Louisiana Coastal Area (LCA) Mississippi River Delta Management Study

Expert Panel on Diversion Planning and Implementation Meeting # 4

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Study Structure

LCA Mississippi River Hydrodynamic and Delta Management Study (MRHDMS)

Hydrodynamic Study

River Science

Data Collection, Analysis, and Modeling

Delta Management Study

Receiving Basins Science

Full Feasibility Study with Chief's Report

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Study Structure

The Delta Management Project Delivery Team (PDT) consists of representatives from multiple state and federal agencies and partners.

Study Structure

Problem

Land Loss:

- 90% of coastal wetland loss in the lower 48 states
- Causes: natural events, historic and current river and coastal management practices, and other human alterations

Opportunities

Preserve wetlands to protect:

- Coastal Population: Over 2 Million Residents
- Coastal Ports: 1st in the Nation in Total Shipping Tonnage, 5 of the Top 15 Ports
- Coastal Energy: Top Producer of Domestic Oil, Over $70 Billion Annually
- Coastal Fisheries: Top Fisheries Producer in Lower 48, Over $3 Billion Annually

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Study Structure

Overarching Goals

- Reconnect Mississippi River resources (freshwater, sediment and nutrients) to the delta
- Restore and sustain a healthy, diverse coastal ecosystem
- Develop a long-term strategy for management of the lower Mississippi River and the surrounding delta
- Balance multiple authorized uses of Mississippi River resources including navigation, flood risk reduction and ecological restoration

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Specific Objectives

Relative to “future without project” (FWOP) conditions:

- Maintain and restore wetlands (max acres)
- Sustain diverse habitats in the region
- Reduce tidal prisms and improve interior hydrology in the basins

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Constraints

Relative to "future without project" (FWOP) conditions:

- Maintain flood conveyance capacity of the river
- Maintain navigation mission of the river
- Minimize flood risk to coastal communities
- Minimize adverse impacts to fisheries

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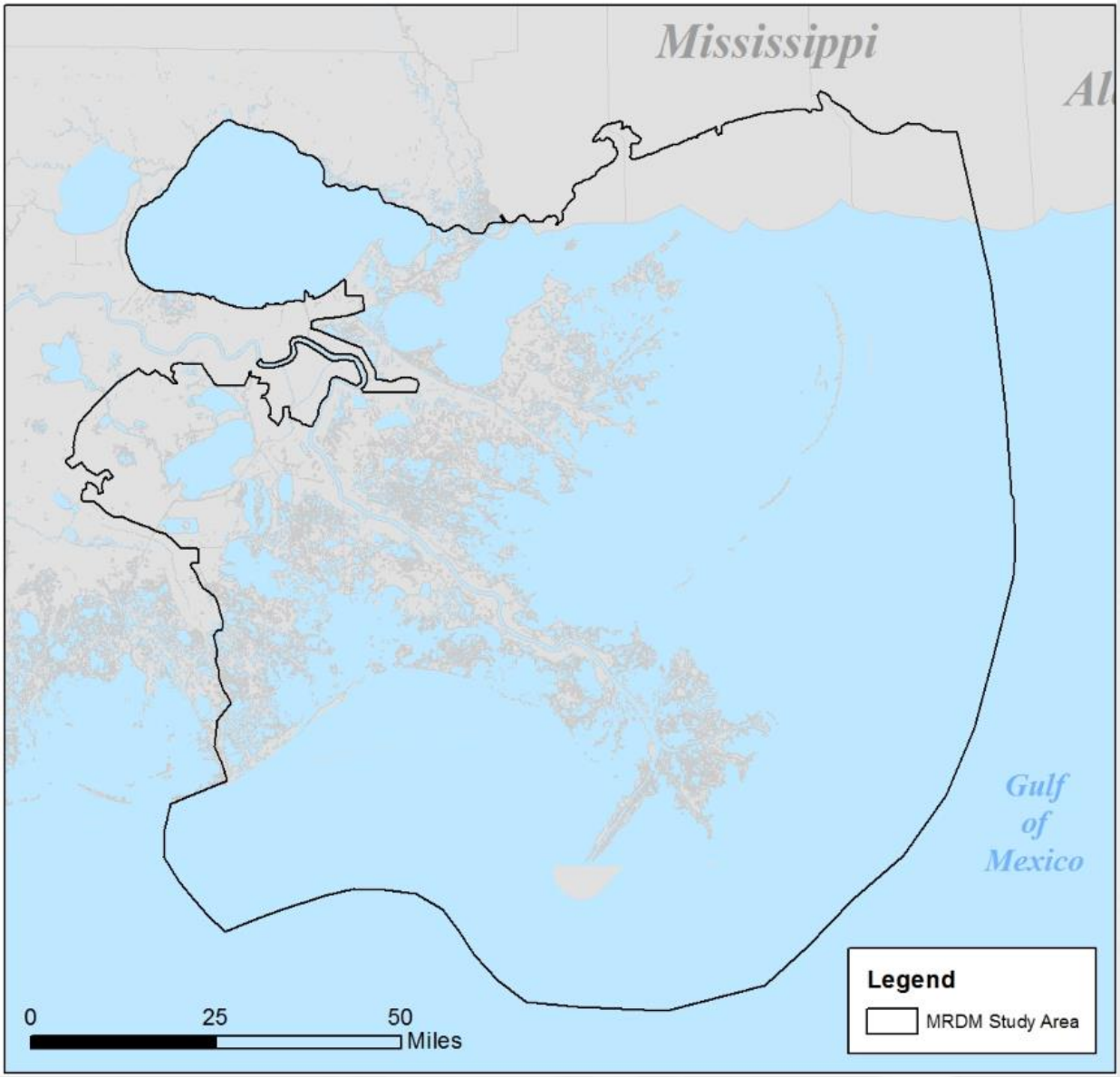
LCA Mississippi River Hydrodynamic and Delta Management Study Area



