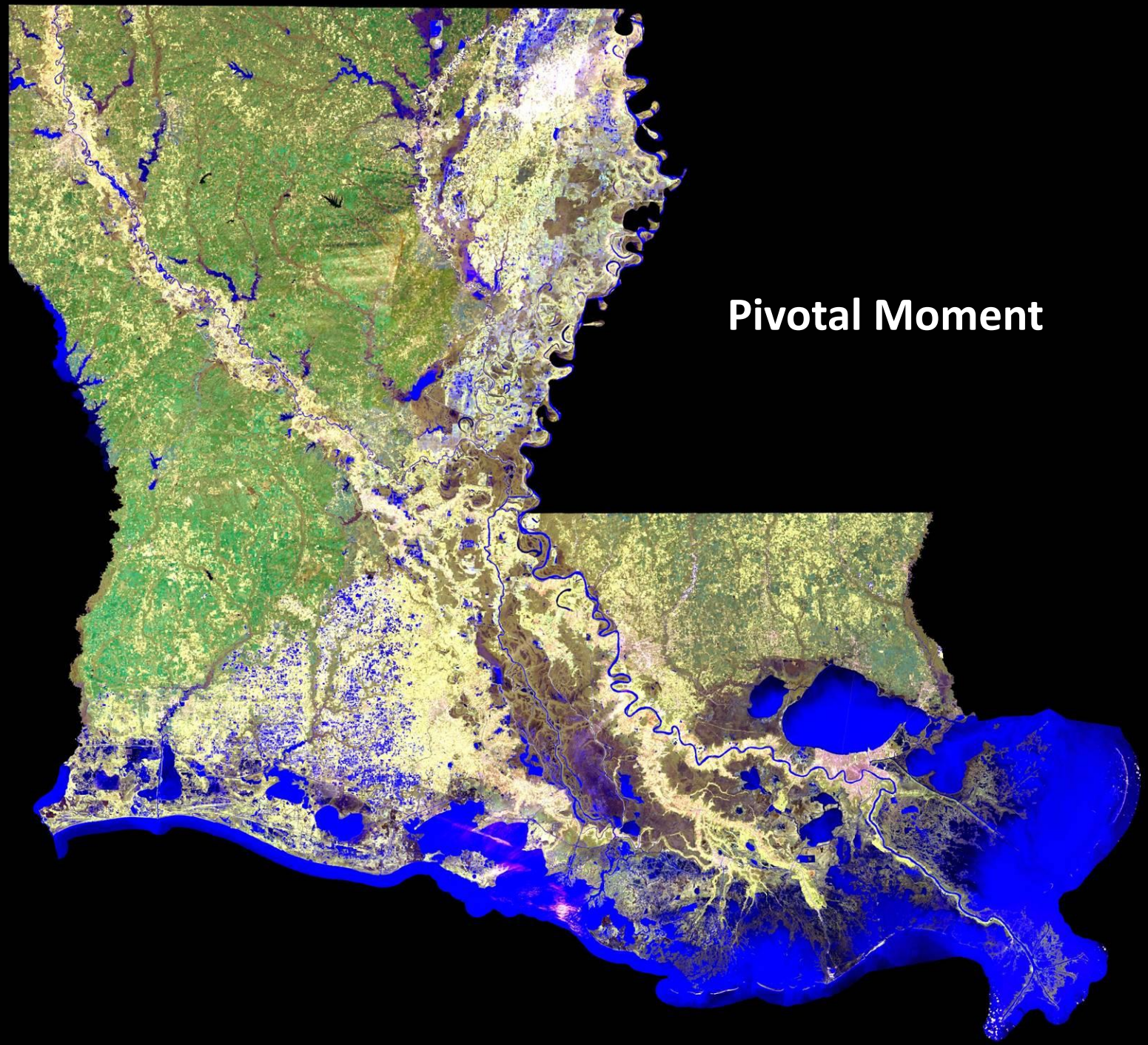
CPRA
Coastal Protection and Restoration Authority of Louisiana

Diversions: Our Path Forward

Kyle Graham, CPRA
January 8, 2014

committed to **our coast**


Pivotal Moment

How Did We Get Here

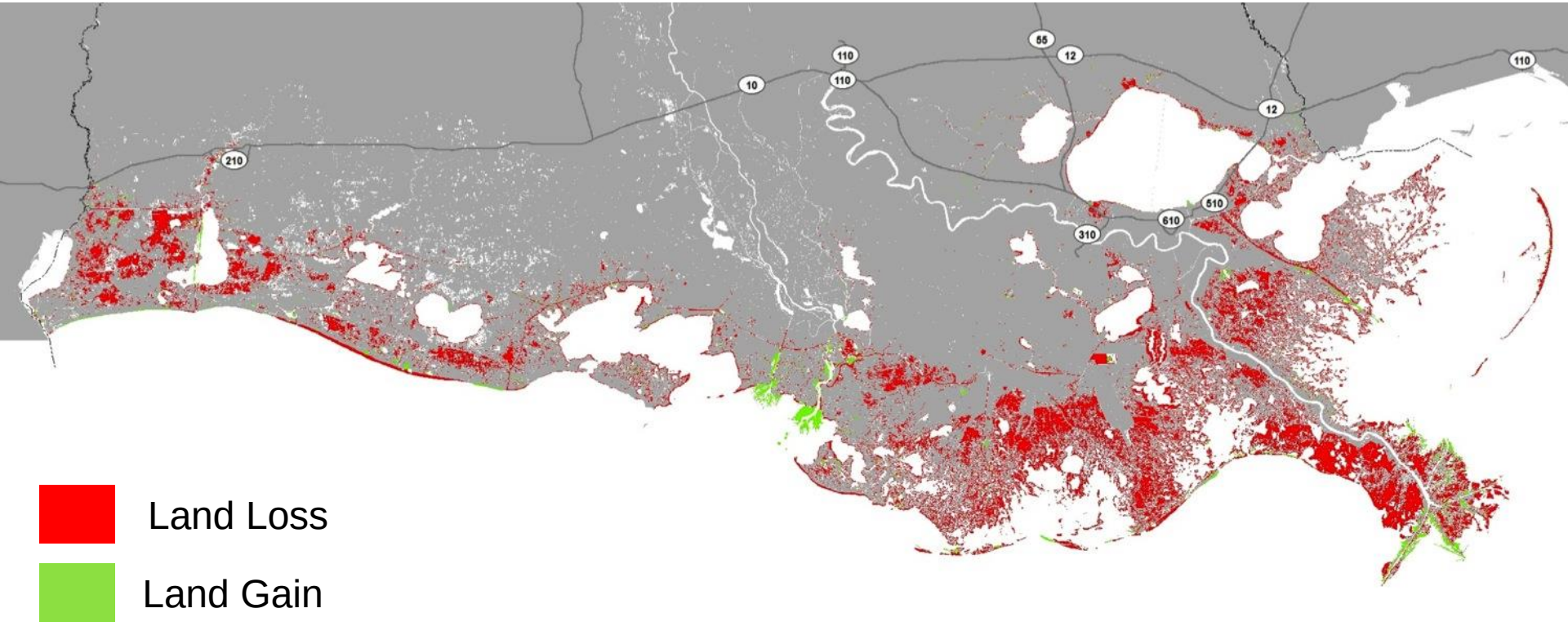
Restructuring State Offices – for Coastal Sustainability

Flood Protection

Coastal Wetland Restoration

CPRA
Coastal Protection and Restoration Authority of Louisiana


Land Area Change in Coastal LA
1932 – 2010



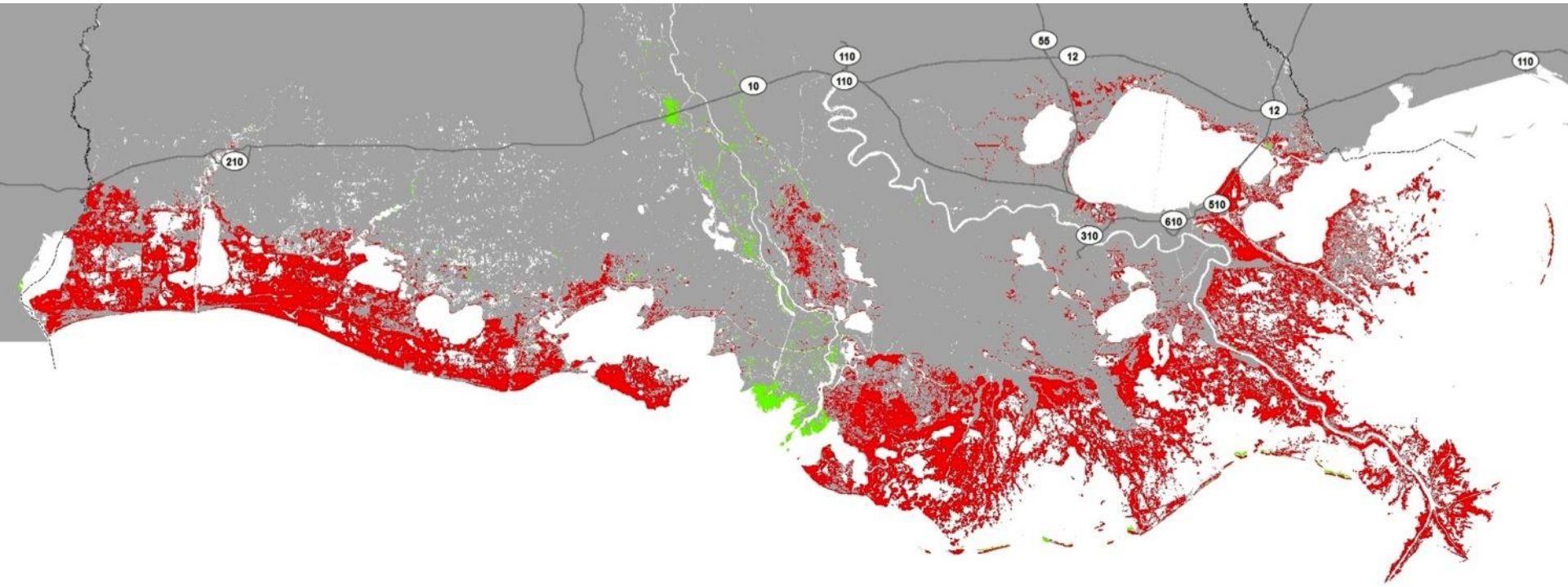
Historic Land-Water Change from 1932-2010

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

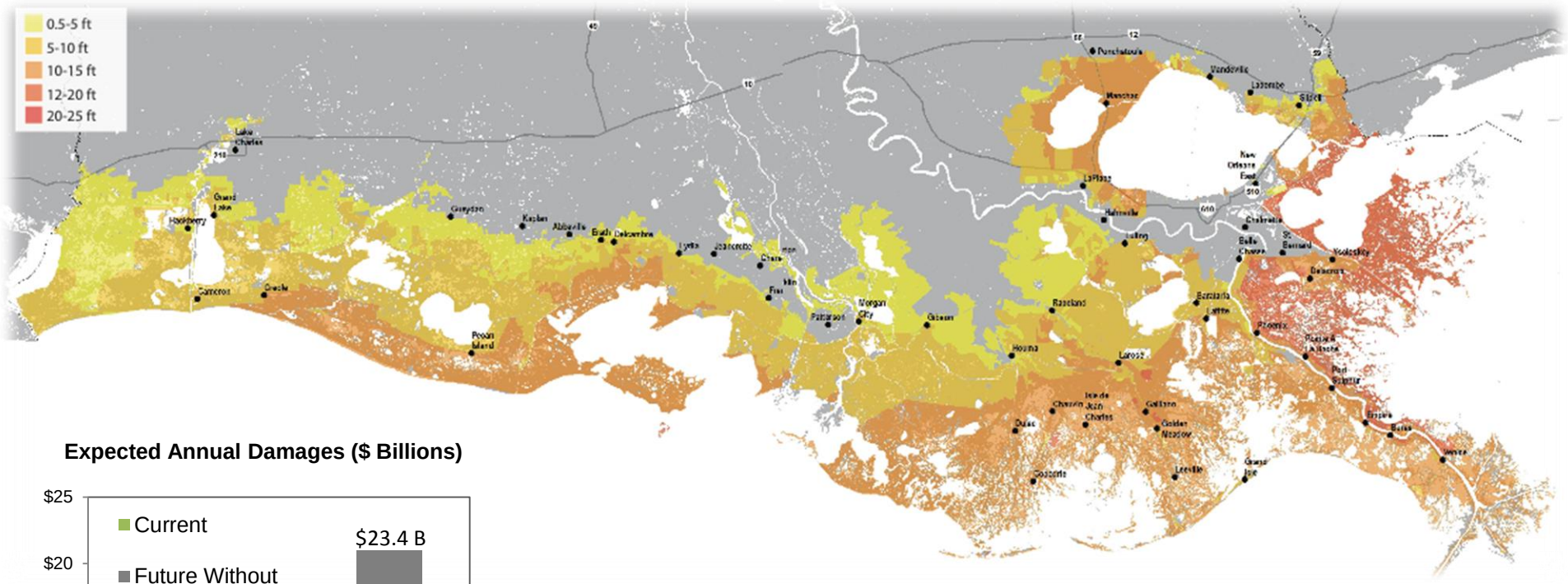
Couvillion et al (USGS), 2011

Looking Forward….

