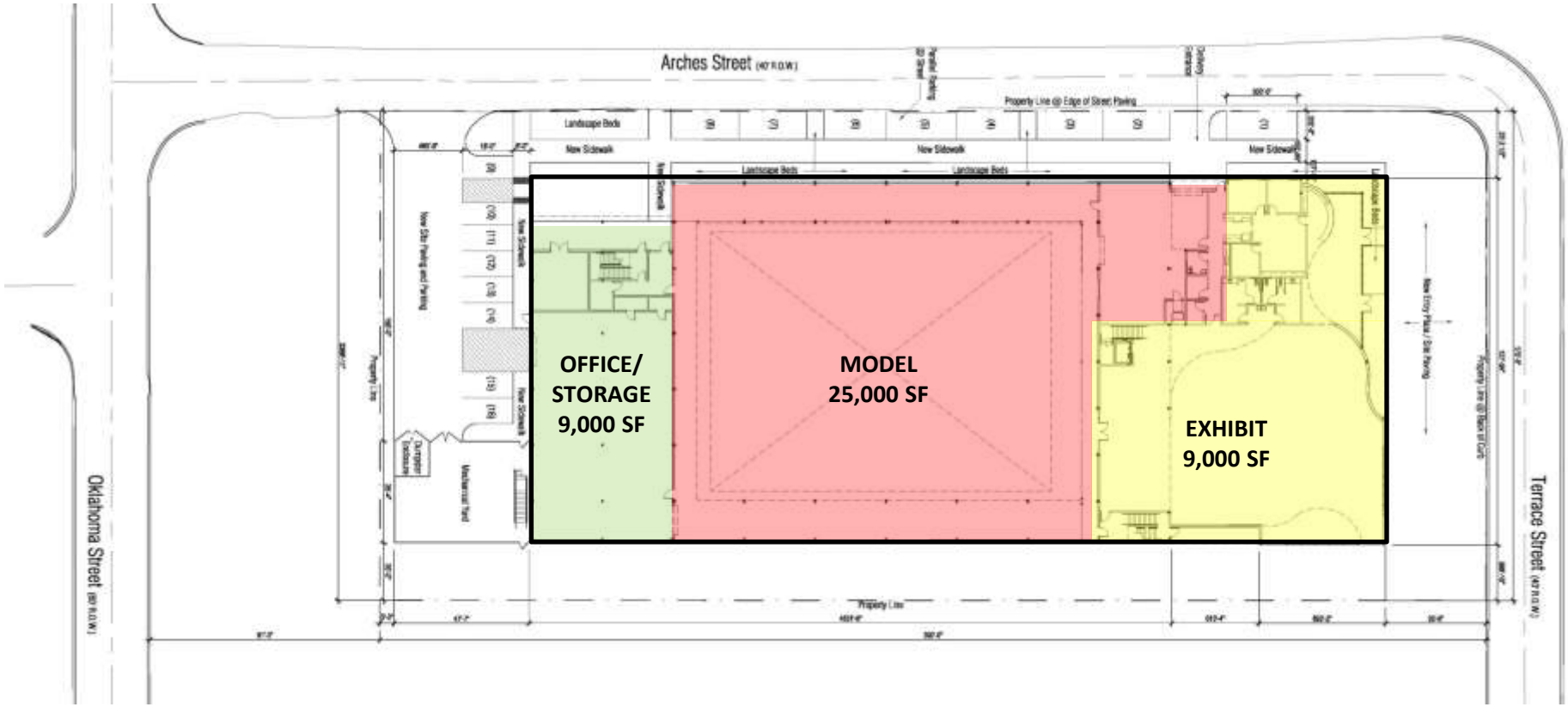
Expanded Small Scale Physical Model

‘Guinea Pig Model’