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Plan Formulation Status

1. Develop **Initial Array** of alternatives *(2014)*
2. Screen initial array to **Focused Array** of alternatives using existing information *(2014)*
3. Refine focused array to **Final Array** of alternatives *(underway)*
4. **Develop models** to evaluate benefits / impacts of alternatives in final array *(underway)*
5. **Apply models** to conduct runs for the final array *(2015)*
6. Choose the **Tentatively Selected Plan** (TSP) (*2015*)

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Looking Back
Getting to the Focused Array

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Developing Initial Array

- 2004 LCA report directed evaluation of large-scale diversions; the PDT decided to begin with LCA and Louisiana 2012 State Master Plan (MP) diversions.
- CPRA requested inclusion of State Master Plan marsh creation projects that use MR as a sediment resource.
- PDT brainstormed to consider new ideas.
- Diversions and Marsh Creation sites are identified as measures
  - same operating plans/locations/assumptions as MP.

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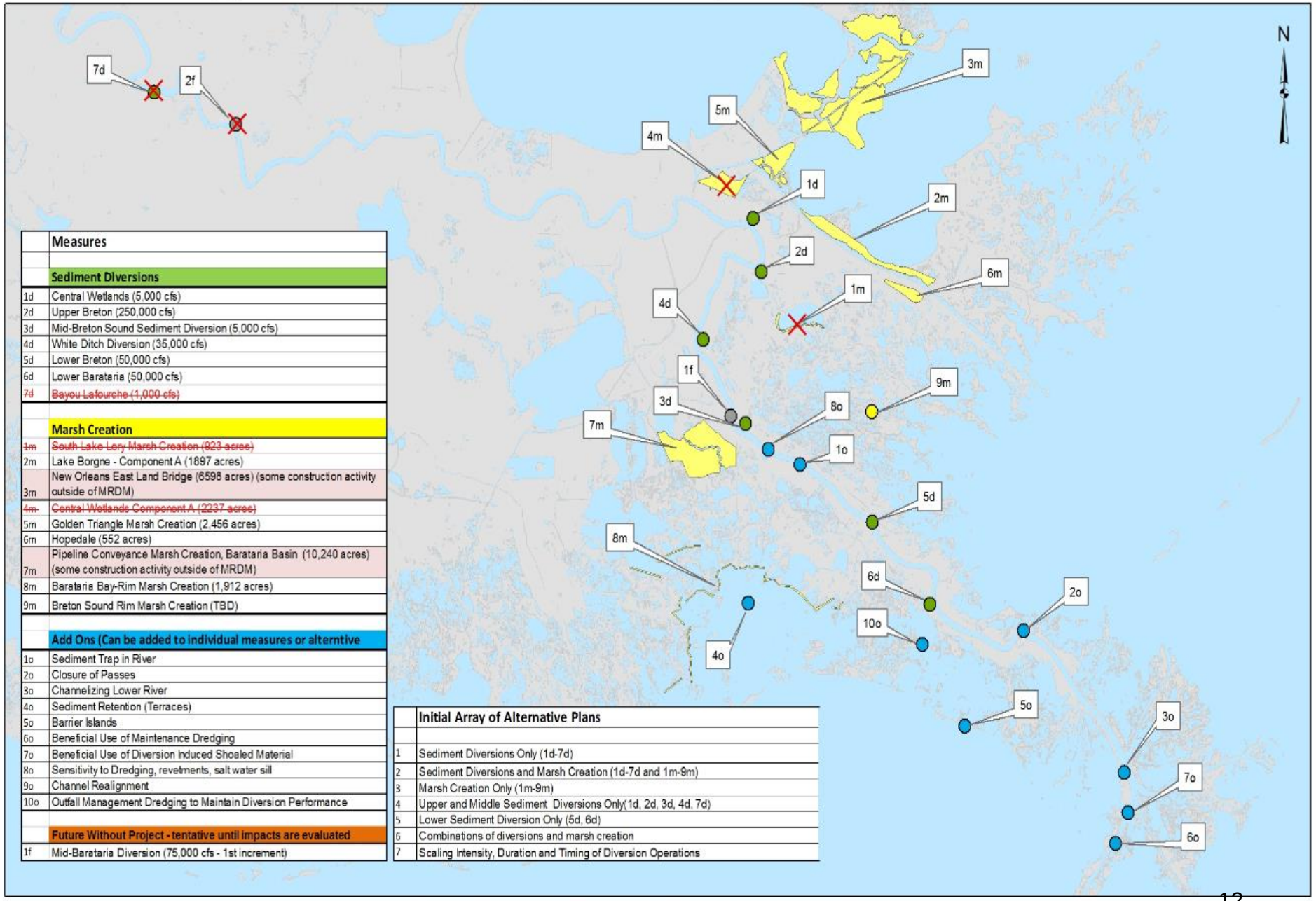
LCA Mississippi River Delta Management Study Initial Array of Measures/Alternatives



	Measures
	Sediment Diversions