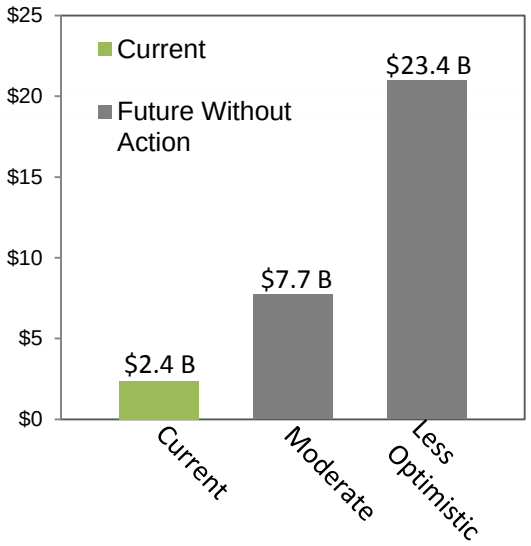
2060



We Could Lose Up to an Additional 1,750 Square Miles of Land



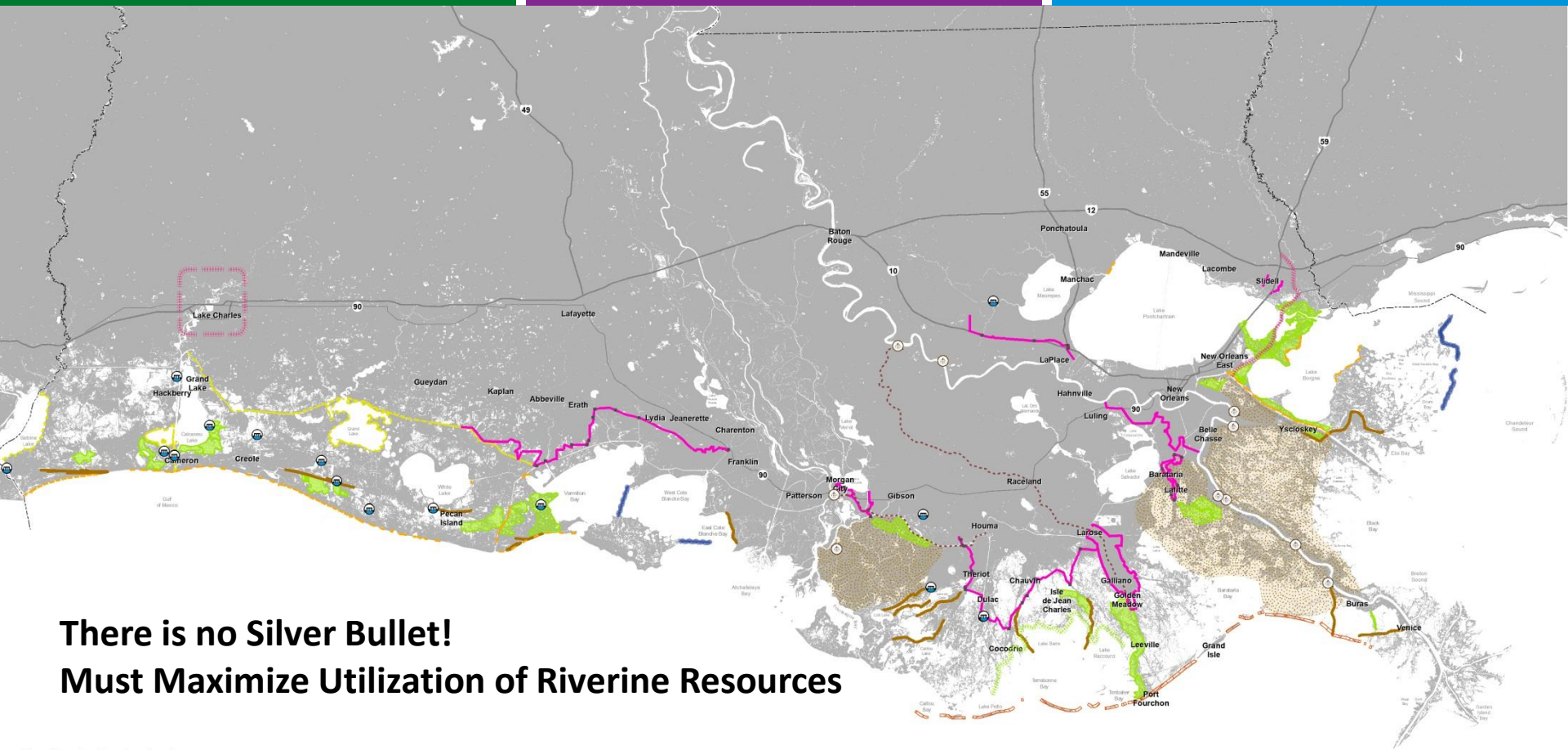
Expected Annual Damages ($ Billions)



The Loss of Land Results in a Loss of Coastal Communities

Louisiana's 2012 Coastal Master Plan

Southwest Coast | Central Coast | Southeast Coast



There is no Silver Bullet!

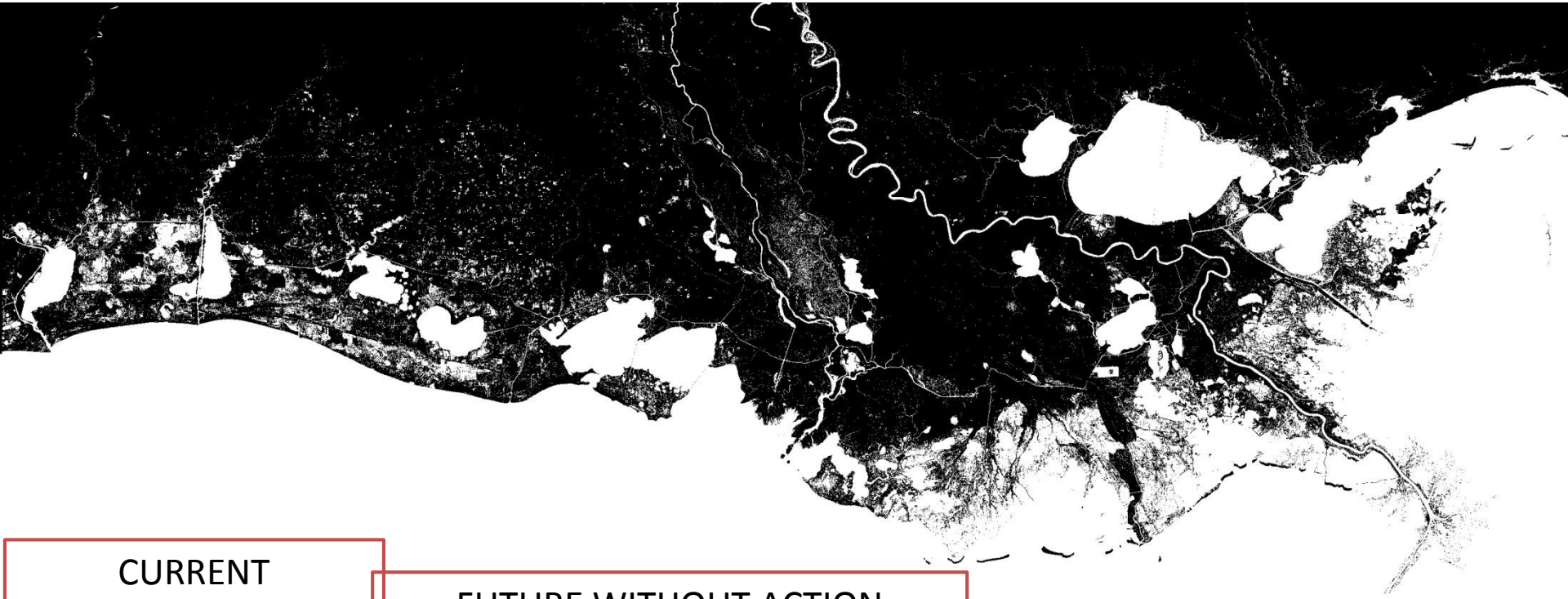
Must Maximize Utilization of Riverine Resources

Projects Included:

Projects for Further Planning:

- Lake Pontchartrain Barrier
- Lake Charles Protection
- Terrebonne Bay Rim Marsh Creation
- Channel Realignment (Not Shown)

Utilizing All Our Available Restoration Tools We Can Sustain Our Coast



CURRENT

FUTURE WITHOUT ACTION
YEAR 50

FUTURE WITH MASTER PLAN
YEAR 50

Implementing the Master Plan: Gather Funds

- Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) - Approx. $75M per year
- Coastal Impact Assistance Program (CIAP) - $496M
- Louisiana Coastal Area Program (LCA) – up to $8B
- Greater New Orleans – Hurricane Protection System - $14.6 B
- State Surplus Funding - $790M
- Gulf of Mexico Energy Security Act (GOMESA) – eventually up approximately $180M per year
- Deepwater Horizon
  - Criminal- $1.2B
  - Civil Penalties - TBD
  - Natural Resources Damages - TBD