River Modeling Center

River Modeling Center



River Modeling Center

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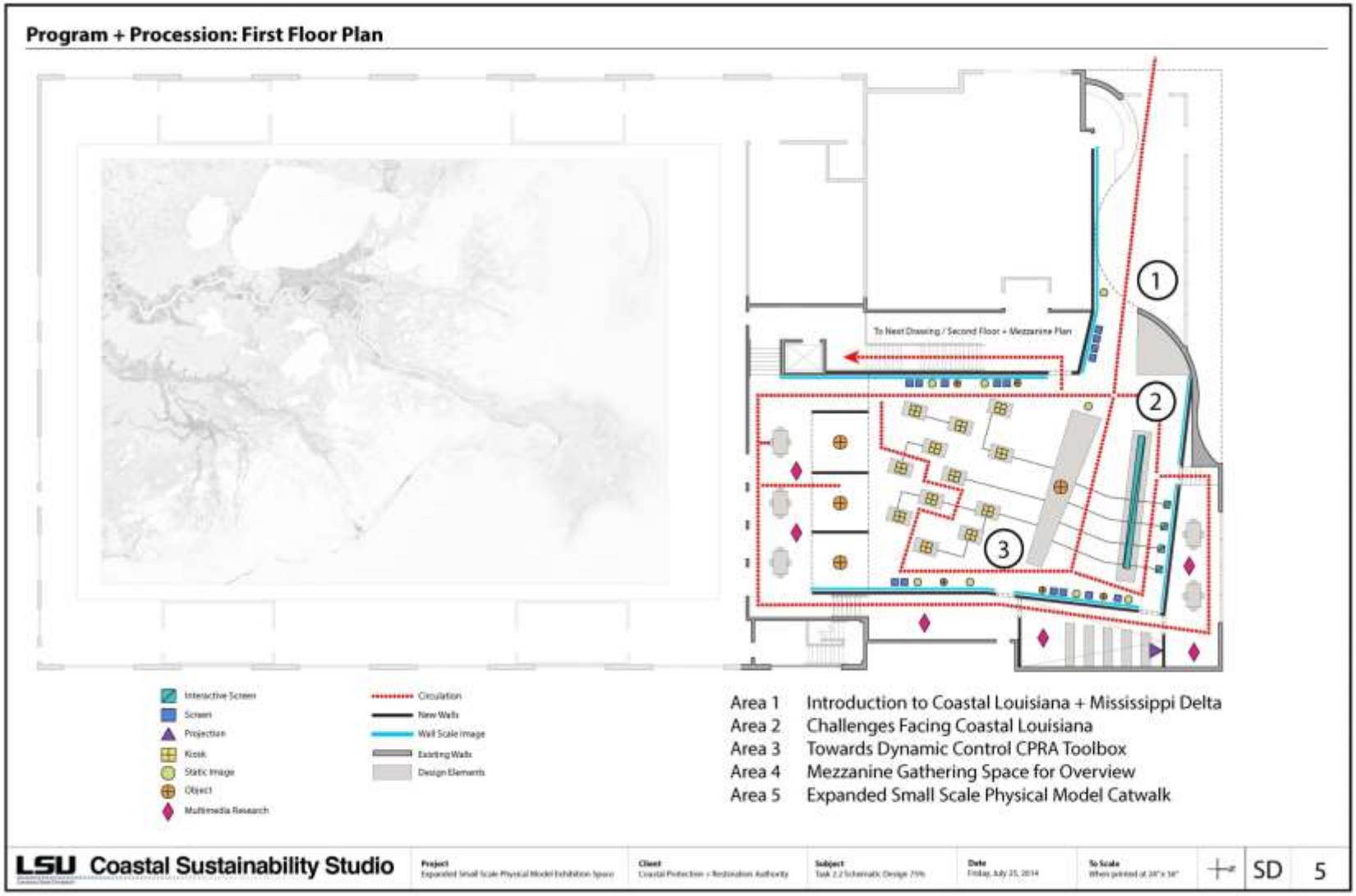
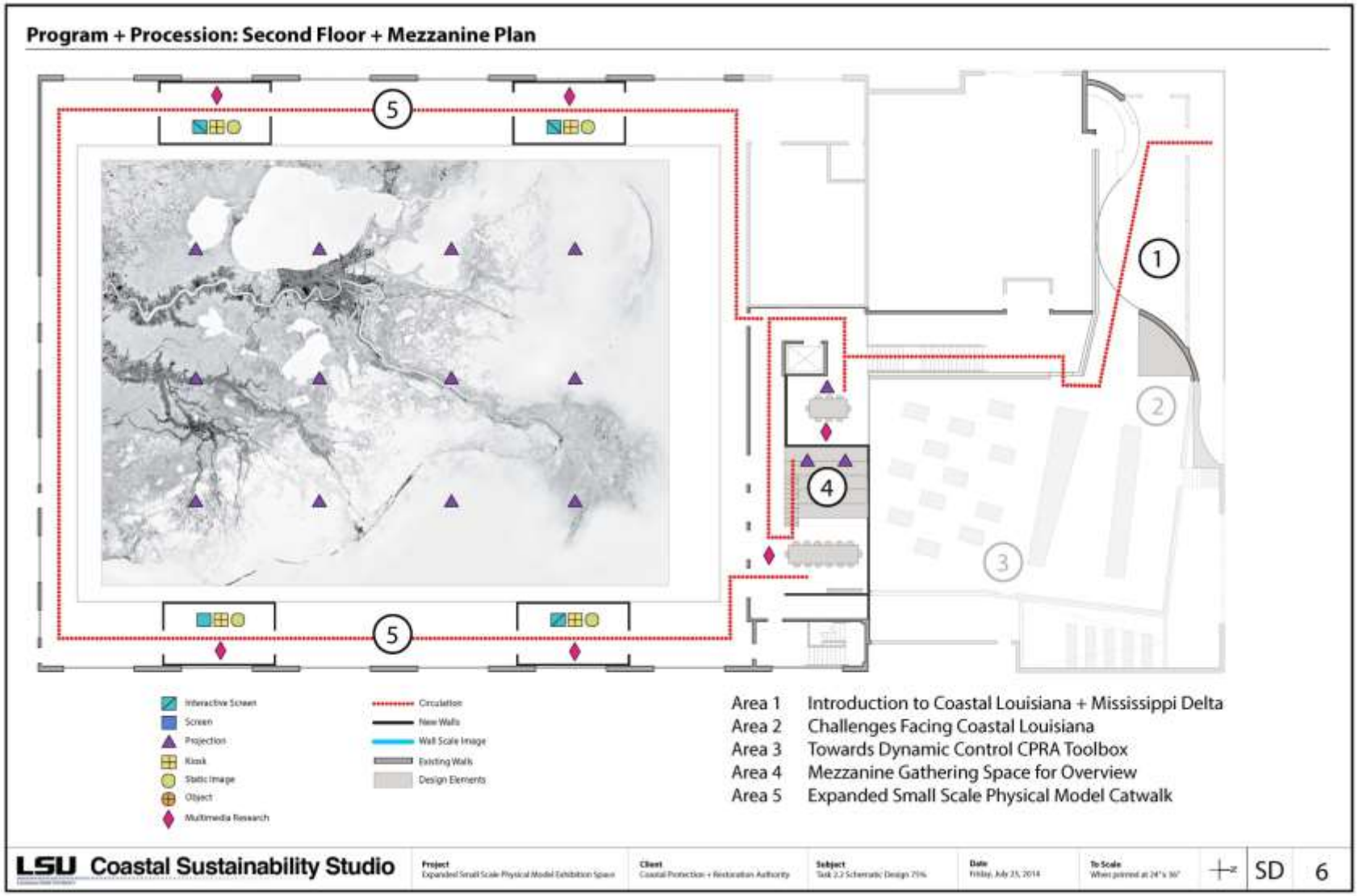


River Modeling Center



Progress to Date


159 miles
of built or
improved levees


19,405 acres
of coastal habitats benefited


$17 Billion
in State & Federal funding
for protection & restoration

Projects Constructed Since Establishment of the Master Plan

Coastal Restoration- January 2008 through FY 15 - 7.5 Years

	Constructed		Under Construction		Headed to Construction		Anticipated to be bid for construction in FY15		TOTALS	
	#	Total Cost	#	Total Cost	#	Total Cost	#	Total Cost	#	Total Cost
Barrier Island/Headland Restoration	9	$584,426,225	1	$70,679,580	0	$0	3	$368,896,867	13	**$1,024,002,672**
Marsh Creation	9	$156,461,322	5	$107,271,080	4	$149,135,706	5	$93,048,958	23	**$505,917,066**
Shoreline Protection	15	$282,644,251	3	$42,788,462	0	$0	3	$41,411,420	21	**$366,844,133**
Hydrologic Restoration	6	$66,824,678	3	$6,280,000	0	$0	4	$19,444,843	13	**$92,549,521**
Diversions	1	$20,000,000	0	$0	0	$0	1	$20,000,000	2	**$40,000,000**
Oyster Barrier Reefs	1	$1,510,433	0	$0	0	$0	1	$26,500,000	2	**$28,010,433**
Other Restoration Projects	4	$5,057,974	1	$3,194,355	1	$13,520,000	2	$6,968,162	8	**$28,740,491**
	45	**$1,116,924,884**	**13**	**$230,213,477**	**5**	**$162,655,706**	**19**	**$576,270,250**	**82**	**$2,086,064,317**

Structural Protection and Infrastructure - January 2008 through FY 15

	Constructed		Under Construction		Headed to Construction		Anticipated to be bid for construction in FY15		TOTALS	
		Total Cost		Total Cost		Total Cost		Total Cost		Total Cost
Greater New Orleans Hurrricane Protection System		$4,984,256,580		$3,748,755,700		*TBD*		*TBD*		**$8,733,012,280**
Other Protection Projects	6	$1,111,764,536	4	$793,584,101	1	$438,148,866	7	$52,682,719	18	**$2,396,180,222**
Infrastructure Projects	5	$53,083,805	0	$0	2	$2,361,942	0	$0	7	**$55,445,747**
		$6,149,104,921		**$4,542,339,801**		**$440,510,808**		**$52,682,719**		$11,184,638,249

