CPRA
Coastal Protection and Restoration Authority of Louisiana

# Diversions Update

Kyle Graham, CPRA

Presentation to Diversions Advisory Panel, Meeting #3

October 28, 2014

committed to **our coast**

# Themes from Panel Report #2

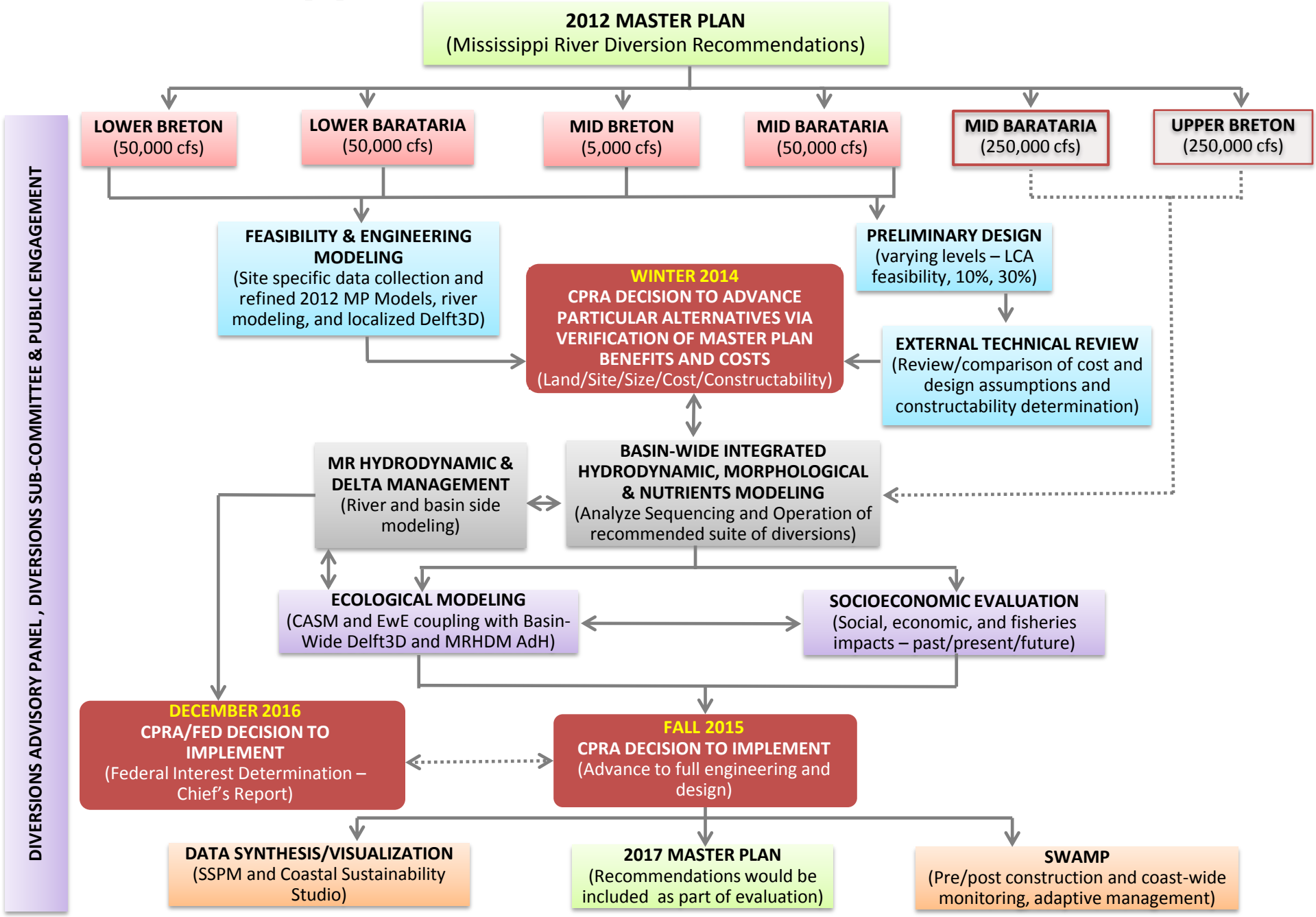
(1) Need for a conceptual model (for planning processes) of diversion outcomes and management endpoints

(2) Explore physical impacts of different diversion operation strategies

(3) Ecological Effects of Diversions: Assessing Risk and Uncertainty

(4) Address inadequacies in social science research and analysis

# 1. Mississippi River Sediment Diversions: Process



# Decision Point: Winter 2014

## *Lower Barataria, Lower Breton, Mid Breton and Mid Barataria*

**WINTER 2014**

**CPRA DECISION TO ADVANCE PARTICULAR ALTERNATIVES VIA VERIFICATION OF MASTER PLAN BENEFITS AND COSTS**

(Land/Site/Size/Cost/Constructability)

# Feasibility and Engineering Modeling

## *Lower Barataria, Lower Breton, Mid Breton, and Mid Barataria*

### Tools Being Developed

**Feasibility**

River Models
- 3D hydrodynamic and sediment transport
- Local and regional 3D hydrodynamic and morphological models

Basin-side Models
- 2012 MP Ecohydrology, Vegetation and Wetland Morphology models.
- Site-Specific Delft 3D morphological model using West Bay as an analogue

*All models runs will use site specific data

**Engineering**

River, Channel and Outfall Models
- Delft 3D, Flow3D, HEC RAS
- Ship simulation model
- Lidar, bathymetric, and topographic surveys
- Boring logs, in situ and lab measurements, geomorphic assessments
- Material strengths, design loads, soil properties
- Gate hydraulic models