Constructing the Low Hanging Fruit

Coastal Restoration- January 2008 through FY 15

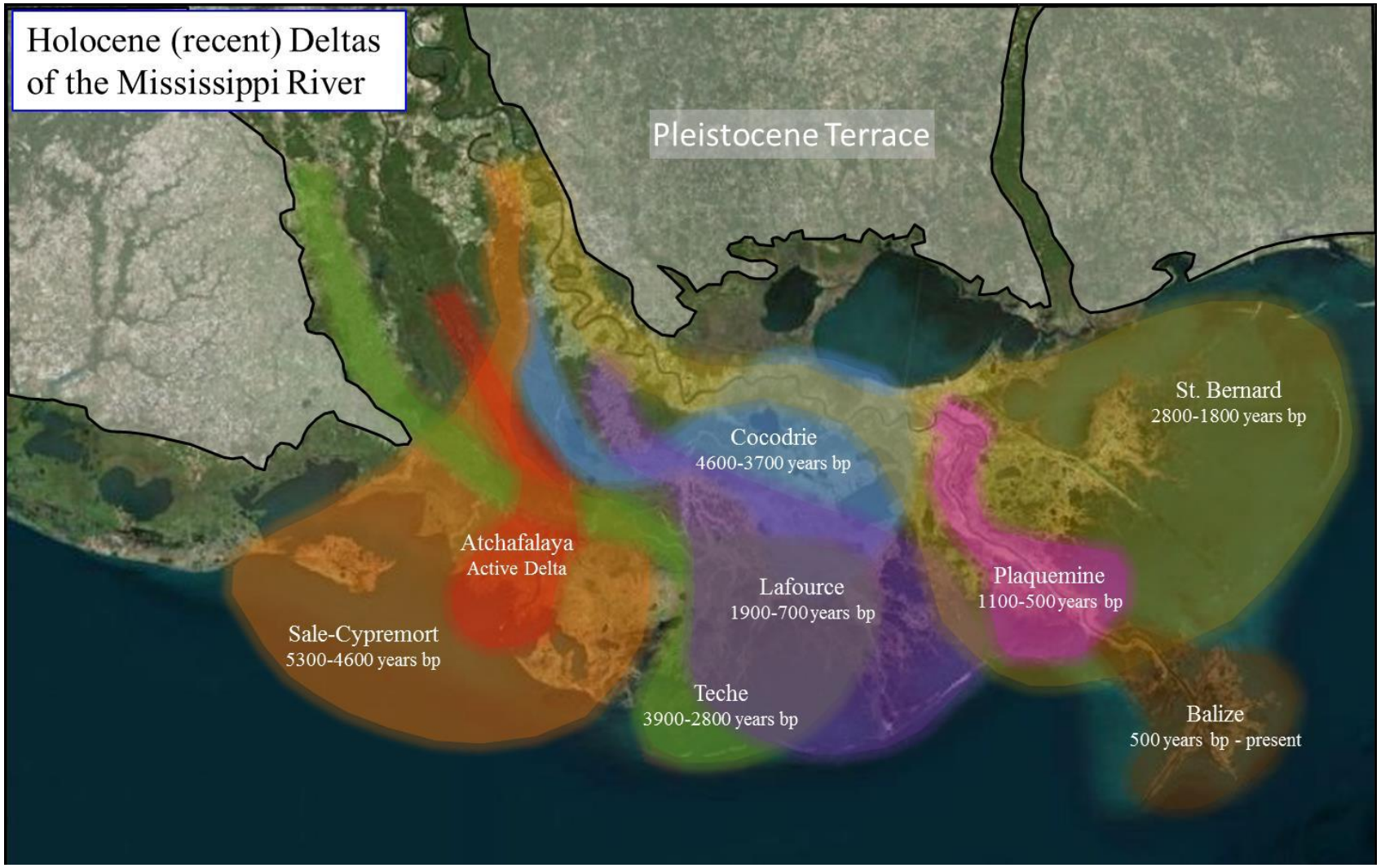
	Constructed		Under Construction		Anticipated to be bid for construction in FY14 (next 6 months)		Anticipated to be bid for construction in FY15		TOTALS	
	#	Total Cost	#	Total Cost	#	Total Cost	#	Total Cost	#	Total Cost
Barrier Island/Headland Restoration	6	$430,107,161	4	$223,760,744	1	$132,439,272	2	$214,269,971	13	**$1,000,577,148**
Marsh Creation	5	$94,302,595	8	$199,830,919	6	$96,211,608	4	$199,773,984	23	**$590,119,106**
Shoreline Protection	12	$247,266,227	6	$76,180,528	1	$26,351,988	1	$11,305,616	20	**$361,104,358**
Hydrologic Restoration	6	$66,824,678	2	$5,500,000	4	$18,536,943	0	$0	12	**$90,861,621**
Diversions	1	$20,000,000		$0		$0	1	$18,350,000	2	**$38,350,000**
Oyster Barrier Reefs	1	$1,510,433		$0		$0	1	$23,500,000	2	**$25,010,433**
	31	**$860,011,094**	**20**	**$505,272,191**	**12**	**$273,539,811**	**9**	**$467,199,571**	**72**	**$2,106,022,667**

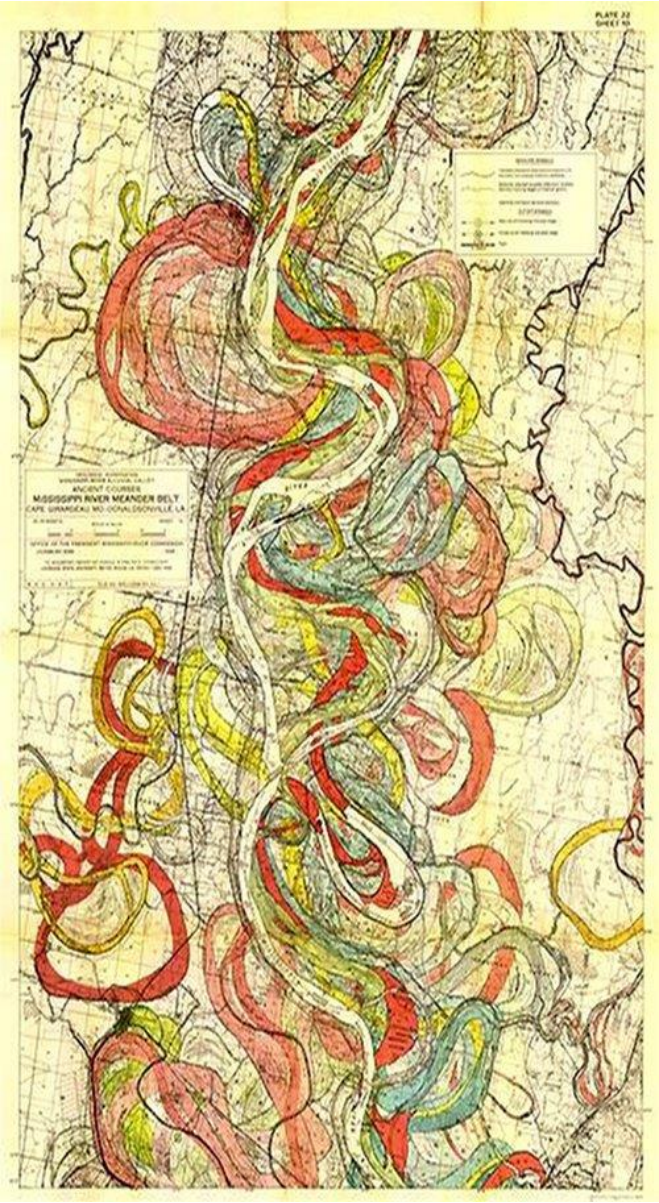
Why Focus on Diversions

History of Diversions

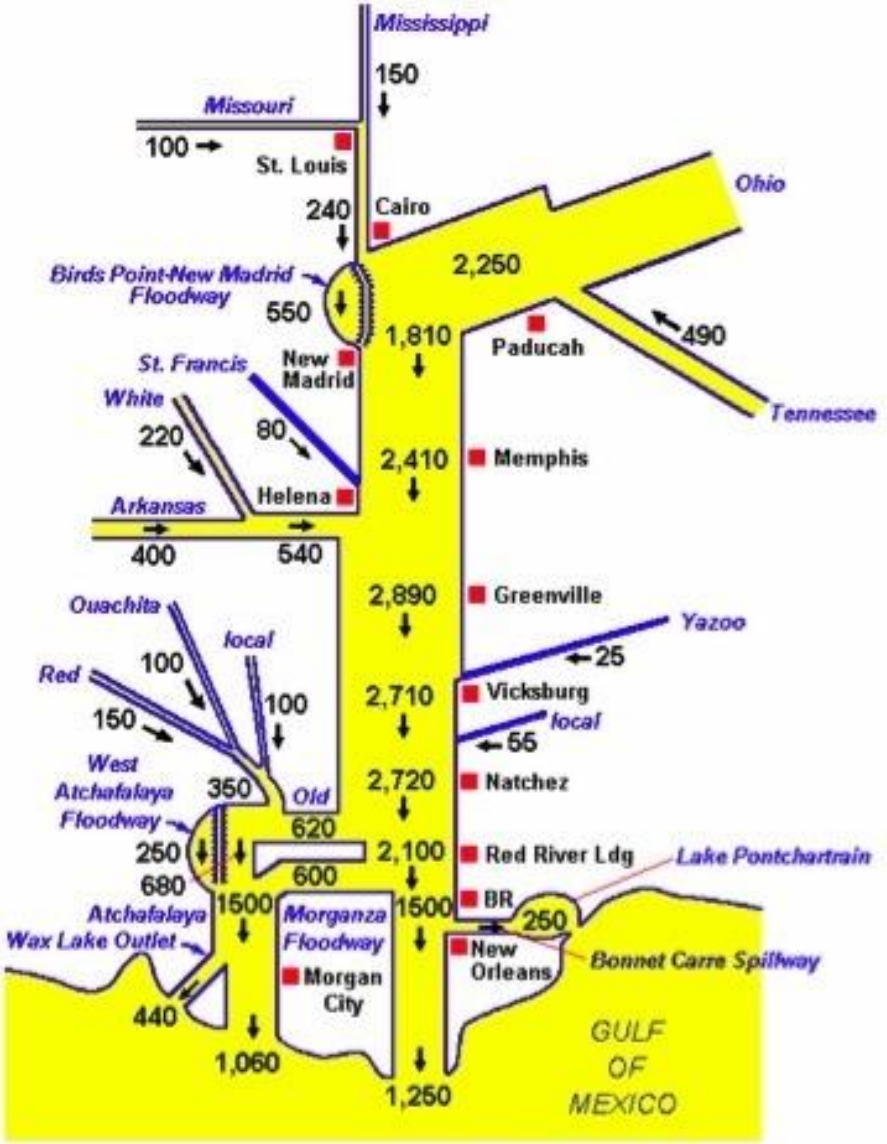
- Diversions are not a new concept or a recent activity. Such projects have been in place since the 1930s.
- First diversion projects were constructed for flood control.
- Later diversions and siphons constructed to combat salt water intrusion.
- Most recently planned diversions are aimed at diverting sediment to build and maintain wetlands.
- 15 existing diversions of various types in south Louisiana
  - 4 flood control projects (Old River Control Structure, Morganza and Bonnet Carré Spillways, and Wax Lake Outlet)
  - 8 freshwater diversions for salinity control and water supply

Mississippi River & Tributaries (MRT)



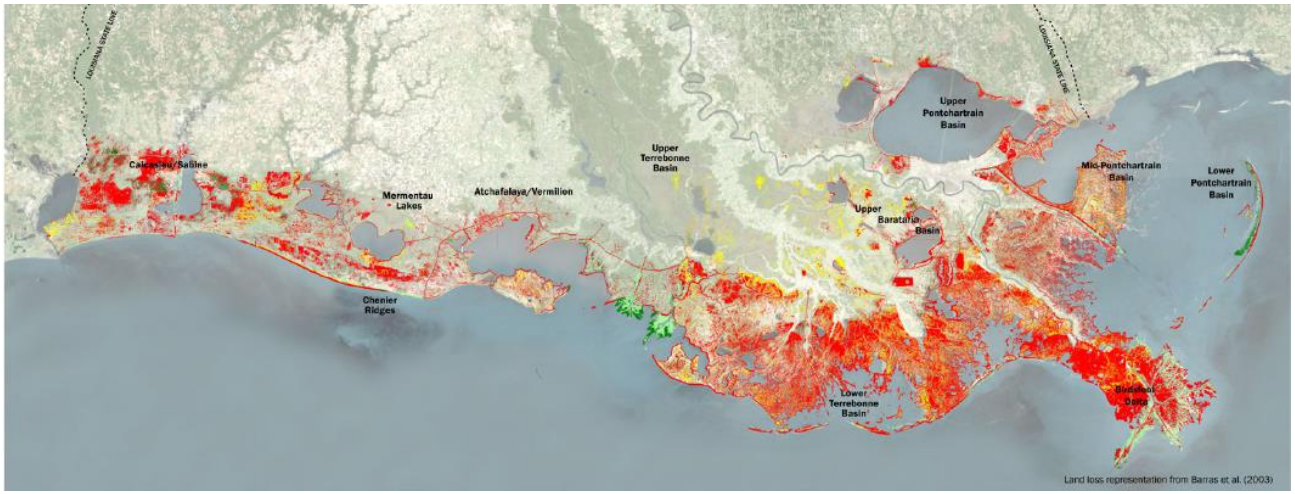


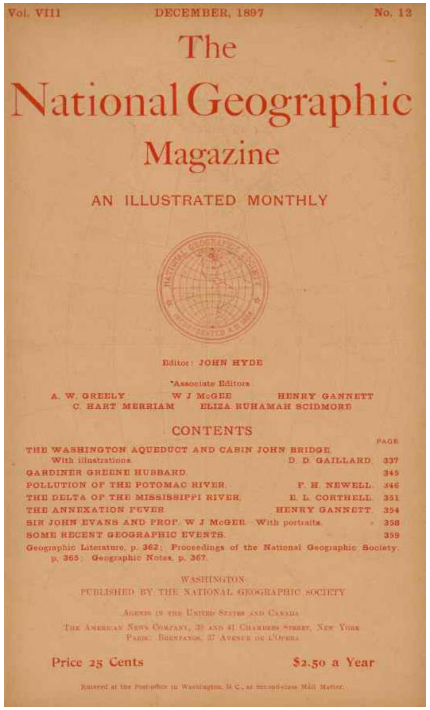
Mississippi River Fisk Map



USACE Mississippi River Design Flood Diagram

Unforeseen Coastal Crisis?