Project Hotlist

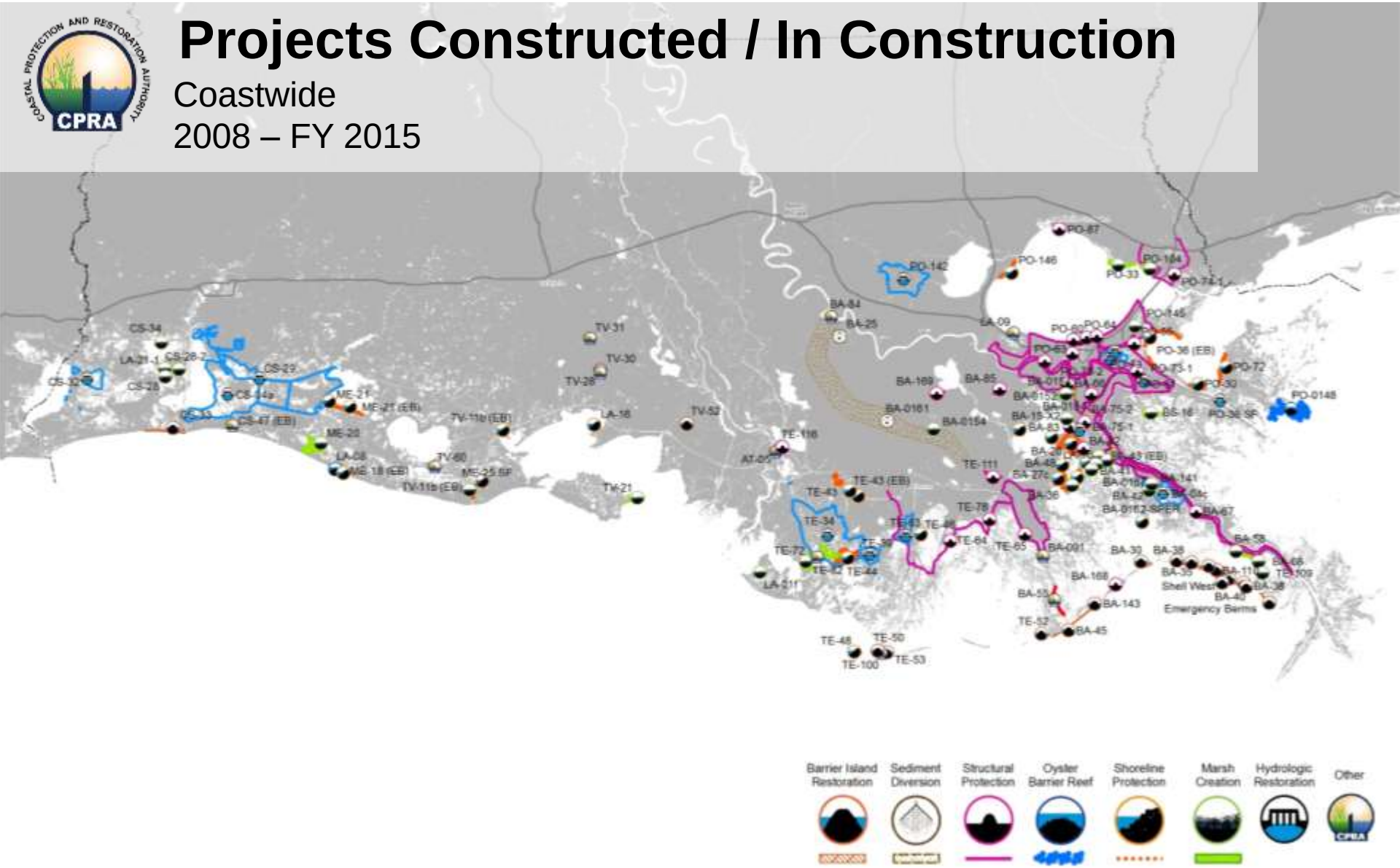
Status	Number of Projects	Estimated Total Cost
In Construction	17	$378M
Headed to Construction	5	$154M
To be bid in next 6 months	17	$517M

**Table does not include Greater New Orleans Hurricane Protection System*

Projects Constructed / In Construction

Coastwide

2008 – FY 2015



Cameron Parish Shoreline Restoration
February 2014

Caminada Headland Beach and Dune Restoration – Increment I
January 2014

Lake Hermitage Marsh Creation
February 2014

Riverine Sand Mining – Scofield Island Restoration
December 2013

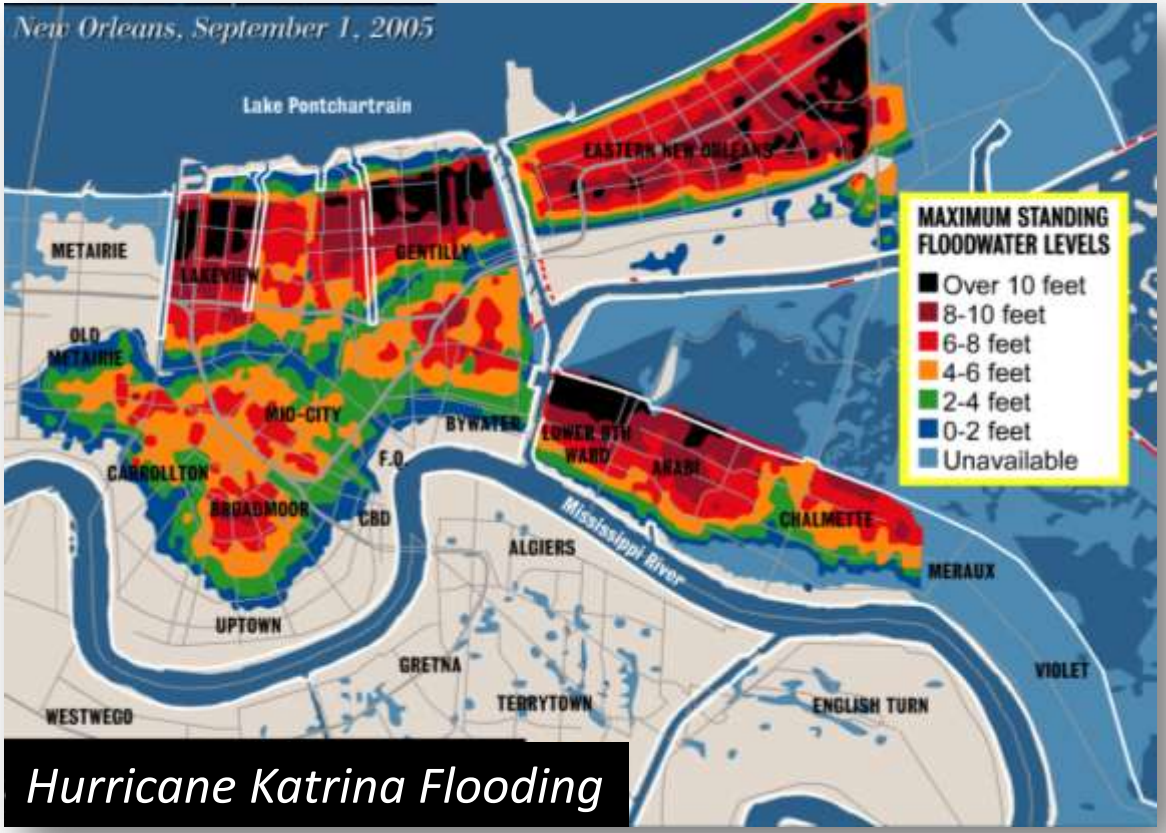
Shell Island East
Barrier Island Restoration
August 2013