# Preliminary Engineering

## *Lower Barataria, Lower Breton, Mid Breton, and Mid Barataria*

### Lower Breton & Lower Barataria

- 10% conceptual design ongoing
- Investigation of optimum siting with relation to costing
- 50,000 cfs structure
- Verification of Master Plan cost assumptions
- Constructability determination

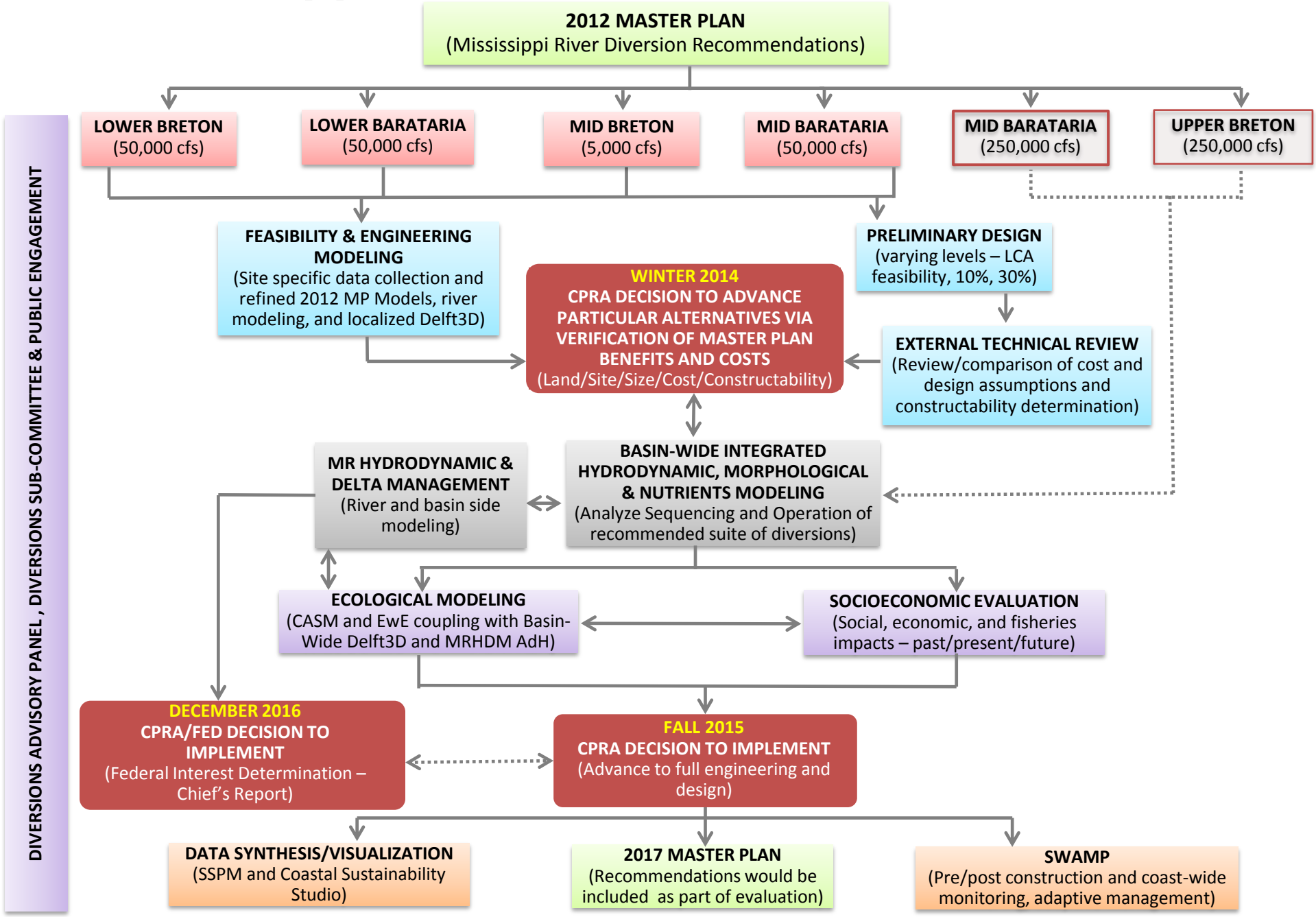
### Mid Breton

- Feasibility level design completed (LCA White Ditch)
- Entered into a Design Agreement
  - Preliminary effort resulted in identification of optimal siting for sediment capture
- 35,000 cfs structure at a total cost of $387.6M
- Feasibility modeling to determine size and operation

### Mid Barataria

- 10+ years of planning
- 30% design and Value Engineering completed
- Preferred site of intake structure identified
- Structure ranging in size from 35,000-75,000 cfs
- Verification of Master Plan cost assumptions
- Determine ability to construct, operate and maintain