Vol. VIII DECEMBER, 1897 No. 12

The National Geographic Magazine

AN ILLUSTRATED MONTHLY

Editor: JOHN HYDE

Associate Editors

A. W. GREELY W J McGEE HENRY GANNETT
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WASHINGTON
PUBLISHED BY THE NATIONAL GEOGRAPHIC SOCIETY

AGENTS IN THE UNITED STATES AND CANADA
THE AMERICAN NEWS COMPANY, 39 AND 41 CHAMBERS STREET, NEW YORK
PARIS: BRENTANO, 37 AVENUE DE L'OPERA

Price 25 Cents $2.50 a Year

Entered at the Post-office in Washington, D. C., as Second-class Mail Matter.

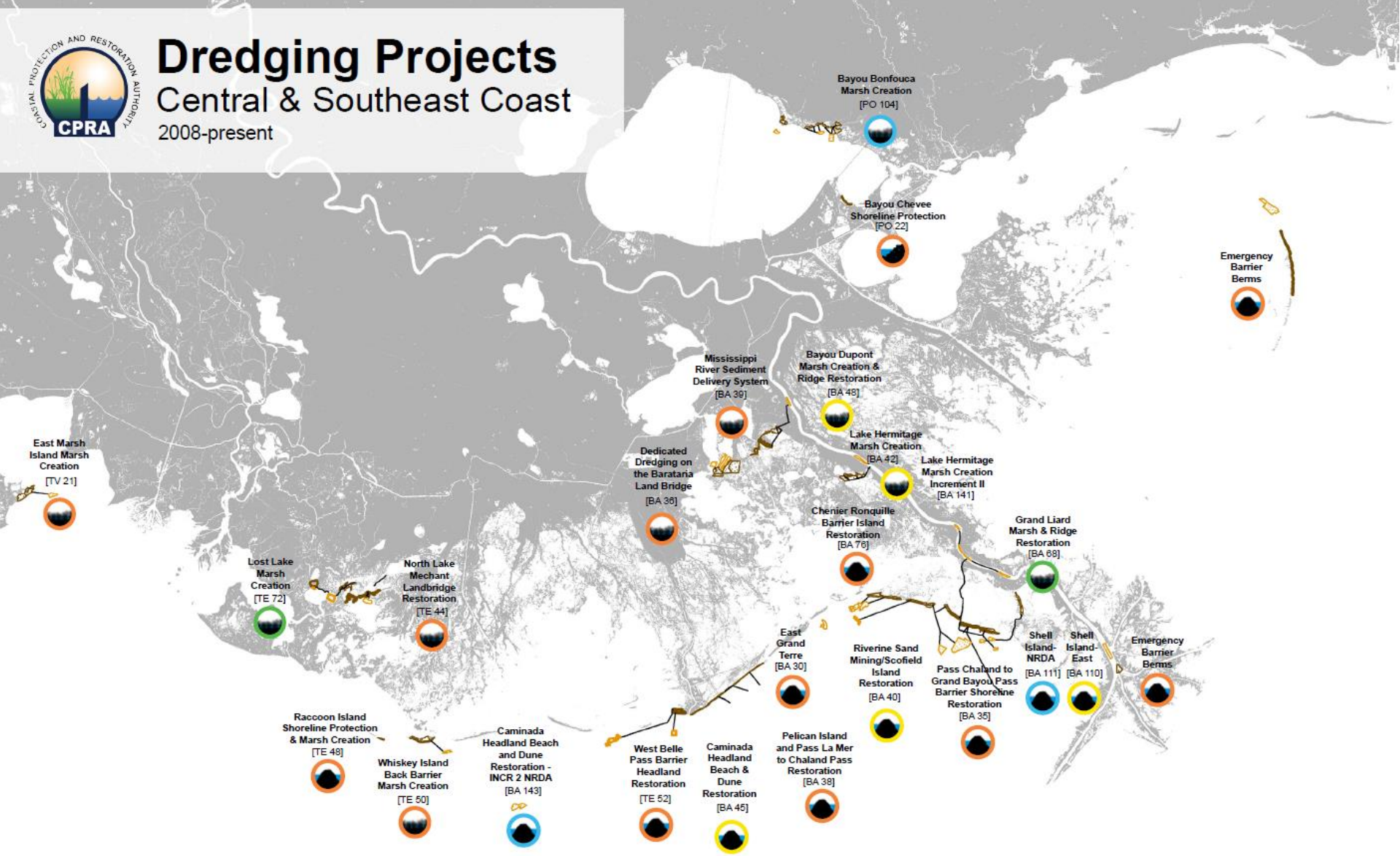
When discussing the Mississippi River Commission 1894 report of survey on the delta to account for the sinking land it was noted:

"The conditions are very different now from those existing prior to the existence of levees. There are at present no annual accretions of sedimentary matters from the periodical overflows of the river. These accretions formerly were a little more than equal to the annual subsidence of the lands…"

Dredging Projects

Central & Southeast Coast

2008-present



Legend

- Dredge Fill Area
- Dredge Borrow Area
- Dredge Pipeline

Project Status

- Past Projects
- Projects Headed To Or In Construction
- Projects Headed To Or Out To Bid
- Projects in Engineering/Design

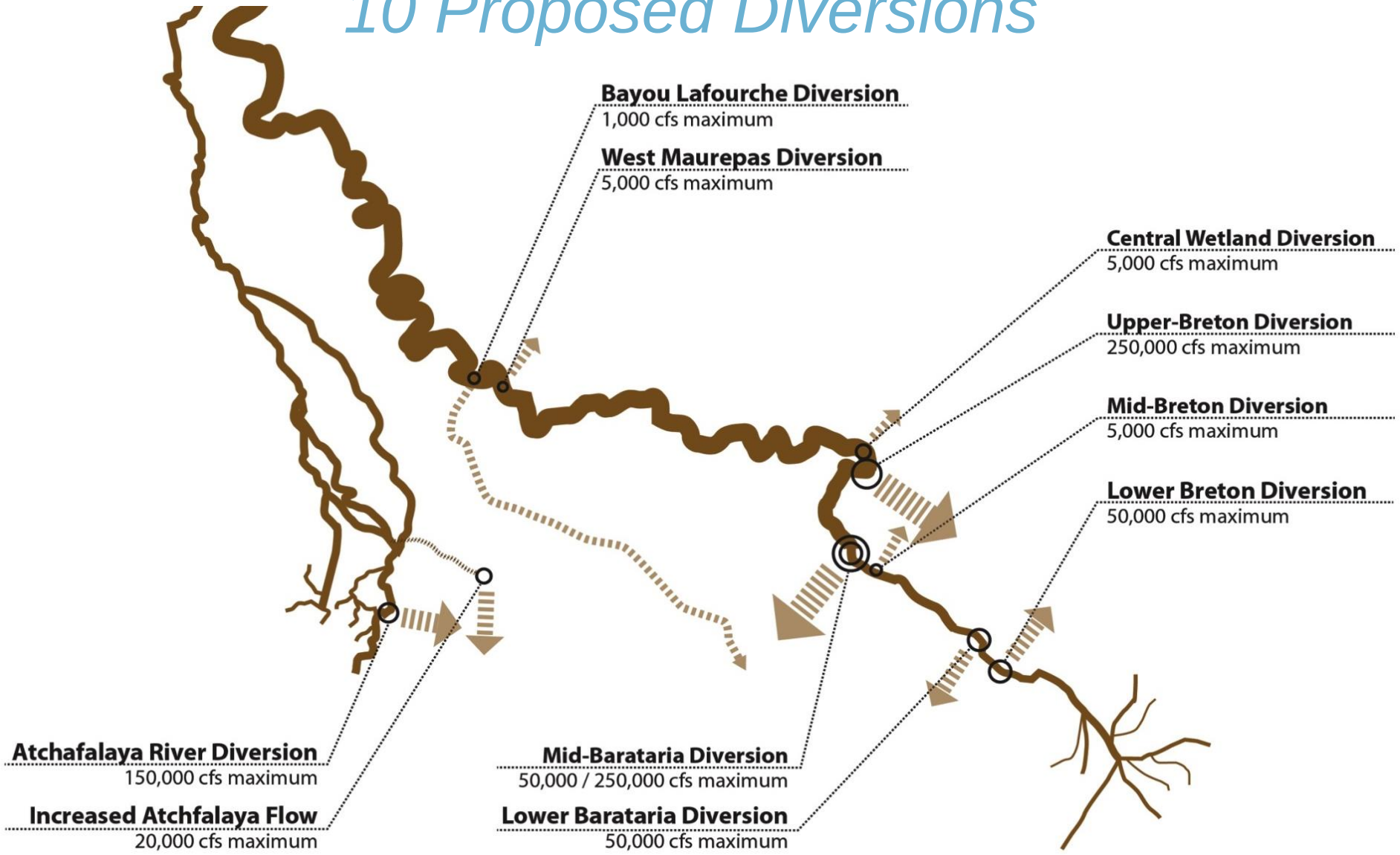
Dredge Project Types

Barrier Island Restoration | Marsh Creation | Ridge Restoration | Shoreline Protection