Biloxi Marsh
January 2014

Flood Protection

Major Components

- Levees
- Floodwalls
- Pump Stations
- Sector Gates & Barge Gates
- Locks

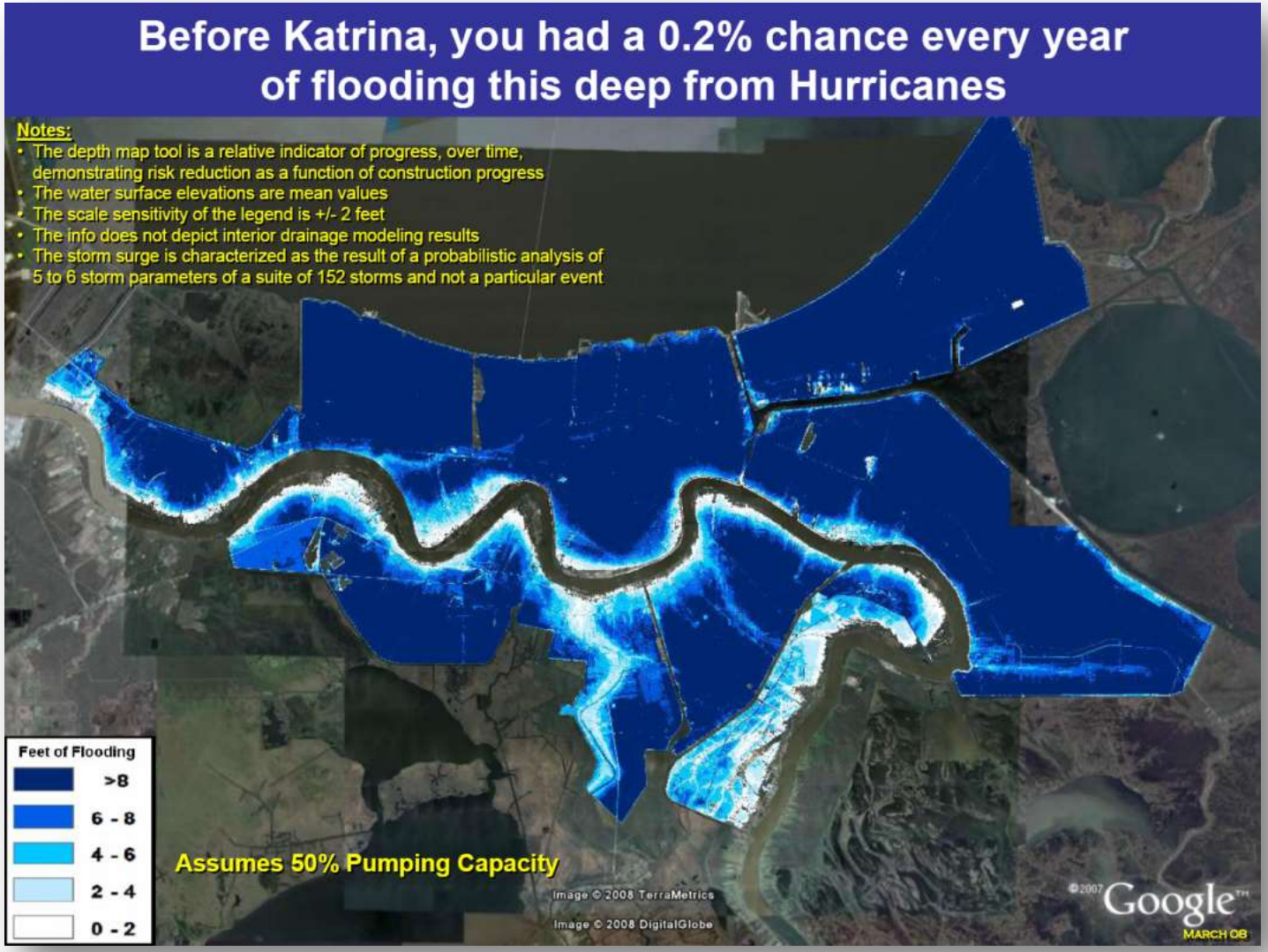


Hurricane Katrina Flooding

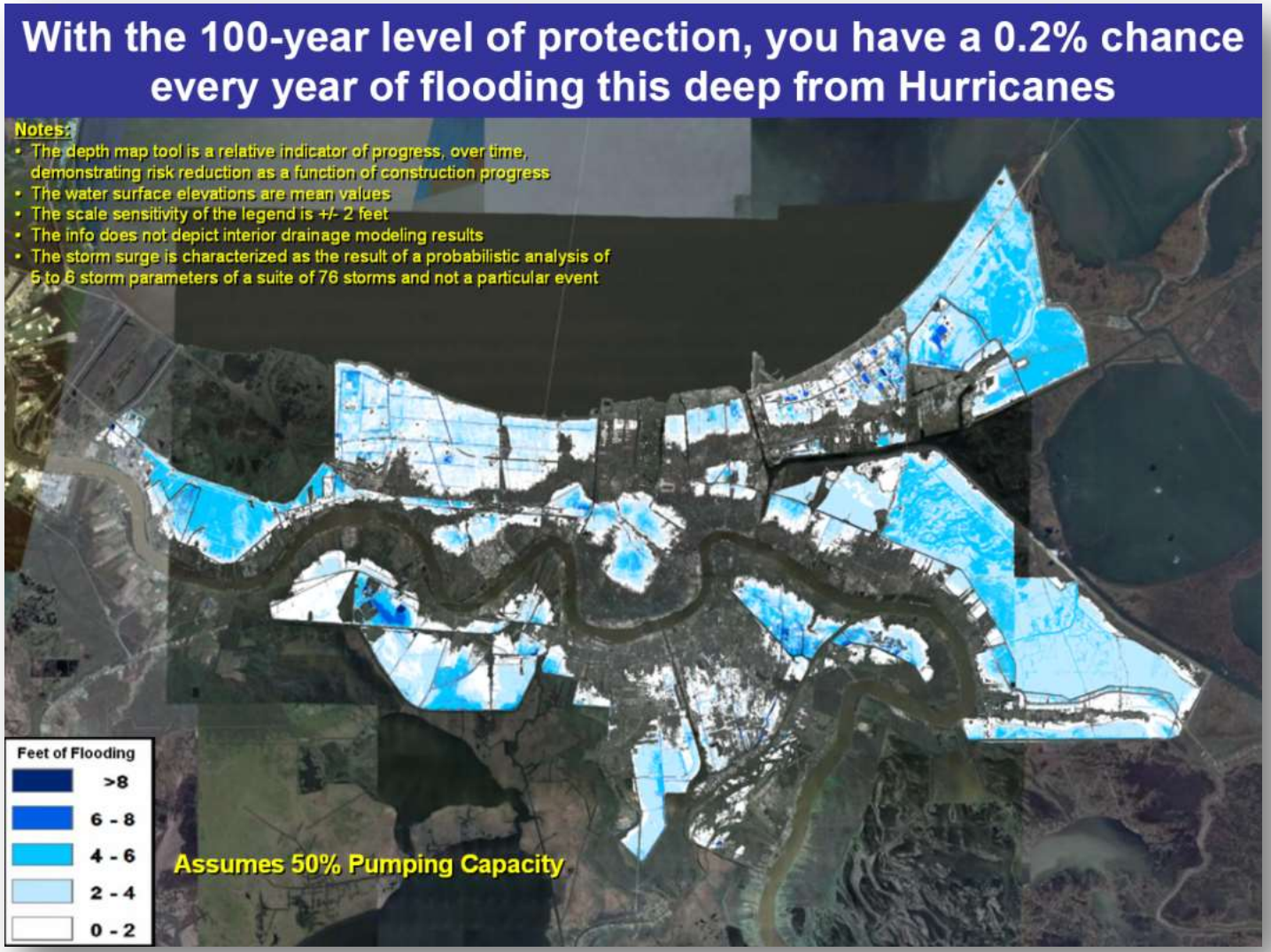
Role of CPRA

- Design and Review
- Construction Oversight & Review
- Levee Inspections
- Emergency Response Teams