# 1. Mississippi River Sediment Diversions: Process



# Decision Point: Fall 2015

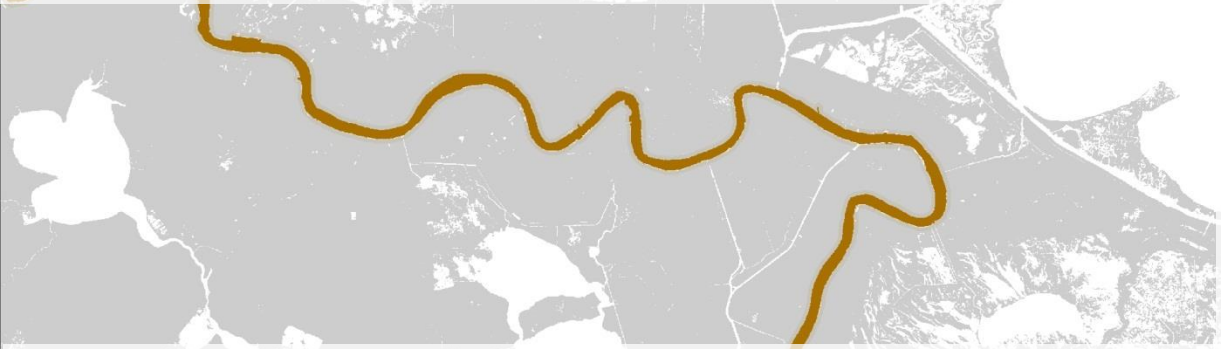
## *Lower Barataria, Lower Breton, Mid Breton and Mid Barataria*

**FALL 2015**

**CPRA DECISION TO IMPLEMENT**

Advance to full engineering and design

# Mississippi River Hydrodynamic Study



## What we will evaluate:

- Water and sediment resources available for restoration
- Effects on navigation
- Sedimentation and effects on river maintenance
- Reduced transport in the river
- Effects on river flood control
- Nutrients and harmful pollutants in the river

## Tools Being Developed:

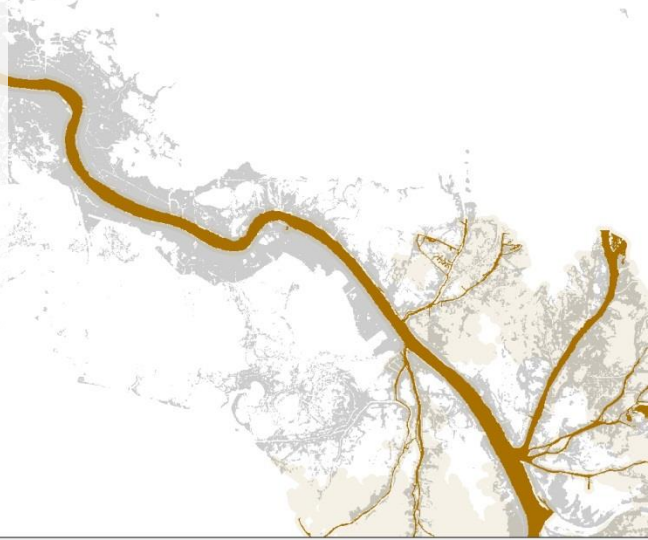
River Models:

- One-Dimensional Models
  - HEC-6T *(Ronnie Heath-USACE/ERDC, Tony Thomas, Ike Mayer and Mike Trawle-BCG)*
- Multi-Dimensional Models
  - ADH-SedLib Multi-D Model *(Gary Brown-USACE/ERDC)*
  - Delft 3D Multi-D Model *(Alex McCorquodale-UNO, Steve Ayres-USACE/MVN, and Ehab Meselhe-Water Institute of the Gulf)*
  - FVCOM Multi-D Model *(Ioannis Georgiou-UNO)*
  - Flow3D Multi-D Model *(Ehab Meselhe-Water Institute of the Gulf)*
- Small Scale Physical Model *(BCG, Cecil Soileau-BCG/Dewberry Joint Venture and Alden Research Laboratory)*

Geomorphic Assessment *(David Biedenharn-Biedenharn Group and Charlie Little-USACE/ERDC)*

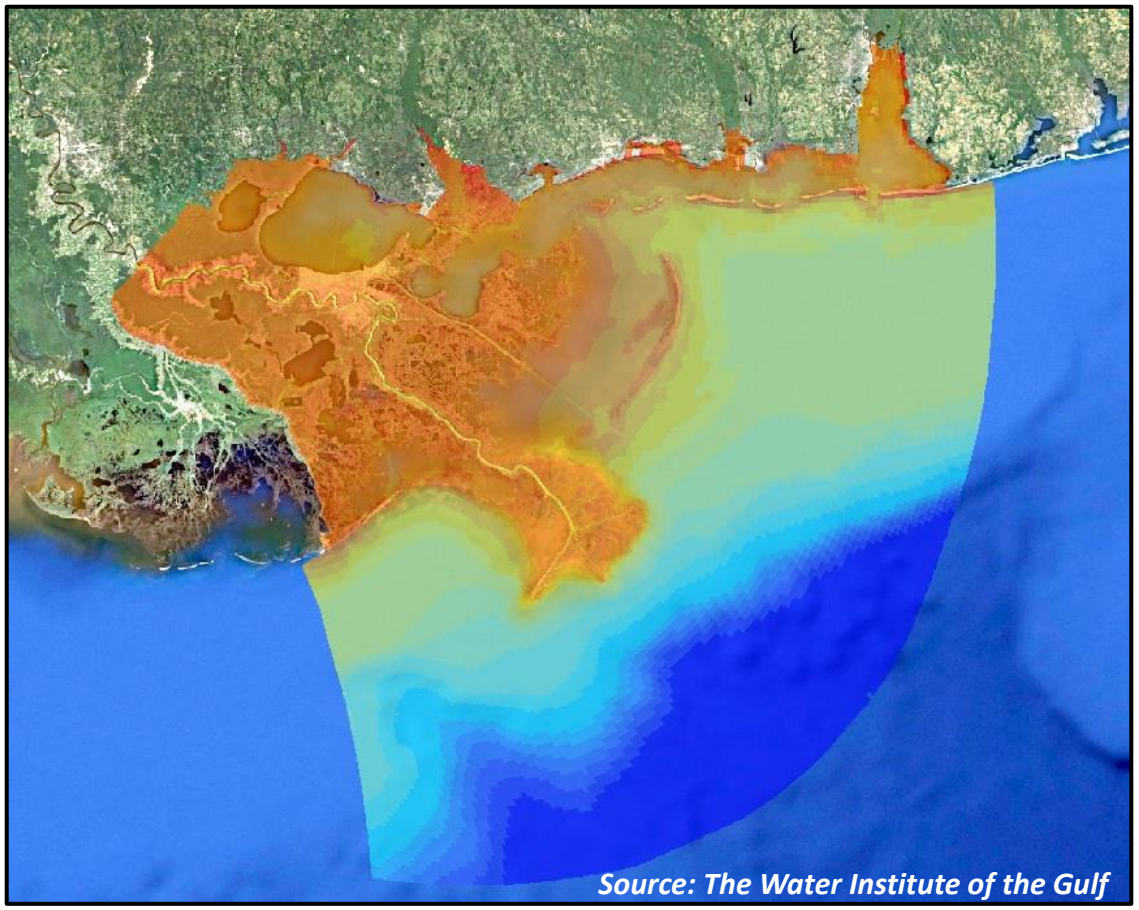
Data Collection *(Mead Allison-Water Institute of the Gulf and Thad Pratt-USACE/ERDC)*