1d	Central Wetlands (5,000 cfs)
2d	Upper Breton (250,000 cfs)
3d	Mid-Breton Sound Sediment Diversion (5,000 cfs)
4d	White Ditch Diversion (35,000 cfs)
5d	Lower Breton (50,000 cfs)
6d	Lower Barataria (50,000 cfs)
~~7d~~	~~Bayou Lafourche (1,000 cfs)~~
	Marsh Creation
~~1m~~	~~South Lake Lery Marsh Creation (923 acres)~~
2m	Lake Borgne - Component A (1897 acres)
3m	New Orleans East Land Bridge (6598 acres) (some construction activity outside of MRDM)
~~4m~~	~~Central Wetlands Component A (2237 acres)~~
5m	Golden Triangle Marsh Creation (2,456 acres)
6m	Hopedale (552 acres)
7m	Pipeline Conveyance Marsh Creation, Barataria Basin (10,240 acres) (some construction activity outside of MRDM)
8m	Barataria Bay-Rim Marsh Creation (1,912 acres)
9m	Breton Sound Rim Marsh Creation (TBD)
	Add Ons (Can be added to individual measures or alterntive
1o	Sediment Trap in River
2o	Closure of Passes
3o	Channelizing Lower River
4o	Sediment Retention (Terraces)
5o	Barrier Islands
6o	Beneficial Use of Maintenance Dredging
7o	Beneficial Use of Diversion Induced Shoaled Material
8o	Sensitivity to Dredging, revetments, salt water sill
9o	Channel Realignment
10o	Outfall Management Dredging to Maintain Diversion Performance
	Future Without Project - tentative until impacts are evaluated
1f	Mid-Barataria Diversion (75,000 cfs - 1st increment)