Flood Protection

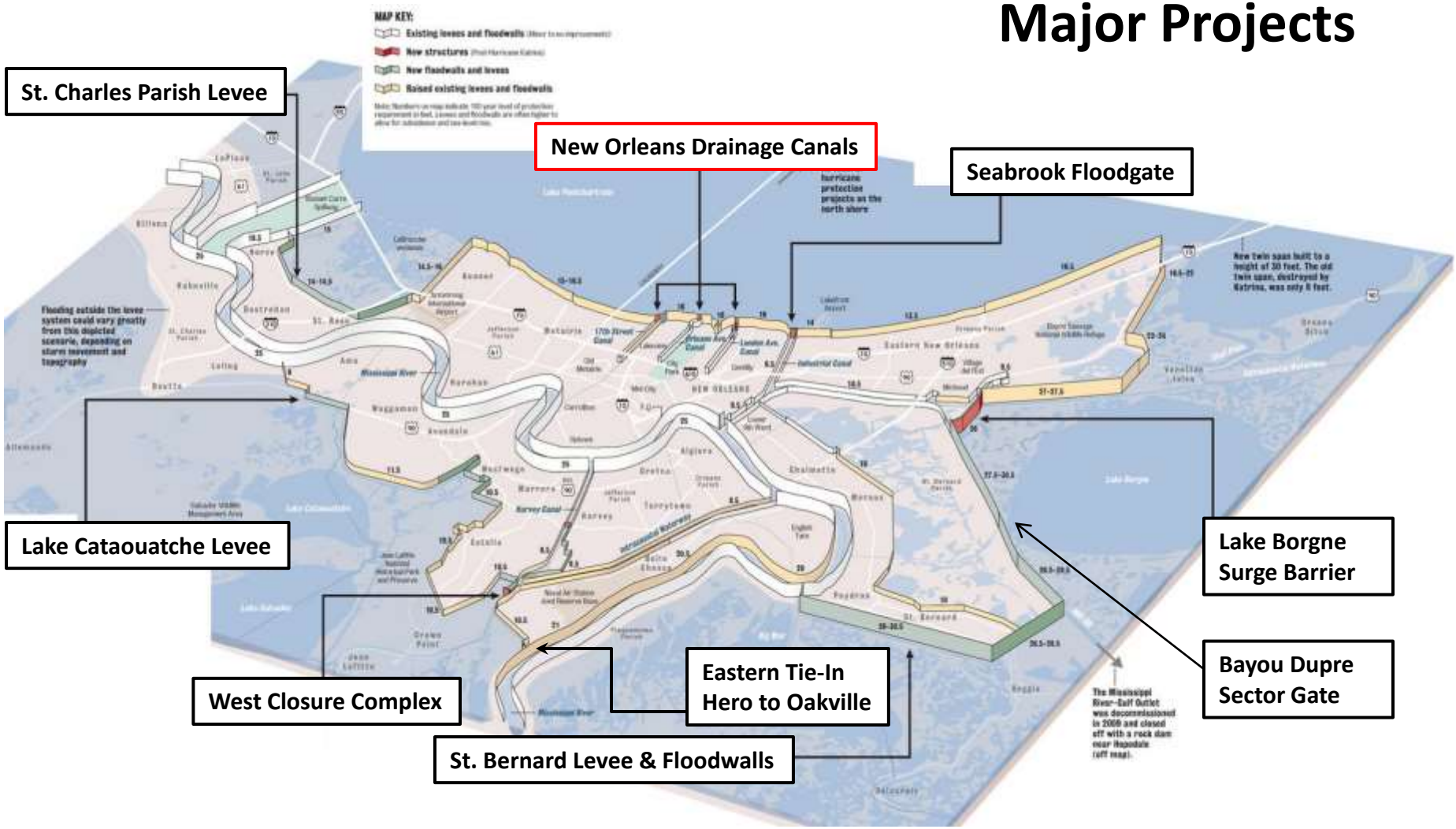


Flood Protection

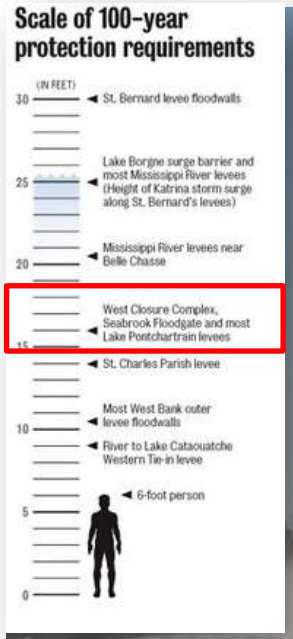


Flood Protection

Major Projects



Flood Protection

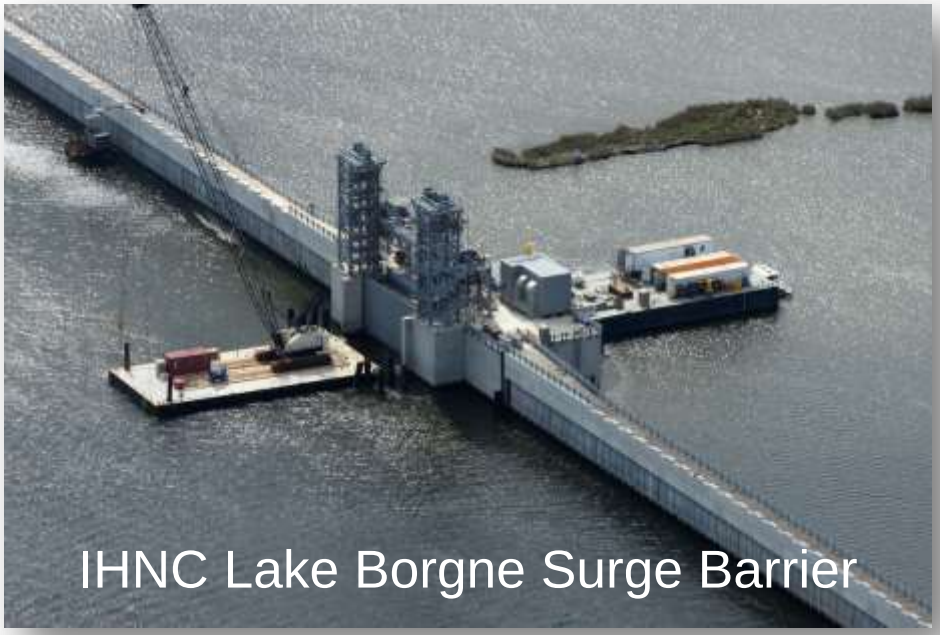


GIWW West Closure Complex (Pump Station)