Data Management *(Christina Hunnicutt and Craig Conzelmann-USGS; Melany Larenas and Beth Forrest-CB&I)*



# Basin-Wide Model Development (Delft 3D)

Model Domain of Integrated Hydrodynamic, Morphological, and Nutrient Dynamics




***Outcome Indicators:*** Water level, velocity, salinity, water temperature, suspended sediment, sediment deposition, sediment erosion, bed-level changes, **aboveground and belowground biomass**, **wetland vegetation type (7 species), nitrogen, phosphorous, silicate, chlorophyll-*a*, dissolved oxygen**

# Fisheries Modeling/Studies

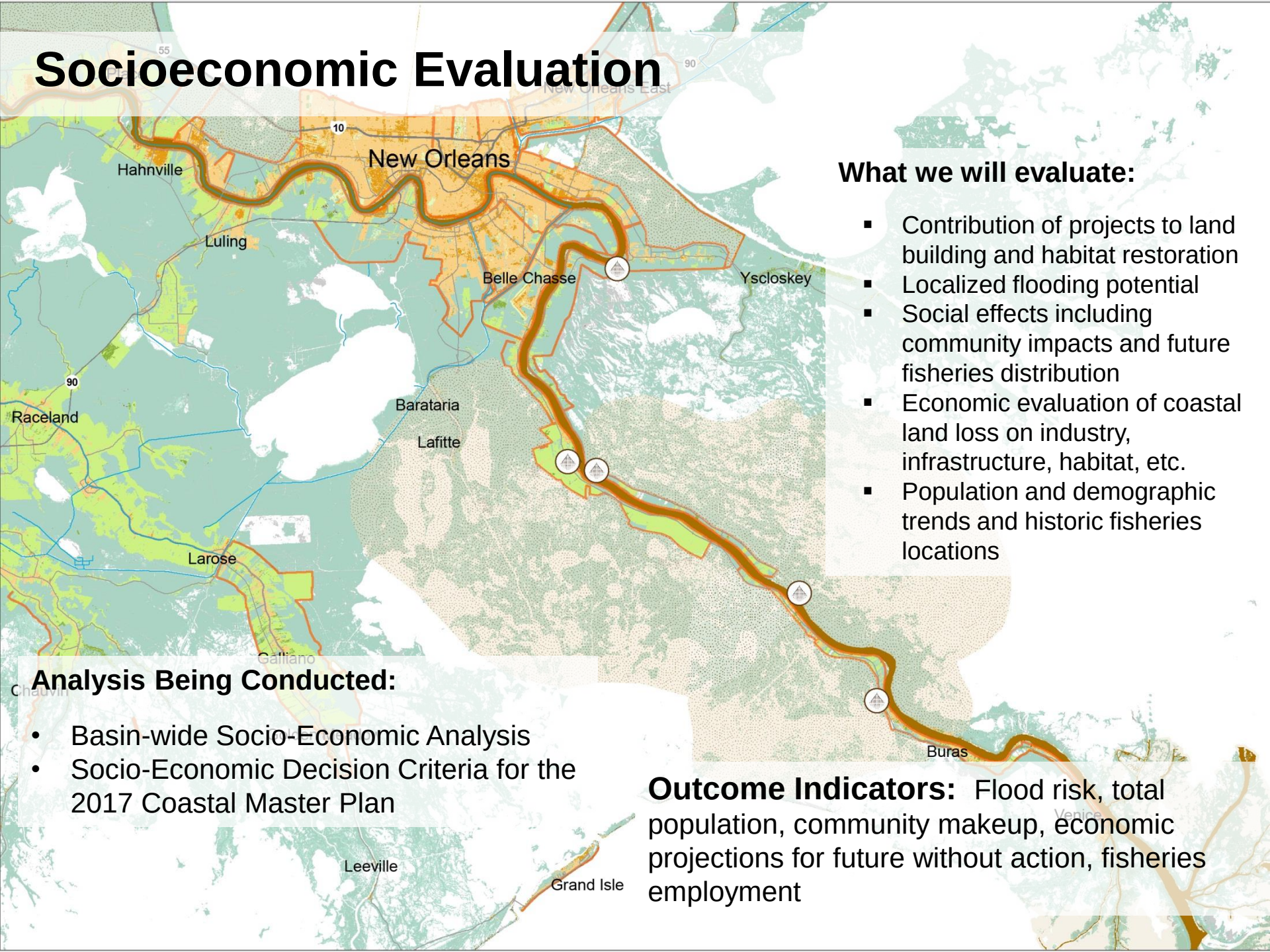
**Following recommended dual model approach** (Sable and Rose, 2013)