Status Of Diversions

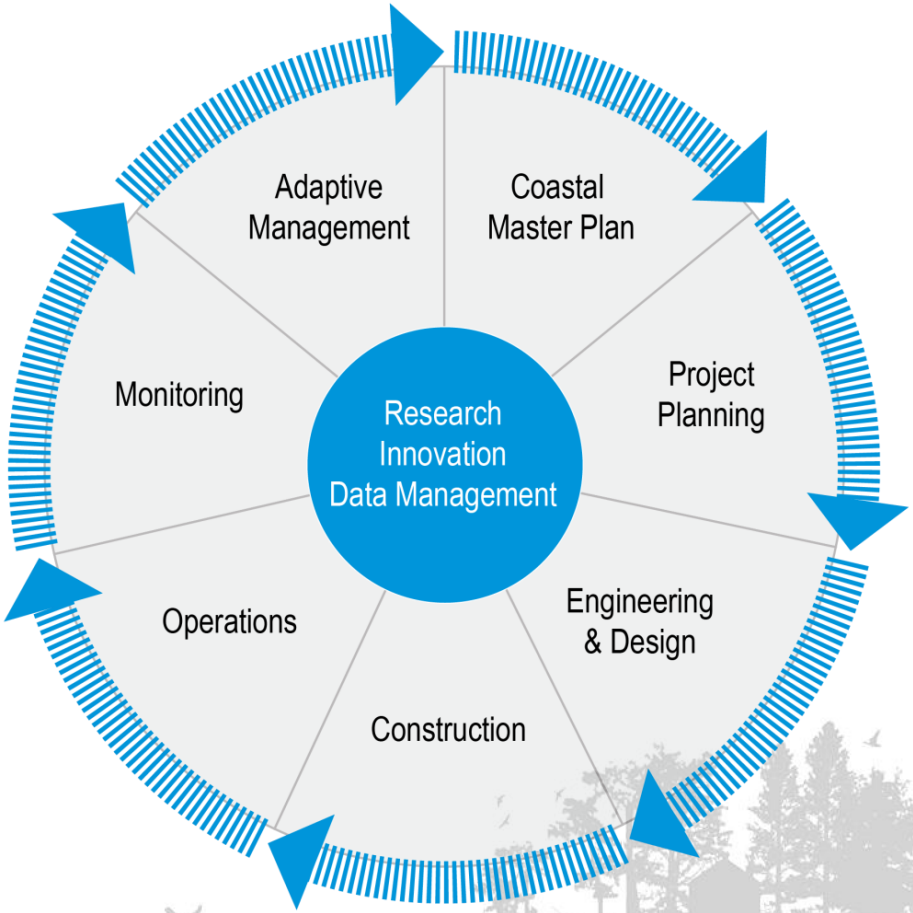
2012 Coastal Master Plan

10 Proposed Diversions



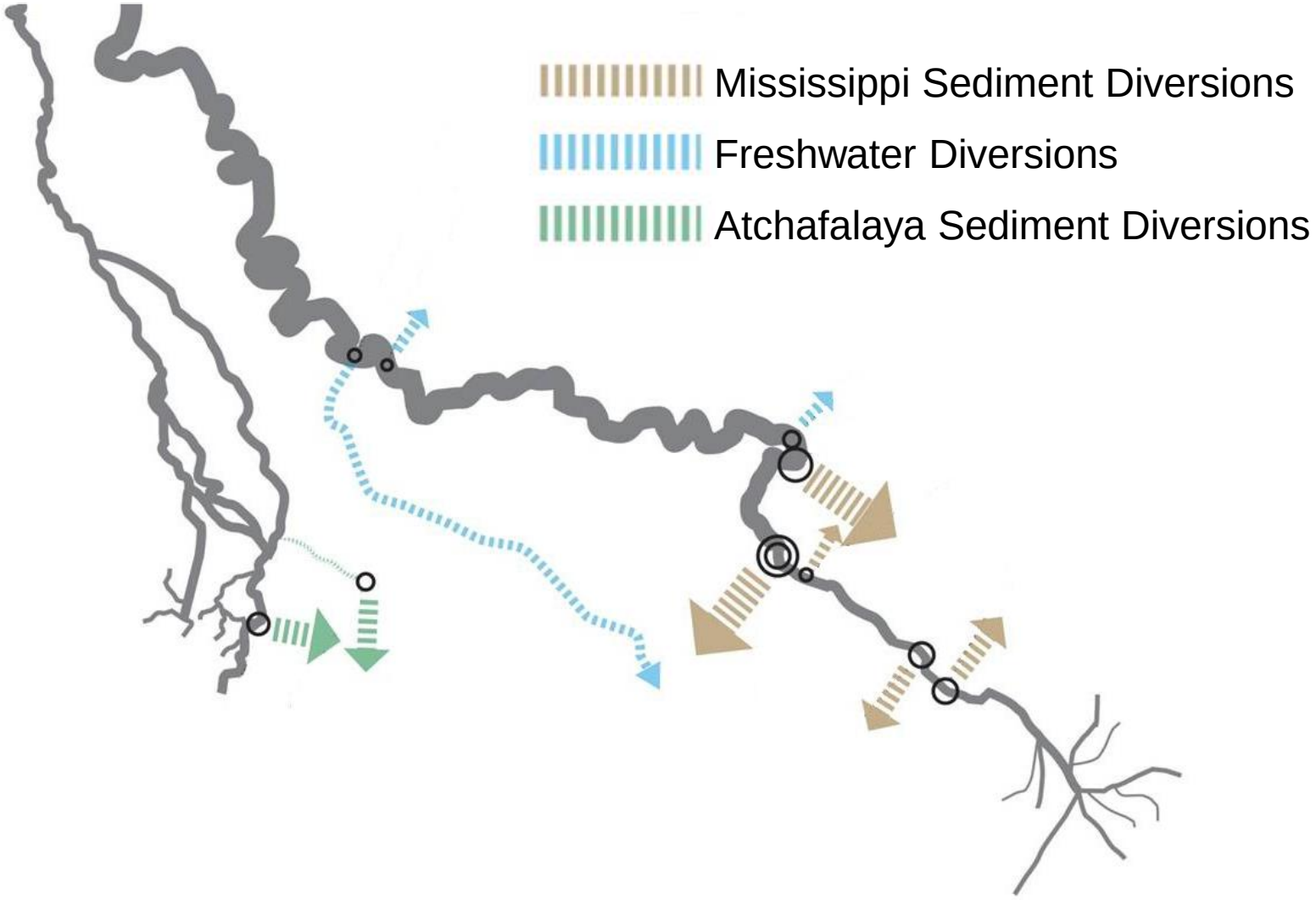
Project Cycle

Master Plan is the 1st Step



2012 Coastal Master Plan

Freshwater and Sediment Diversions

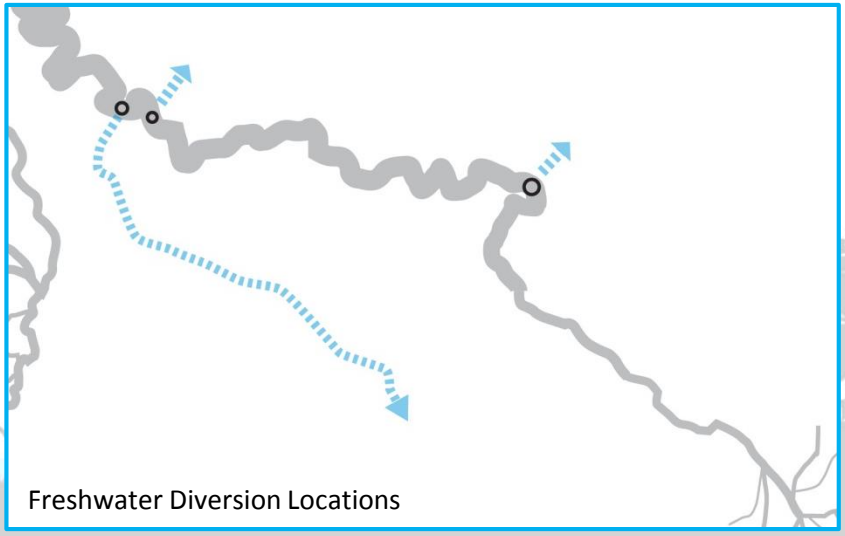


Implementing Diversions in the Master Plan

Freshwater Diversions

Diversion	Size	Status
Bayou Lafourche Diversion	Up to 1,000 cfs	Construction/Operations (Phase I and II funded at $40 million through CIAP)
Central Wetlands Diversion	Up to 5,000 cfs	Project Planning (currently no active tasks)
West Maurepas Diversion(s)* • Maurepas/Hope Canal Diversion • Convent/Blind River Diversion	Up to 5,000 cfs Up to 2,000 cfs Up to 3,000 cfs	-- Maurepas Diversion: Engineering & Design Convent/Blind River Diversion: Project Planning

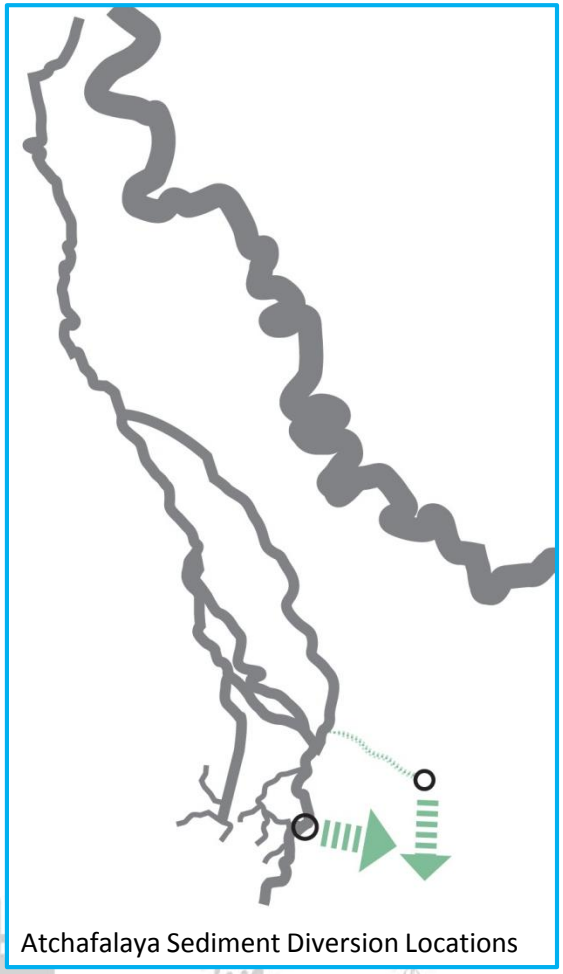
*The West Maurepas Diversion may consist of two ongoing diversion projects, Maurepas/Hope Canal Diversion (up to 2,000 cfs) and Convent/Blind River Diversion (up to 3,000 cfs) for a total discharge of up to 5,000 cfs.



Freshwater Diversion Locations

Implementing Diversions in the Master Plan

Atchafalaya Sediment Diversions

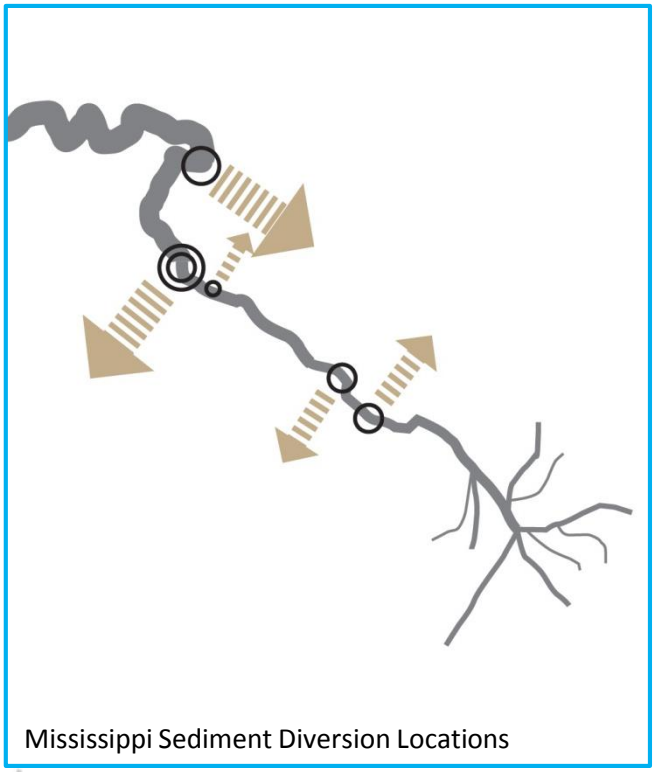


Atchafalaya Sediment Diversion Locations

Diversion	Size	Status
Increase Atchafalaya Flow to Terrebonne	Up to 20,000 cfs	Project Planning
Atchafalaya River Diversion	Up to 150,000 cfs	Project Planning (Not yet initiated)

Implementing Diversions in the Master Plan

Mississippi Sediment Diversions



Mississippi Sediment Diversion Locations

Diversion	Size	Status
Mid-Barataria Sediment Diversion*	Up to 75,000 cfs	Engineering and Design (E&D)
Mid-Breton Sediment Diversion*	Up to 35,000 cfs	Project Planning
Lower Barataria Sediment Diversion	Up to 50,000 cfs	Project Planning
Lower Breton Sediment Diversion	Up to 50,000 cfs	Project Planning
Upper Breton Sediment Diversion	Up to 250,000 cfs	Project Planning

*Diversion capacities have been refined through the LCA projects Myrtle Grove and White's Ditch:

- Mid-Barataria Sediment Diversion capacity has increased from 50,000 cfs in the 2012 Coastal Master Plan to 75,000 cfs to increase sediment capture ratios at the project site.
- Mid-Breton Sediment Diversion capacity has been modified from a 5,000 cfs diversion which operated nearly year-round, to a 35,000 cfs diversion which is pulsed during peak flood events.

Funding for Diversions:

- Criminal Settlement –
  - **BP**: $1.2B to the National Fish and Wildlife Foundation (NFWF) for barrier islands and diversions in Louisiana.
    - NFWF currently defining process.
  - **Transocean**: $75M directed to NFWF for barrier island restoration and/or river diversions off the coast of Louisiana.

NFWF Proposal No. 1 Summary:

Request for $67.9M for the advancement of Barrier Island and Diversion projects.