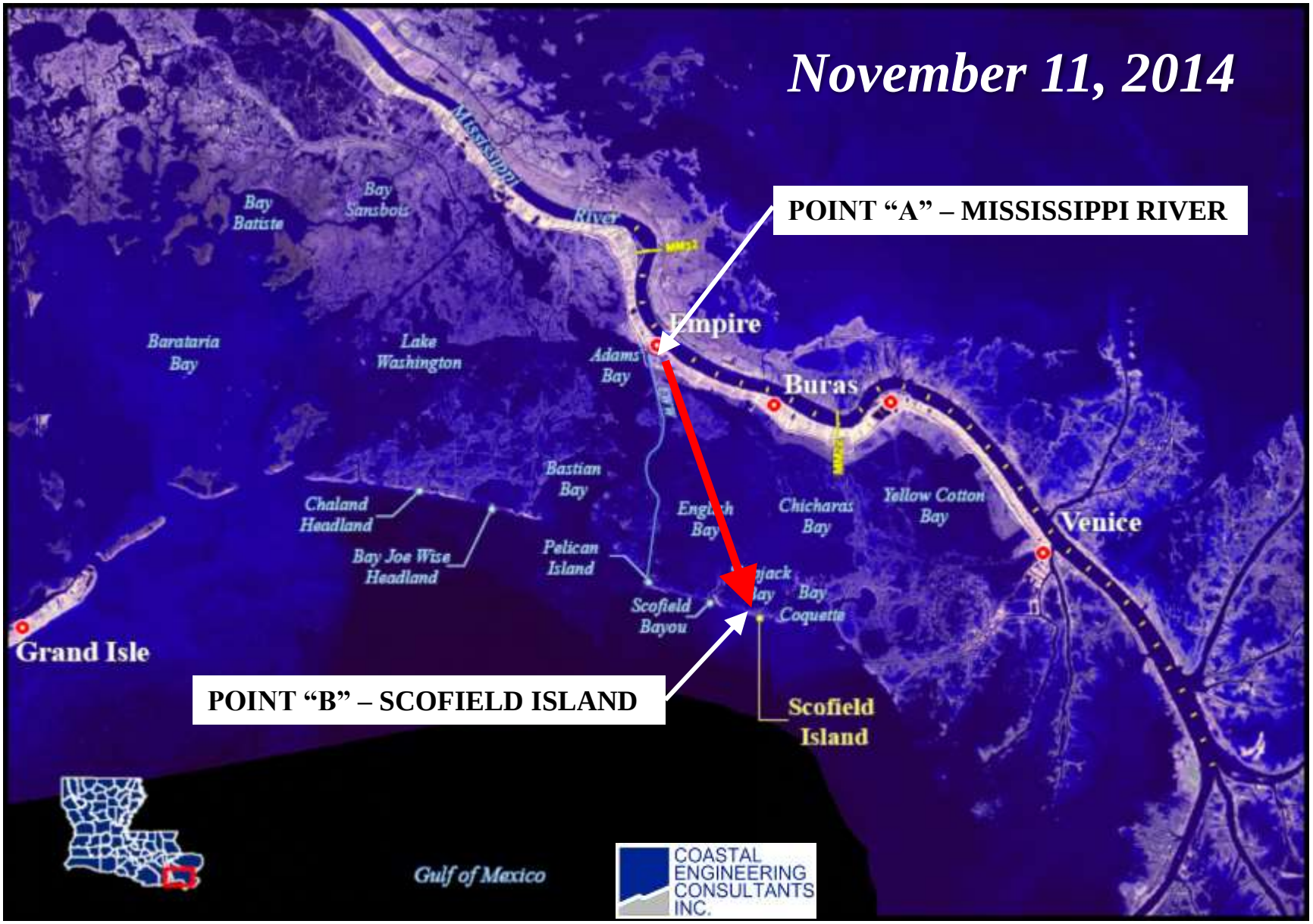
Flood Protection

GIWW West Closure Complex

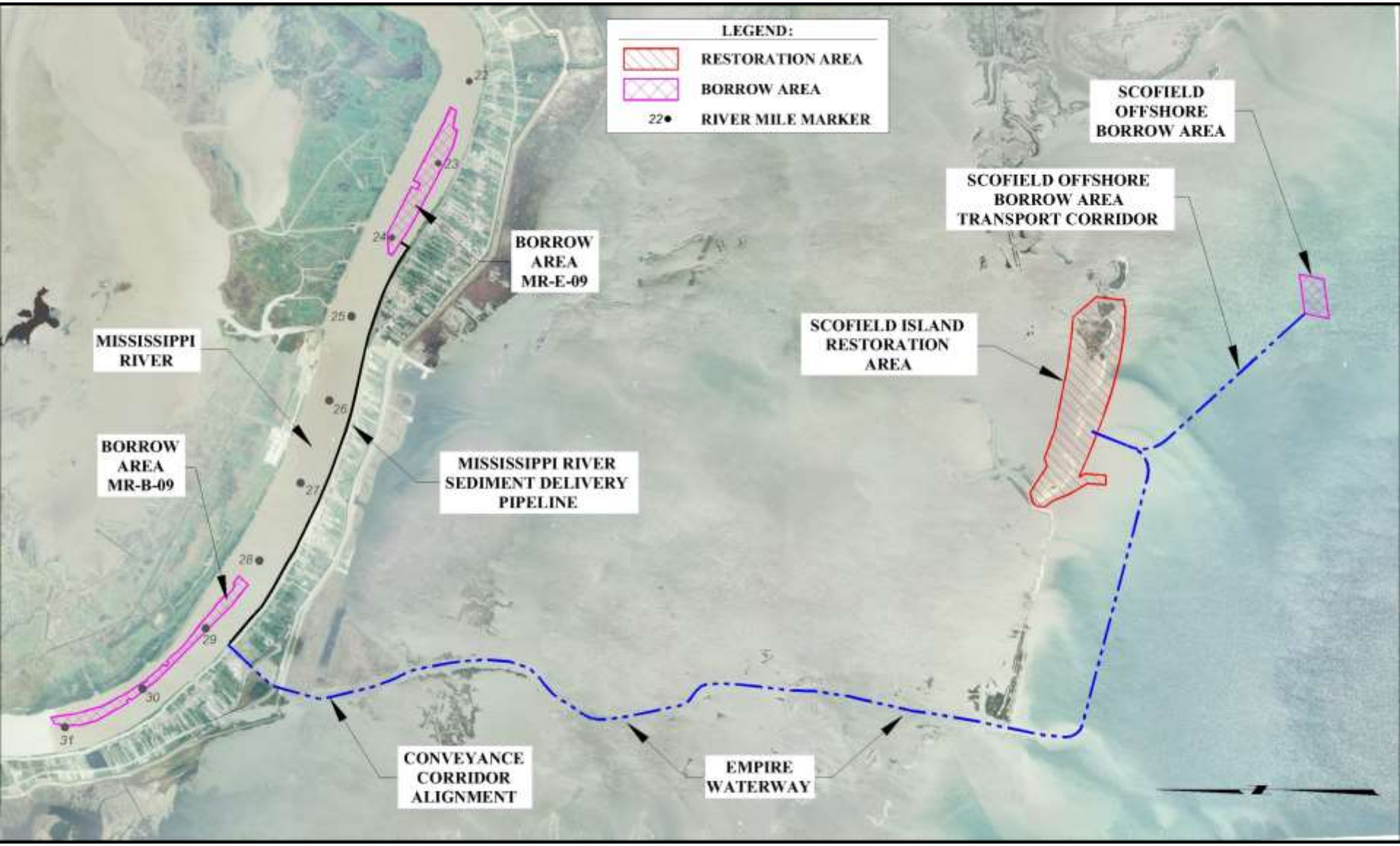