1. Improved Habitat Suitability Indices (HSIs)
   - Develop polynomial regressions that relate fish and shellfish abundance to key environmental variables

2. Development of a community-level food web model
   - Evaluate how food web dynamics affect species response to change in environmental conditions, and show changes in species biomass over time
     - EcoPath and EcoSim and EcoSpace (EwE**)**
     - Trophic Simulation Model (TroSim) to capture lower tropic levels / oysters
     - Comprehensive Aquatic Systems Model (CASM)

***Outcome Indicators***: Fish and shellfish habitat quality, food web responses over time, changes in species biomass over time, changes in species distribution over time

# Socioeconomic Evaluation




## What we will evaluate:

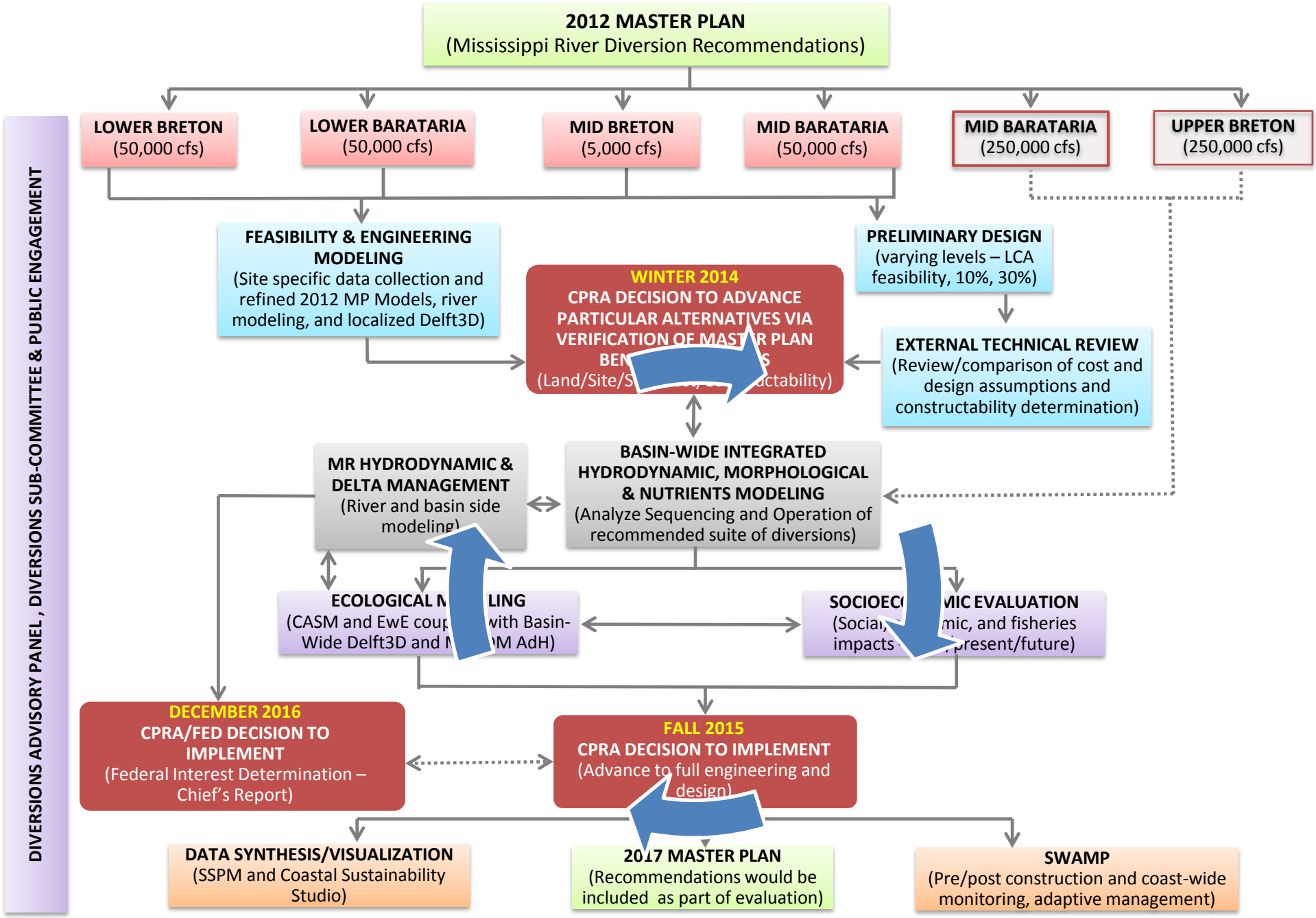
- Contribution of projects to land building and habitat restoration
- Localized flooding potential
- Social effects including community impacts and future fisheries distribution
- Economic evaluation of coastal land loss on industry, infrastructure, habitat, etc.
- Population and demographic trends and historic fisheries locations

## Analysis Being Conducted:

- Basin-wide Socio-Economic Analysis
- Socio-Economic Decision Criteria for the 2017 Coastal Master Plan

**Outcome Indicators:** Flood risk, total population, community makeup, economic projections for future without action, fisheries employment

# 2. Explore physical impacts of different diversion operation strategies



# 3. Ecological Effects of Diversions: Assessing Risk and Uncertainty

(1) Determine Areas of Concern (Public, resource agency…)

(2) Establish Ecosystem Modeling Approach (multiple?)