Barrier Islands

1. Caminada Increment II – $3.0 M for Engineering and Design
2. East Timbalier - $6.0M for Engineering and Design

River Diversions

Atchafalaya River Diversions

1. Increase Atchafalaya Flow to Terrebonne - $4.9M for Planning

Mississippi River Diversions

1. Mid-Barataria Sediment Diversion - $40.4M for Engineering and Design
2. Mississippi River Diversion Planning $13.6M for Planning

Mid- Barataria Sediment Diversion - Engineering and Design

Mid-Barataria Sediment Diversion

Pilot Project in E&D

Project Concept

CWPPRA

Planning

CPRA Master Plan

Preliminary E&D

State/NGO Effort

Feasibility

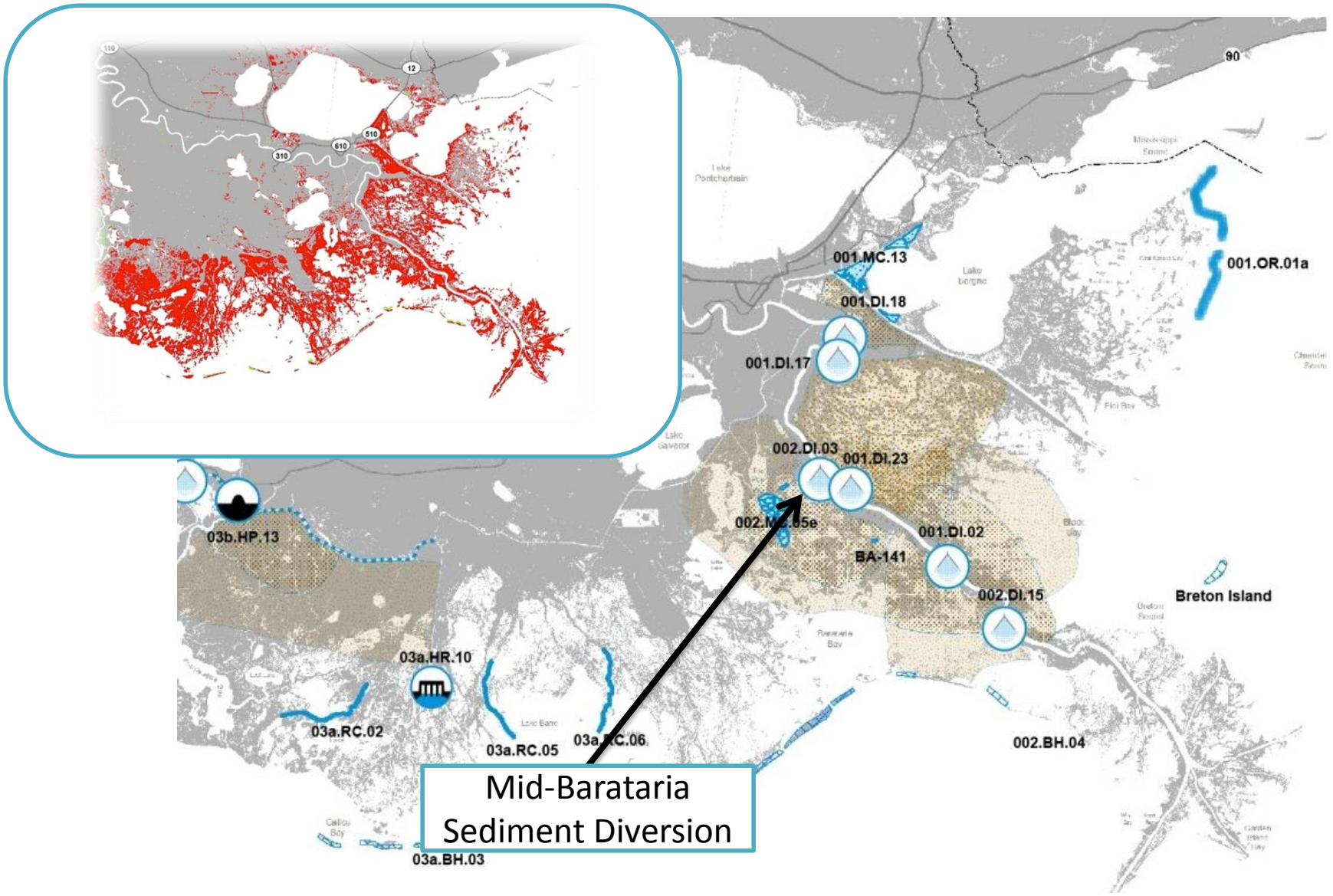
LCA Myrtle Grove

Detailed E&D

CPRA Mid-Barataria

This Project Has Been Planned, Evaluated and Discussed with Stakeholders For 10+ Years

Mid-Barataria Sediment Diversion



Mid-Barataria Sediment Diversion

Project Goals

The **primary goal** of the MBSD project is to **divert sediment** from the Mississippi River through a constructed channel into mid-Barataria Basin. **Reconnecting the river** to the Basin will mimic historic sediment deposition; building, sustaining, and maintain land.

Secondary long-term goals include **minimizing flooding risks to coastal communities** and both restoring and preserving **critical coastal ecosystems**.

Mid-Barataria Sediment Diversion

Project Timeline

★ • Scoping Meetings	Fall 2013 (TBD)
★ • 30% Plans submittal	February 2014
★ • 60% Plans submittal	August 2014
★ • 408 Permit Submittal	August 2014
★ • Amended CUP 10/404 Permit	August 2014
★ • Draft EIS	August 2014
★ • Public Hearing	Winter 2014
★ • 90% Plans	November 2014
• Final EIS and ROD	Spring 2015

★ Denotes Formal and Informal Public Engagement Points

Mid-Barataria Sediment Diversion

Building and Expanding on Previous Efforts

- **Location: River Mile 60.7**
- **Sediment Load and Concentration**
- River Flood Stage
- Sedimentation and River Morphology
- Section 408 Permit
- Ship Simulation

Mississippi River

- **Channel Dimensions/ Configuration**
  - **Up to 75K cfs**
- Hydrologic Performance
- Depositional Trends
- Land Rights/Infrastructure
- Engineering & Design
- Section 404/10 Permit

Diversion Complex

- Depositional Patterns
- Outfall Management
- Hydraulic Connectivity
- **Land Built/Maintained Over Time**
  - **Up to 50 square miles over next 50 years**
- Section 404/10 Permit

Outfall Area

- **Salinity**
- **Vegetation and Habitat**
- **Fish and Wildlife**

Basin

- Storm Surge Reduction
- Social Impact Assessment

Communities

- Operational Regime
- Adaptive Management
- Monitoring
- **Ongoing Public Engagement**

Management

HDR

BCG

GeoEngineers

FUGRO

ATKINS

THE WATER INSTITUTE
OF THE GULF

Ben C. Gerwick, Inc. | COWI

MOFFATT & NICHOL

SPEYRER CONSULTING |

Project Planning

-Mid-Breton Sediment Diversion

-Lower Barataria Sediment Diversion

-Lower Breton Sediment Diversion

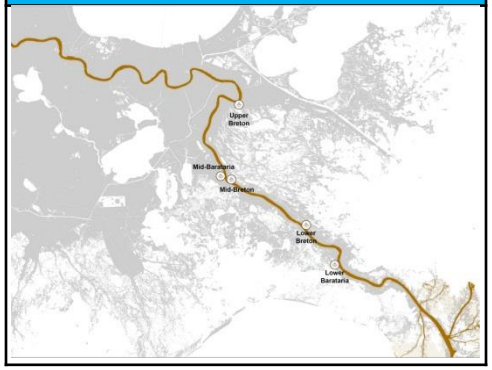
-Increase Atchafalaya Flow to Terrebonne

Mississippi Sediment Diversions

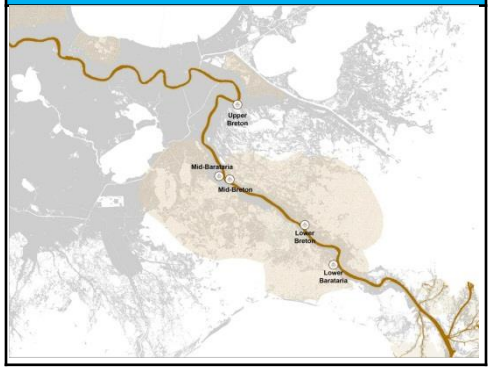
Building On What We Know

Mississippi River

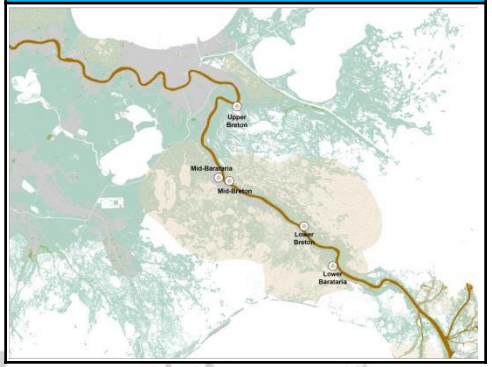
Diversion Channels



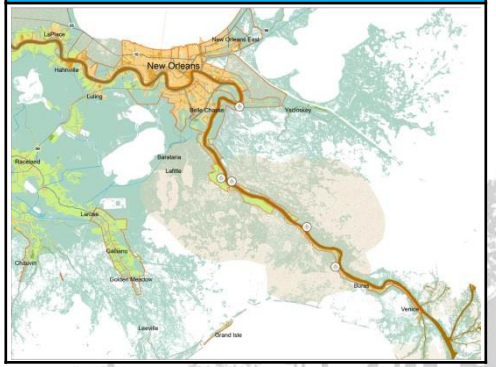
Outfall Areas



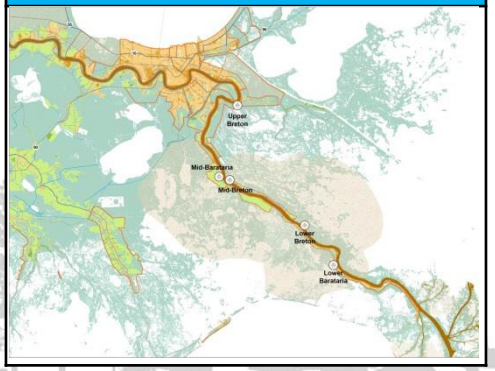
Basin-Wide Influence



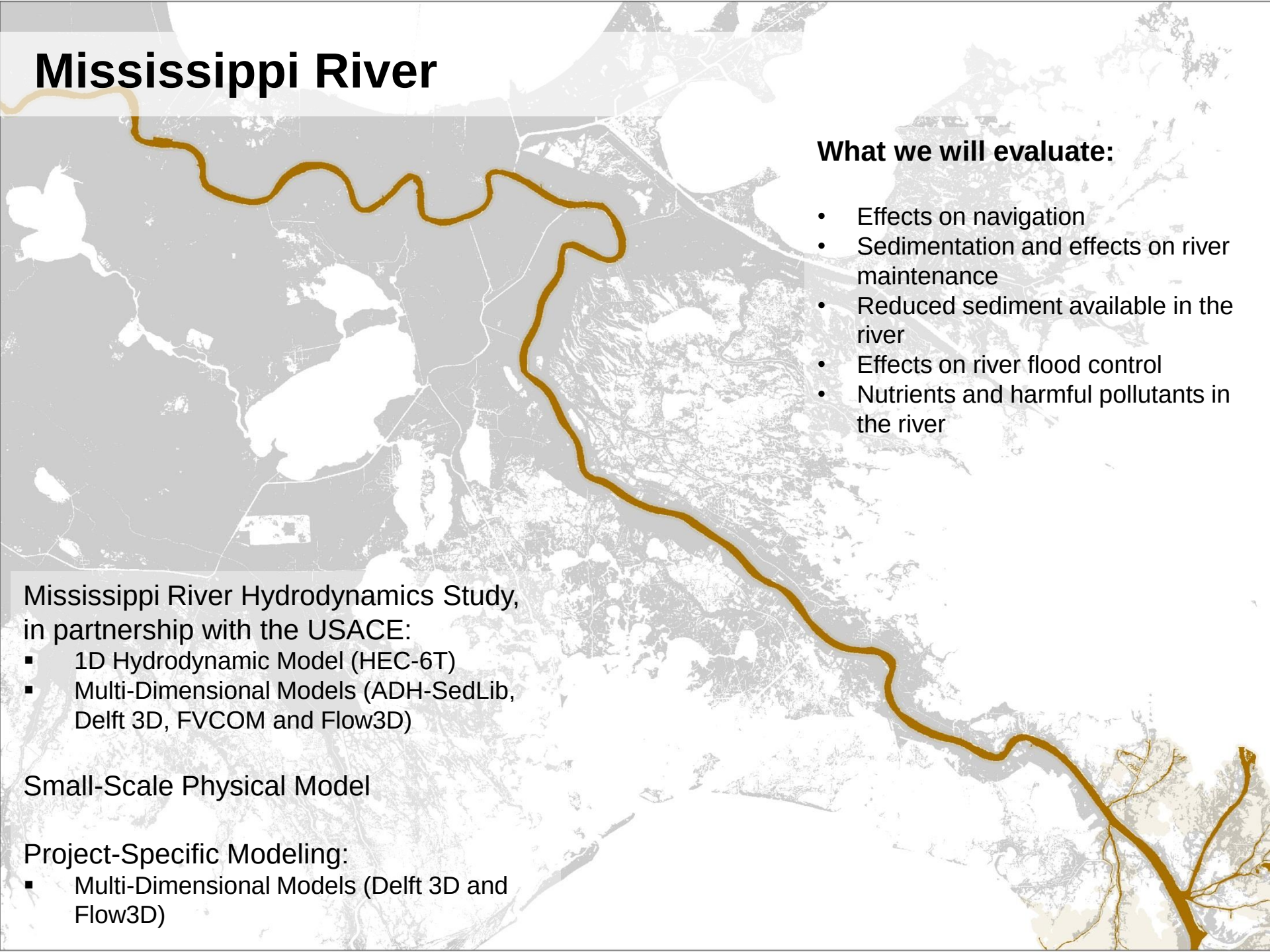
Coastal Communities



System Management



Mississippi River



What we will evaluate:

- Effects on navigation
- Sedimentation and effects on river maintenance
- Reduced sediment available in the river
- Effects on river flood control
- Nutrients and harmful pollutants in the river

Mississippi River Hydrodynamics Study, in partnership with the USACE:

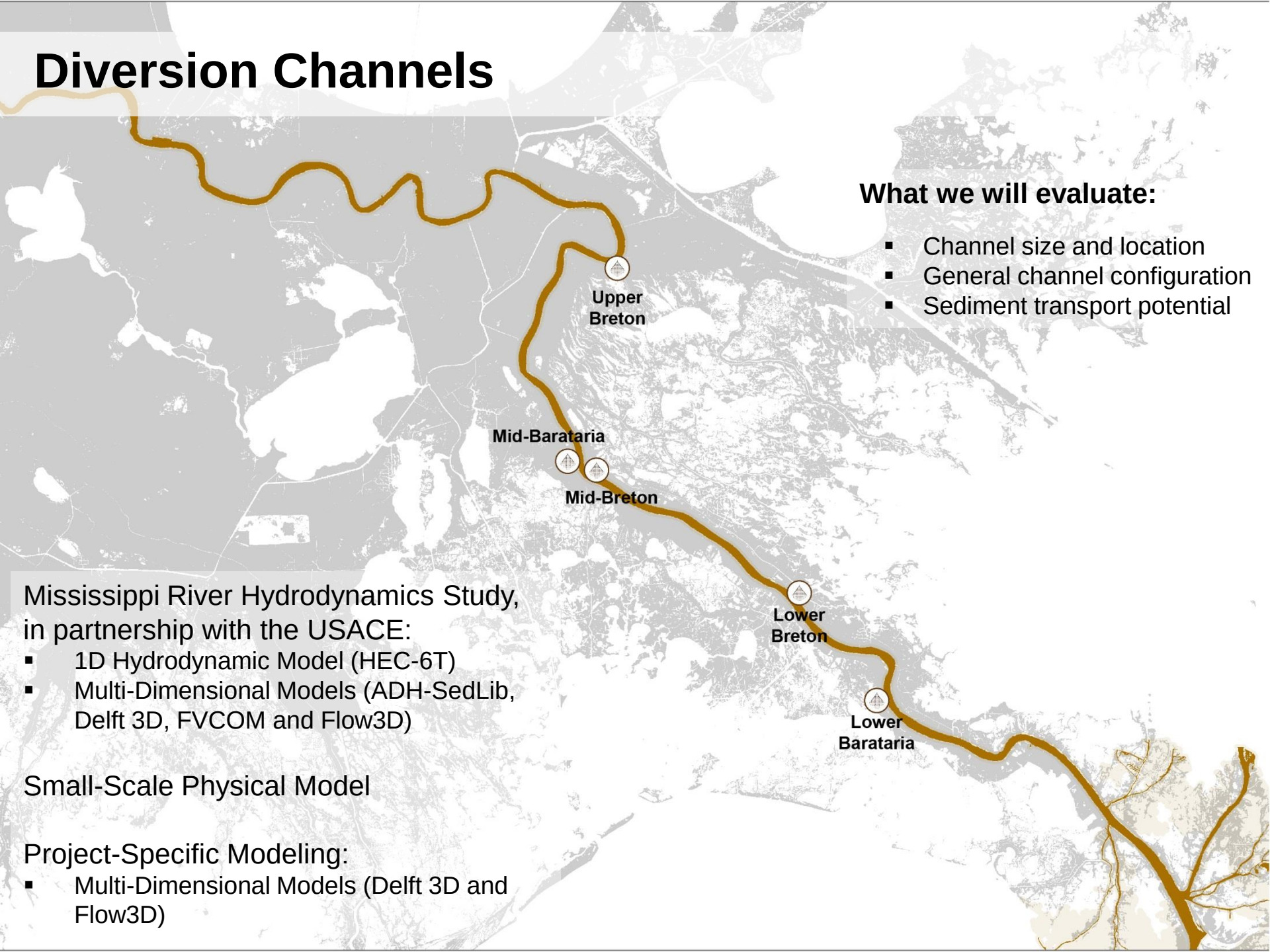
- 1D Hydrodynamic Model (HEC-6T)
- Multi-Dimensional Models (ADH-SedLib, Delft 3D, FVCOM and Flow3D)

Small-Scale Physical Model

Project-Specific Modeling:

- Multi-Dimensional Models (Delft 3D and Flow3D)

Diversion Channels



What we will evaluate:

- Channel size and location
- General channel configuration
- Sediment transport potential

Mississippi River Hydrodynamics Study, in partnership with the USACE:

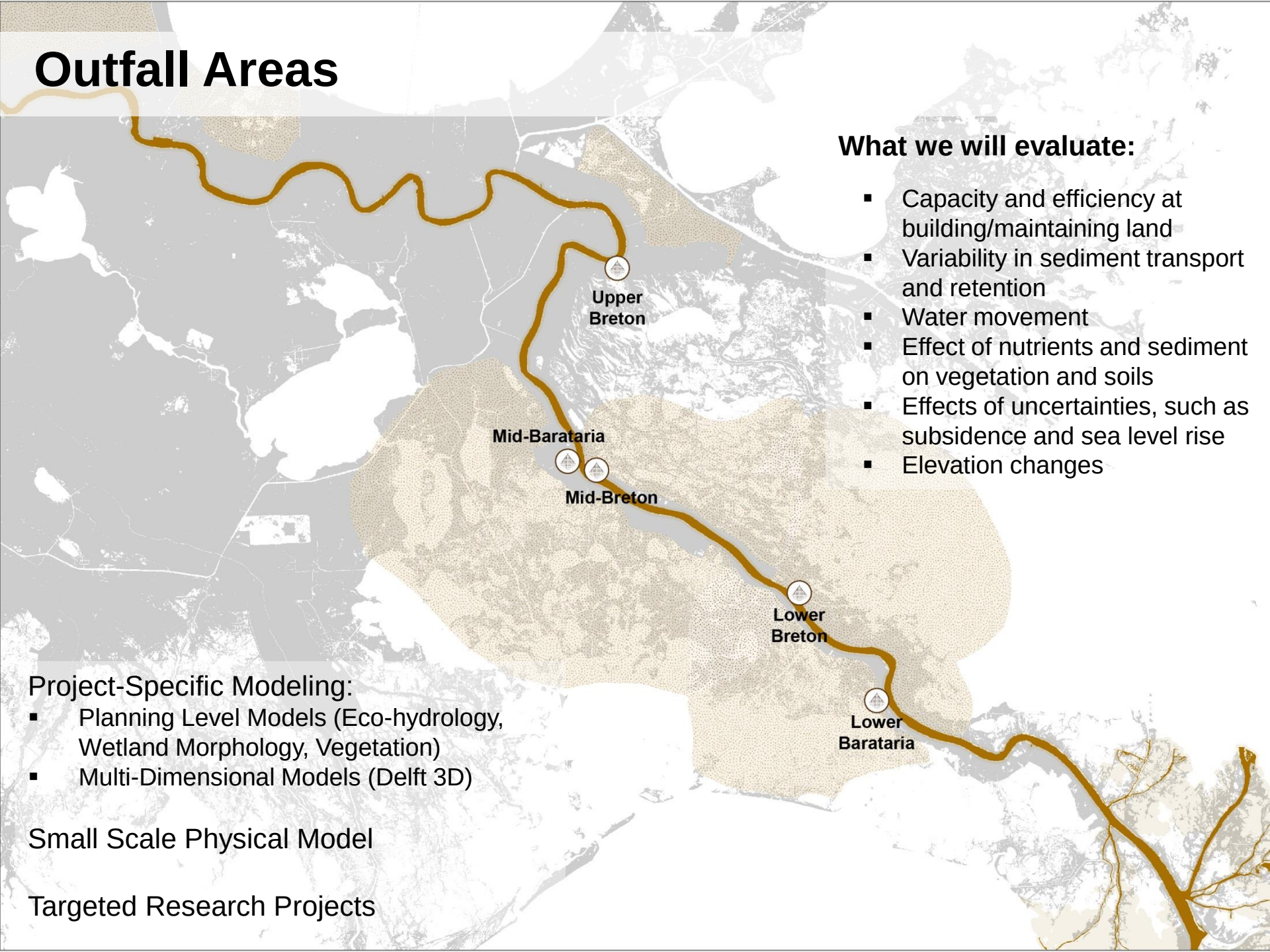
- 1D Hydrodynamic Model (HEC-6T)
- Multi-Dimensional Models (ADH-SedLib, Delft 3D, FVCOM and Flow3D)

Small-Scale Physical Model

Project-Specific Modeling:

- Multi-Dimensional Models (Delft 3D and Flow3D)

Outfall Areas



What we will evaluate:

- Capacity and efficiency at building/maintaining land
- Variability in sediment transport and retention
- Water movement
- Effect of nutrients and sediment on vegetation and soils
- Effects of uncertainties, such as subsidence and sea level rise
- Elevation changes