Flood Protection



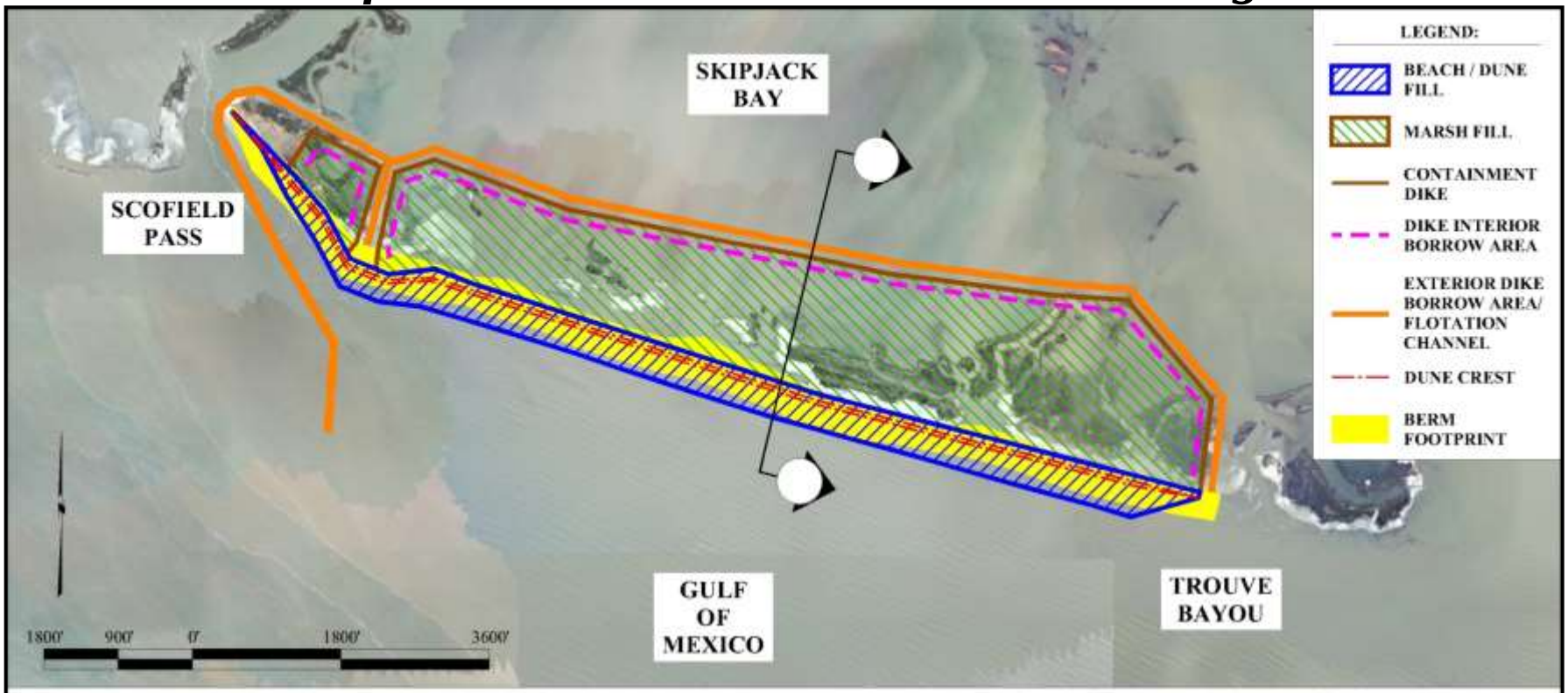
Riverine Mining / Scofield Island Restoration