(3) Link results to reality (Physical modeling, whole marsh system experiments, socioeconomic)

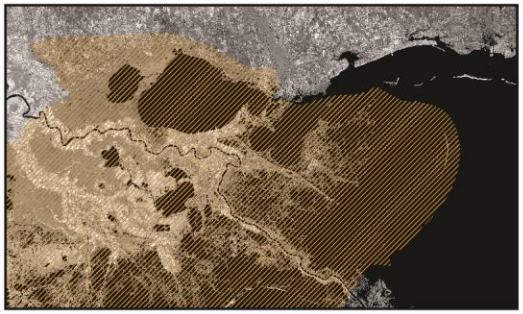
(4) Establish Robust Monitoring for calibration and validation

# BASINWIDE SOCIO-ECONOMIC ANALYSIS

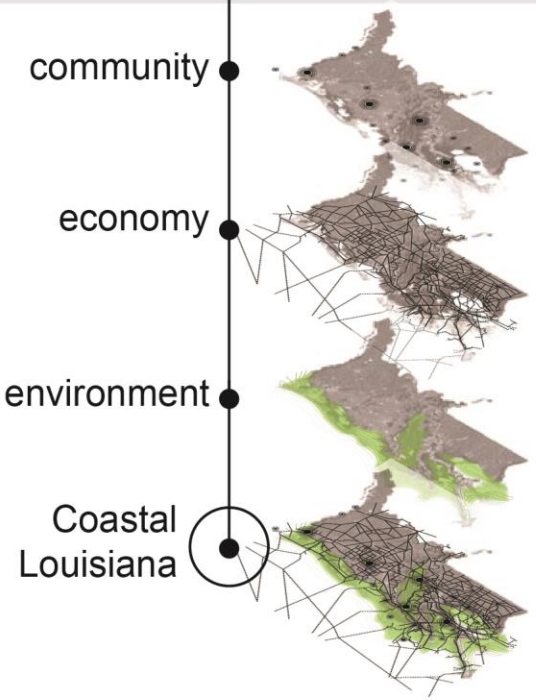
*[Past - Present - Future]*

**GOALS:** *Further analyze the potential effects to communities, fisheries, and the economy from continued land loss and the implementation of sediment diversion projects recommended in the 2012 Coastal Master Plan.*

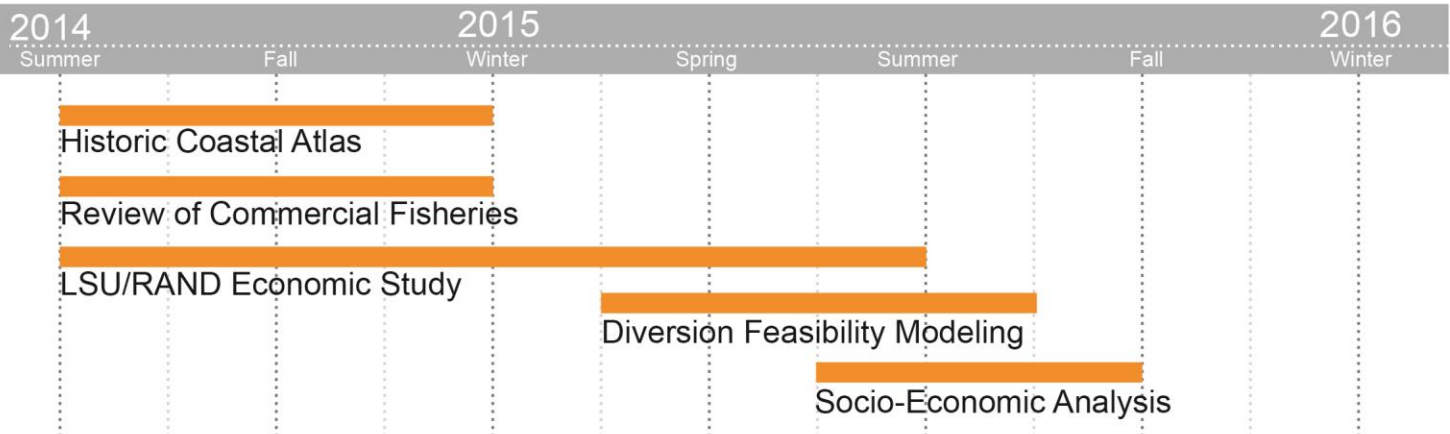
**SCALE:**



Regional




**TIMEFRAME:**



# The Historic Coastal Atlas

*[past-present]*

- Documents socio-economic trends in coastal Louisiana (1950- 2010).
- Examine **past trends** (1950-2010) at parish level.
- Examine **current trends** (1990-2010) at census block level.