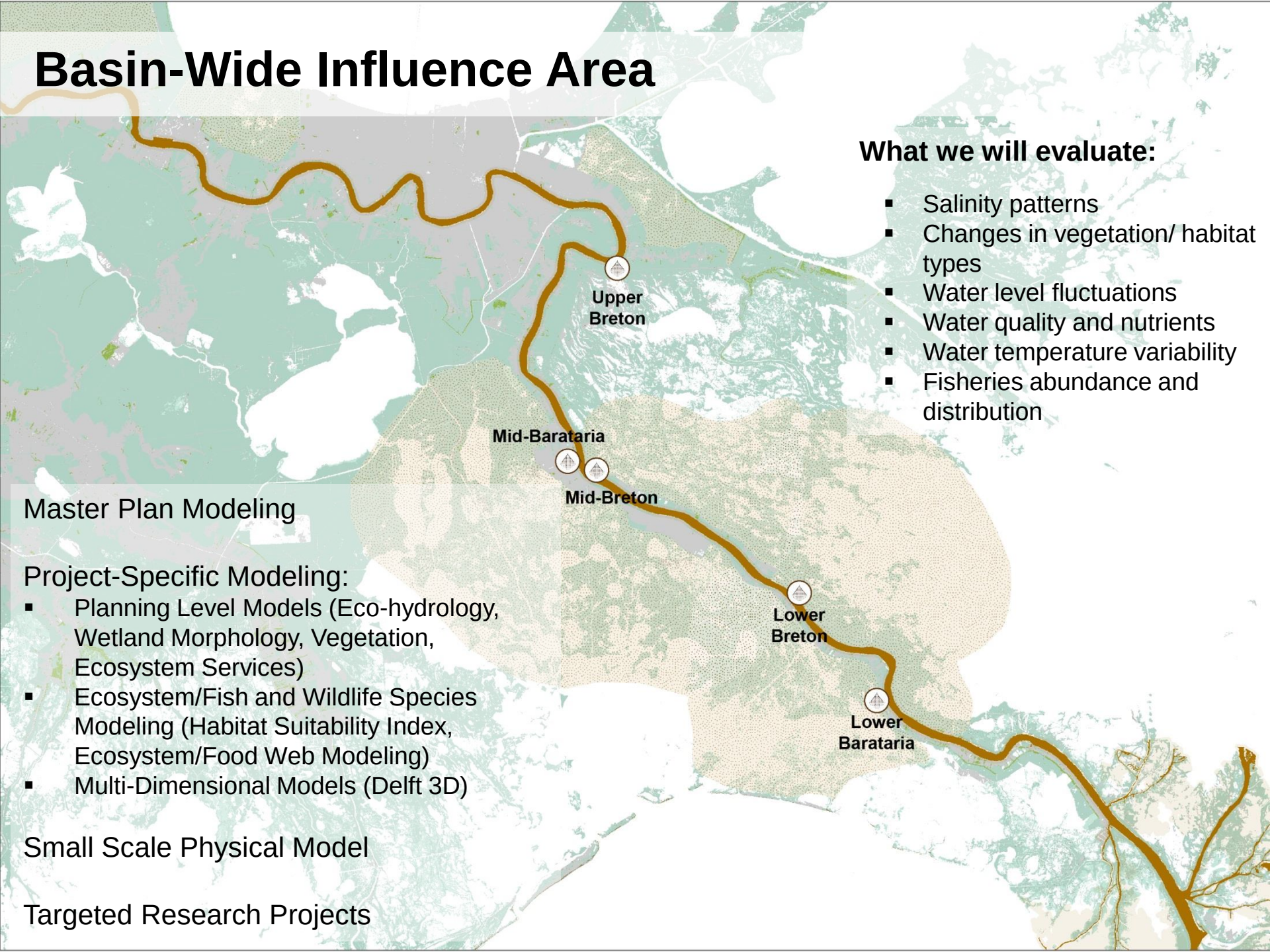
Project-Specific Modeling:

- Planning Level Models (Eco-hydrology, Wetland Morphology, Vegetation)
- Multi-Dimensional Models (Delft 3D)

Small Scale Physical Model

Targeted Research Projects

Basin-Wide Influence Area



What we will evaluate:

- Salinity patterns
- Changes in vegetation/ habitat types
- Water level fluctuations
- Water quality and nutrients
- Water temperature variability
- Fisheries abundance and distribution

Master Plan Modeling

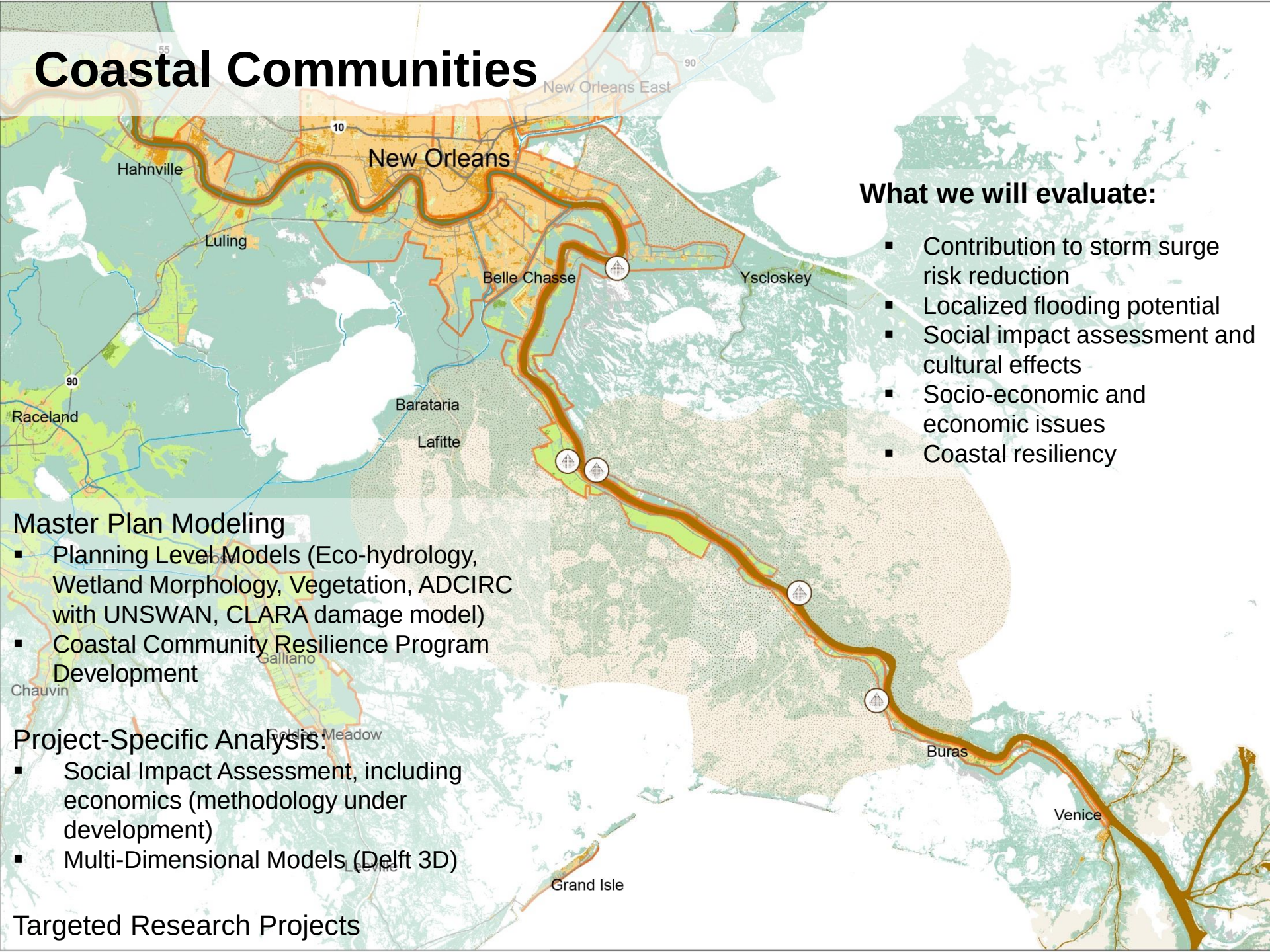
Project-Specific Modeling:

- Planning Level Models (Eco-hydrology, Wetland Morphology, Vegetation, Ecosystem Services)
- Ecosystem/Fish and Wildlife Species Modeling (Habitat Suitability Index, Ecosystem/Food Web Modeling)
- Multi-Dimensional Models (Delft 3D)

Small Scale Physical Model

Targeted Research Projects

Coastal Communities



What we will evaluate:

- Contribution to storm surge risk reduction
- Localized flooding potential
- Social impact assessment and cultural effects
- Socio-economic and economic issues
- Coastal resiliency

Master Plan Modeling

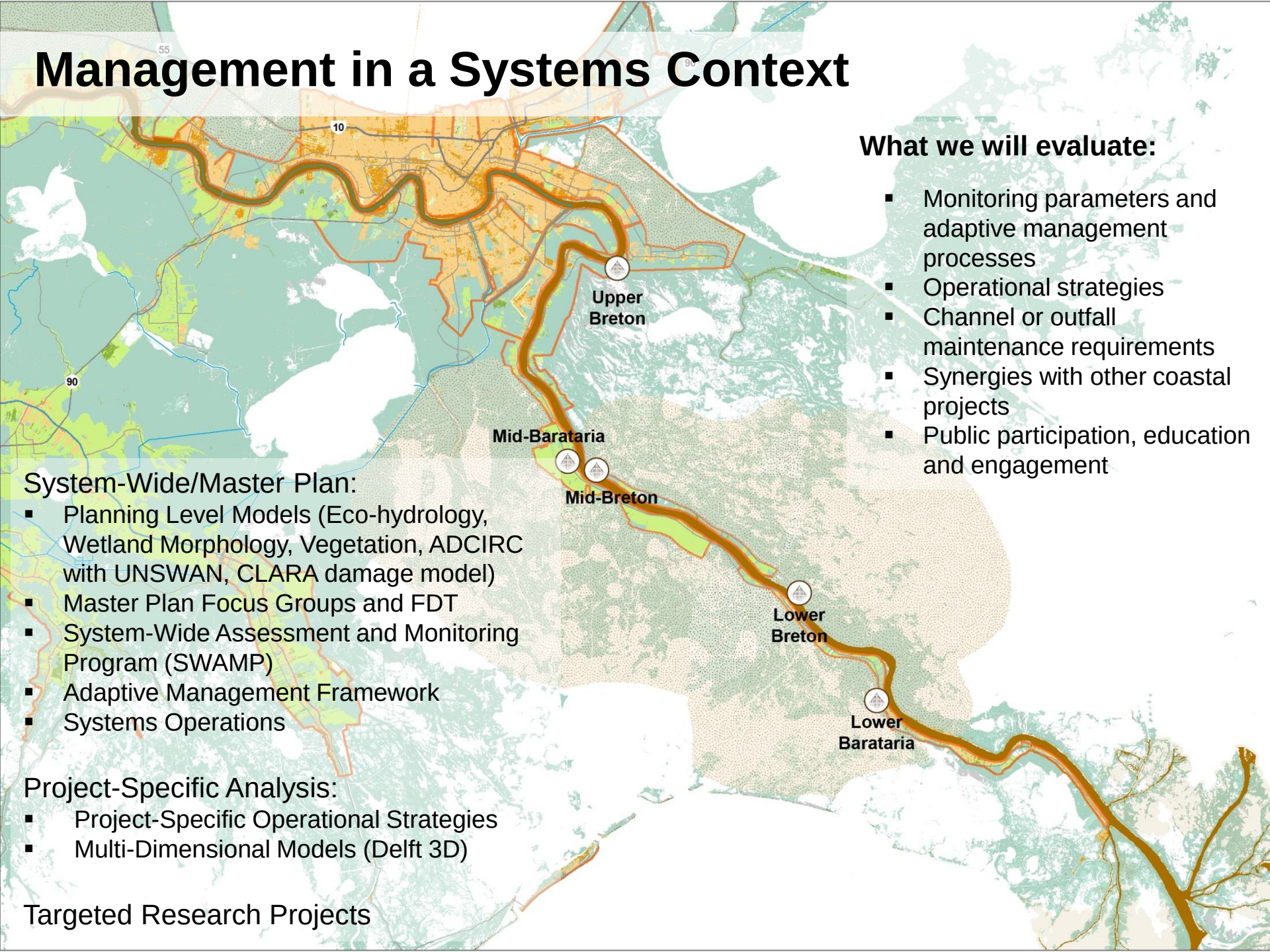
- Planning Level Models (Eco-hydrology, Wetland Morphology, Vegetation, ADCIRC with UNSWAN, CLARA damage model)
- Coastal Community Resilience Program Development

Project-Specific Analysis:

- Social Impact Assessment, including economics (methodology under development)
- Multi-Dimensional Models (Delft 3D)

Targeted Research Projects

Management in a Systems Context



What we will evaluate:

- Monitoring parameters and adaptive management processes
- Operational strategies
- Channel or outfall maintenance requirements
- Synergies with other coastal projects
- Public participation, education and engagement

System-Wide/Master Plan:

- Planning Level Models (Eco-hydrology, Wetland Morphology, Vegetation, ADCIRC with UNSWAN, CLARA damage model)
- Master Plan Focus Groups and FDT
- System-Wide Assessment and Monitoring Program (SWAMP)
- Adaptive Management Framework
- Systems Operations

Project-Specific Analysis:

- Project-Specific Operational Strategies
- Multi-Dimensional Models (Delft 3D)

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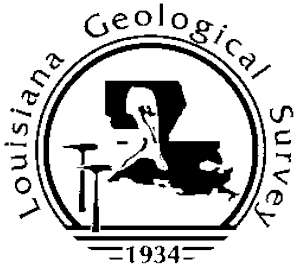

Biedenharn Group, LLC

Mobile Boundary Hydraulics

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Questions?

Kyle.Graham@LA.Gov