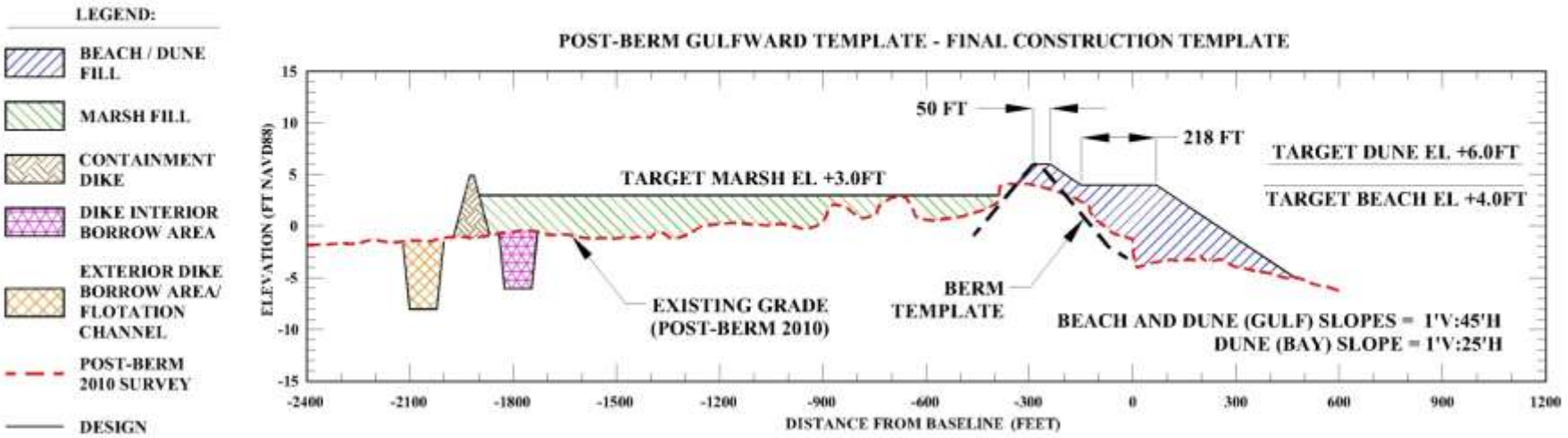


Project Design



Scofield Island - Final Construction Design





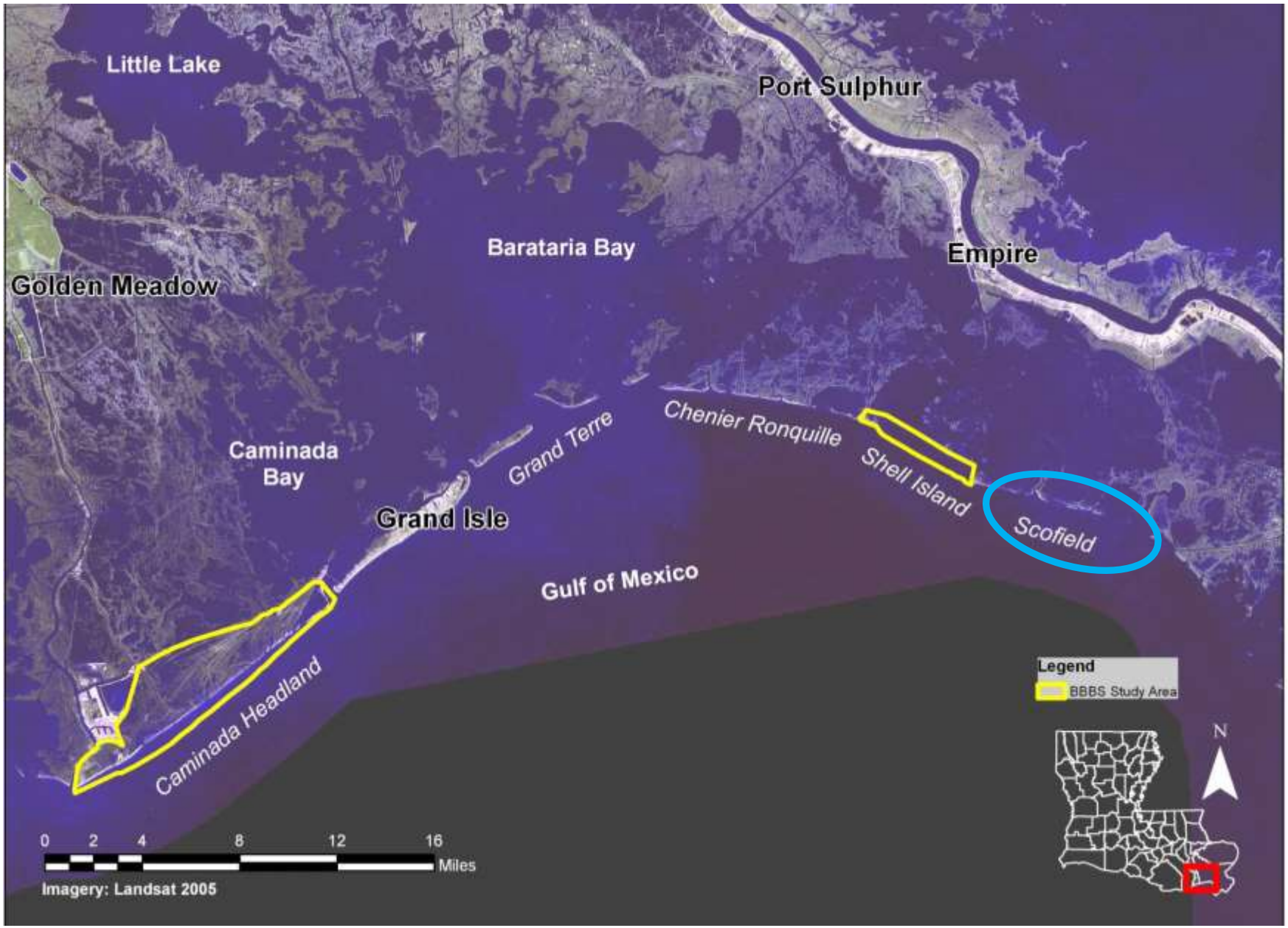
Lessons Learned

- **Stakeholder coordination early and continuously from Plan Formulation through Construction completion**
- **Sand quality of the Mississippi River performance versus offshore sand source performance**
- **Flexibility during construction to benefit Project, Owner, and Contractor**

Scofield Island

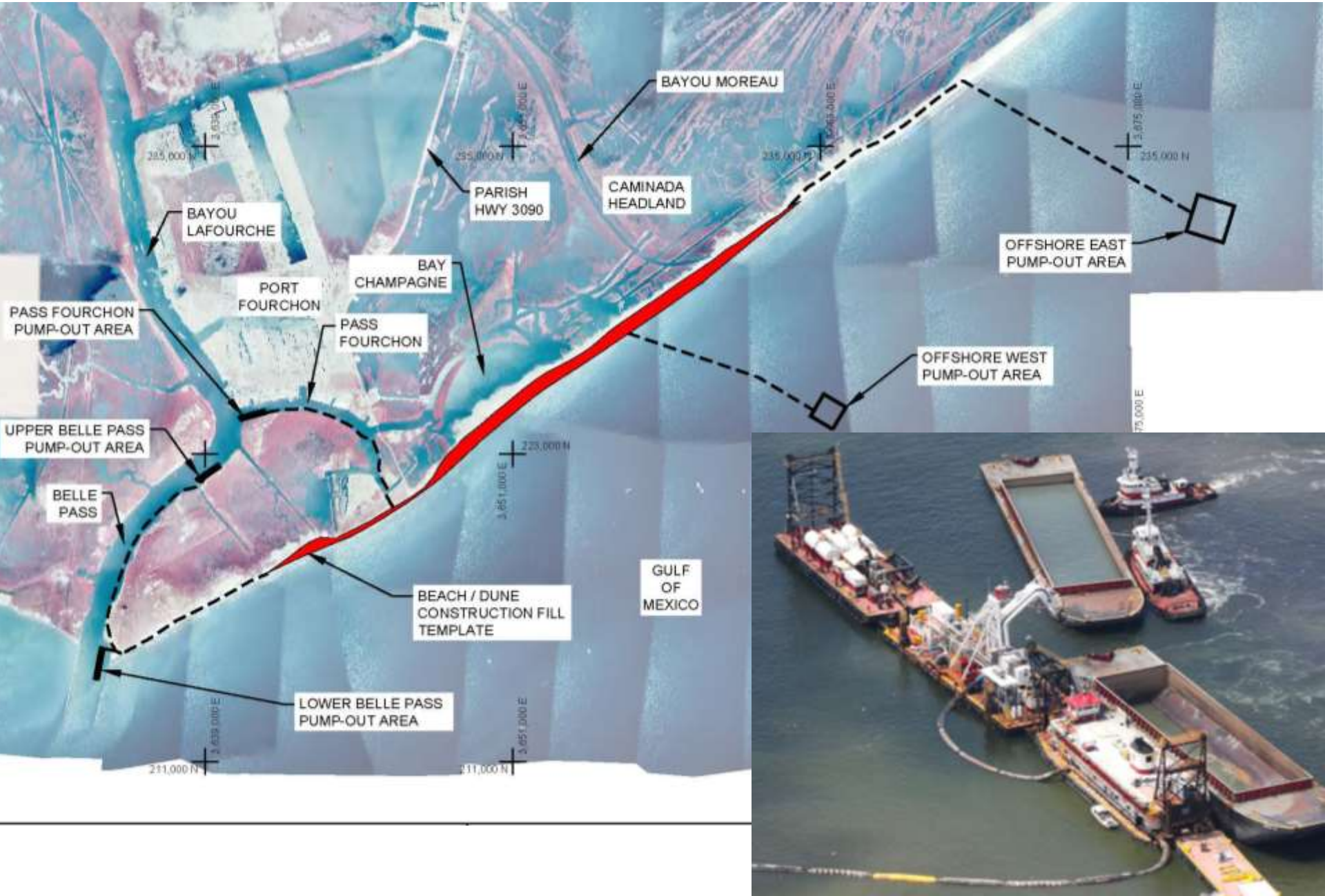
Image # 131002 6116
Date 10.02.13

Caminada Headland Restoration



OCS Borrow Area

Project Design



Lessons Learned

- **Reduce Contractors risk by providing most updated site information possible**
- **Permit multiple points of access ~ contractor's can bid projects utilizing available dredging equipment**
- **Reach out to project stakeholders / have open dialogue with regulatory officials**
- **Expect the unexpected**

COMMITTED TO **OUR COAST**