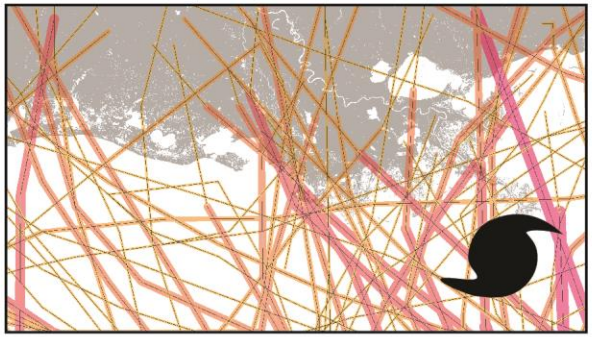
**Scale: Coastal Louisiana**

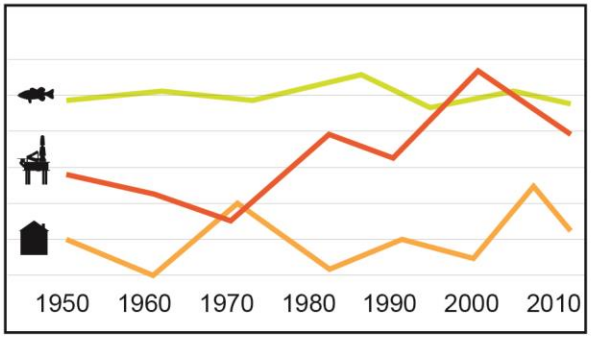
THE WATER INSTITUTE OF THE GULF

## *Long-Term Shifts in Population and Socio-Economic Trends*

***Areas Investigated:***

- **Storm/flood events** affecting coastal parishes (1950-2010)
- **Long-term shifts-** industry, fisheries, agriculture, housing values, and jobs
- **Population and employment-** past trends including demographic analysis such as race, population density, elderly
- **Recovery factors-** population return, percent of vacant homes, and unemployment rates






# Economics of Coastal Land Loss

*[future without action]*

- **Monitizes the direct, indirect, and induced economic costs** of storms and coastal erosion in Louisiana.
- **Explores far-reaching fiscal impact** on the State of Louisiana, other states, and the nation.
- **Sums the value of economic activities and replacement costs** of infrastructure that will be affected by coastal land loss or increased storm risk.
- **Quantifies impacts** in terms of output, employment, and wages.

**Scale: Coastal Louisiana, Gulf, & Nation**

LSU

RAND CORPORATION

## *Impacts of Land Loss & Flood Risk on Communities & Resources*

***Areas Investigated:***

### Homes & Businesses
- Housing stock
- Historic districts
- Private businesses
- Shopping centers

### Institutions
- Schools
- Hospitals
- Community facilities
- Government & military

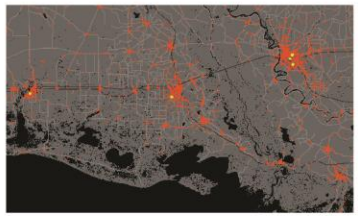
### Fisheries Habitat
- Coastal fishing/ harvesting areas
- Offshore fisheries habitat areas

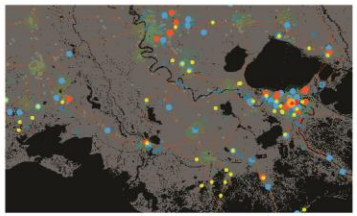
### Ecosystem Services
- Freshwater availability
- Flood control
- Carbon sequestration
- Wildlife habitat
- Clean Water Act credits

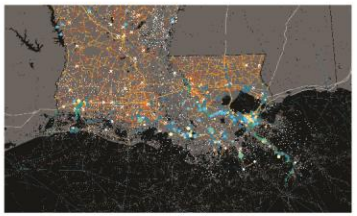
### Infrastructure
- Transportation
- Water / wastewater / drainage
- Oil & gas (on/off shore, extraction, production, transportation)
- Gasoline prices

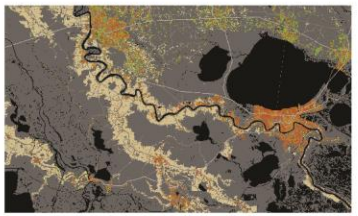
### Recreation
- Recreational fishing
- Tourism / eco-toursim
- National / state parks
- Historic sites

### Future Growth
- Currently undeveloped land suitable for future homes & businesses









# Commercial Fishing in LA
*[past-present]*

- Summarize **historic patterns of areas fished** (1999-2013).
- Summarize **geographic patterns in landings and land-based operations** of commercial fishers across coast.
- Analyze and synthesize **relationship** between place of business and area fished, and determine any changes over time.

**Scale: Coastal Louisiana**

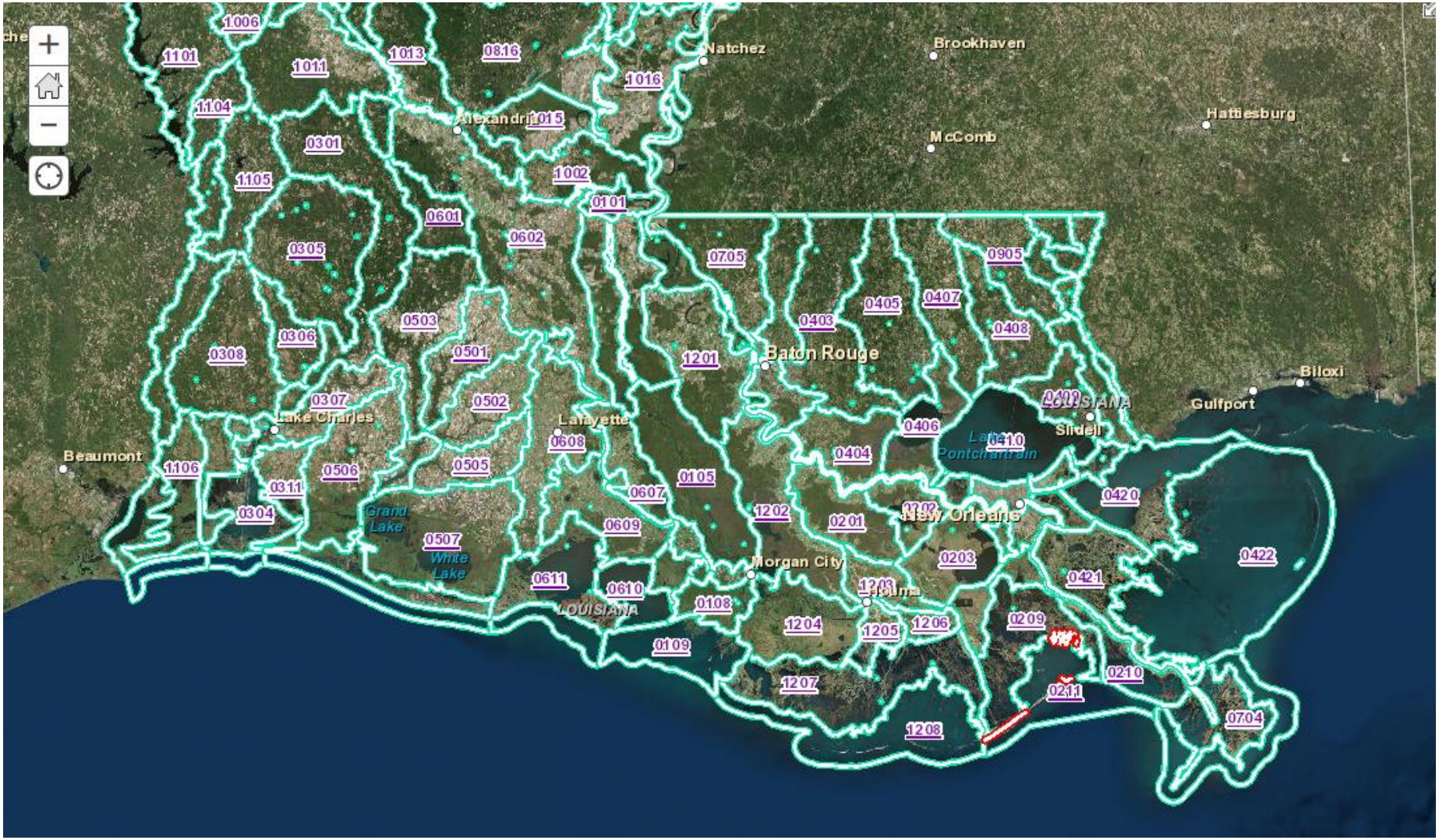
LSU

## *Long-Term Trends Between Areas Fished and Places of Business*

***Areas Investigated:***

- **Trip Tickets-** LDWF trip tickets for broad species groups (crab, oyster, shrimp, freshwater/ saltwater finfish).
- **Landing Data-** coastwide or higher level of detail if possible.
- **Additional Fishing Data-** include additional data on commercial fishing liscenses and boat registrations.
- **Land Based Operations-** at parish or higher level of detail if possible.

# Coastal Louisiana Map of Areas Fished



# Diversion Modeling

*[future with projects]*

- Examines sediment diversion impacts on land building and fisheries.
- Compares a "Future Without Action" to a "Future With Projects" over next 50 years.
- Investigate impacts on land building and maintenance, flood risk, fisheries' abundance and distribution, and other coastal habitats.

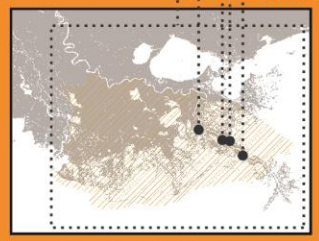
## *Effects of Sediment Diversion Projects*

WATER & SALINITY LEVELS

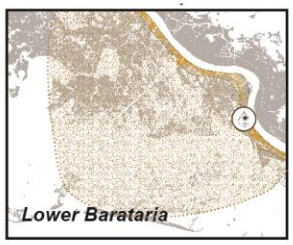
LAND BUILDING

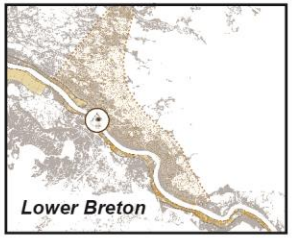
HABITATS

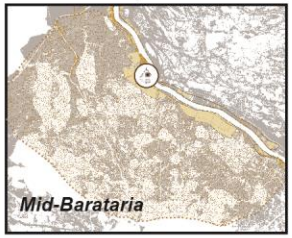
FISHERIS ABUNDANCE & DISTRIBUTION

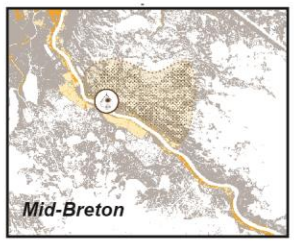


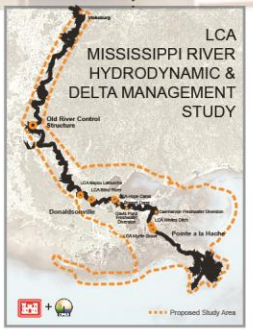
Scale: Local



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# Thank You!

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