	Initial Array of Alternative Plans
1	Sediment Diversions Only (1d-7d)
2	Sediment Diversions and Marsh Creation (1d-7d and 1m-9m)
3	Marsh Creation Only (1m-9m)
4	Upper and Middle Sediment Diversions Only(1d, 2d, 3d, 4d. 7d)
5	Lower Sediment Diversion Only (5d, 6d)
6	Combinations of diversions and marsh creation
7	Scaling Intensity, Duration and Timing of Diversion Operations

Screening the Initial Array

Objective Criteria

- Acres of wetland created/maintained
- Habitat Diversity (salinity and HSIs)

Constraint Criteria

- River Impacts
  - Sediment/dredging volumes
  - Stage
- Basin water level - Flooding Impacts

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Screening the Initial Array

Models used for Initial Screening

2012 Louisiana State Master Plan Models

- Acres, HSIs, Salinity, Basin stage

Hydrodynamic Study 1D River Models

- River stage, Sediment/Dredging volume

Analytic Methods and New AdH (screening level)

- Acres, Salinity, Stage

Existing LCA Models (e.g., White Ditch, Myrtle Grove)

- Salinity, Stage

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Screening the Initial Array

Diversion Measures	Description	River Shoaling Impacts (over 50 period of analysis)	River Stage Increases	River Water Volume Impacts (operations;% of total river flow)	Proximity to Navigation Channel	River Sediment Volume Utilized for Restoration (total sediment over 50 years)	Maximize Wetland Building and Maintenance (difference between FWP and FWOP at 50 years in acres)	Flood Control (basin stage changes between FWP and FWOP)	Diversity of Habitat (Amount of diversity based on salinities and HSIs in basin where diversion is located comparing FWP to FWOP)	Conclusion
Central Wetlands (5,000 cfs)	Pontchartrain Basin Small Sediment Diversion	Low	None	Low	East Bank	Low	Low	Low	High	Dropped
Upper Breton (250,000 cfs)	Breton Sound Extra Large Sediment Diversion	Low in navigation channel (moderate in river mile 80-12)	Minimal	Moderate when river is below 600 kcfs and High when river flow is over 900kcfs	East Bank	High	Very High	Very High	Very Low (Mostly Fresh Species)	Moved to Adaptive Future Implementation
Upper Breton (50,000 cfs)	Breton Sound Large Sediment Diversion	Low in navigation channel (moderate in river mile 80-12)	None	Moderate	East Bank	N/A	High	High	N/A	Moved to Adaptive Future Implementation
Mid-Breton Sound Sediment Diversion (5,000 cfs)	Breton Sound Small Sediment Diversion	Low	None	Low	East Bank	Moderate	Moderate	Moderate	Low (Mostly Salt Species)	Retained and Combined with White Ditch
White Ditch Diversion (35,000 cfs) only operated for two months/year	Breton Sound Medium Sediment Diversion	Low in navigation channel (moderate in river mile 80-12)	None	Moderate	East Bank	N/A	Low	Moderate	Moderate	Retained and Combined with Mid Breton
Lower Breton (50,000 cfs)	Breton Sound Large Sediment Diversion	Low in navigation channel (moderate in river mile 80-12)	None	Moderate	East Bank	Moderate	Moderate	Moderate	Low	Retained
Lower Barataria (50,000 cfs)	Barataria Basin Large Sediment Diversion	Low in navigation channel (moderate in river mile 80-12)	None	Moderate	West Bank	Moderate	Moderate	Moderate	Low	Retained
~~Bayou Lafourche (1,000 cfs)~~										

Developing the Focused Array

Project Measures Screened

Diversions

- **Upper Breton Sound Diversion** recommended for Future Implementation in separate study (high risk of impacts)
- **Central Wetlands Diversion** screened out (relatively low wetland acres and high risk of basin flooding)

Marsh Creation

- **Rim projects** moved to consideration as “add on” features
- **Hopedale project** screened out (relatively low wetland acres, low connectivity to the system)
- **Lake Borgne, NO East, and Golden Triangle projects** screened out (distance to diversion influence areas)

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Developing the Focused Array

Plan Formulation Decisions

- Comparisons will be made between diversions and marsh creation projects that are as direct as possible (i.e., keeping as many variables constant as possible, including the sediment source/bar in the river).
- Outfall management add on features are NOT stand alone features; they serve to optimize alternative plans.
- Diversion induced shoaled material can be utilized for outfall management/marsh creation.

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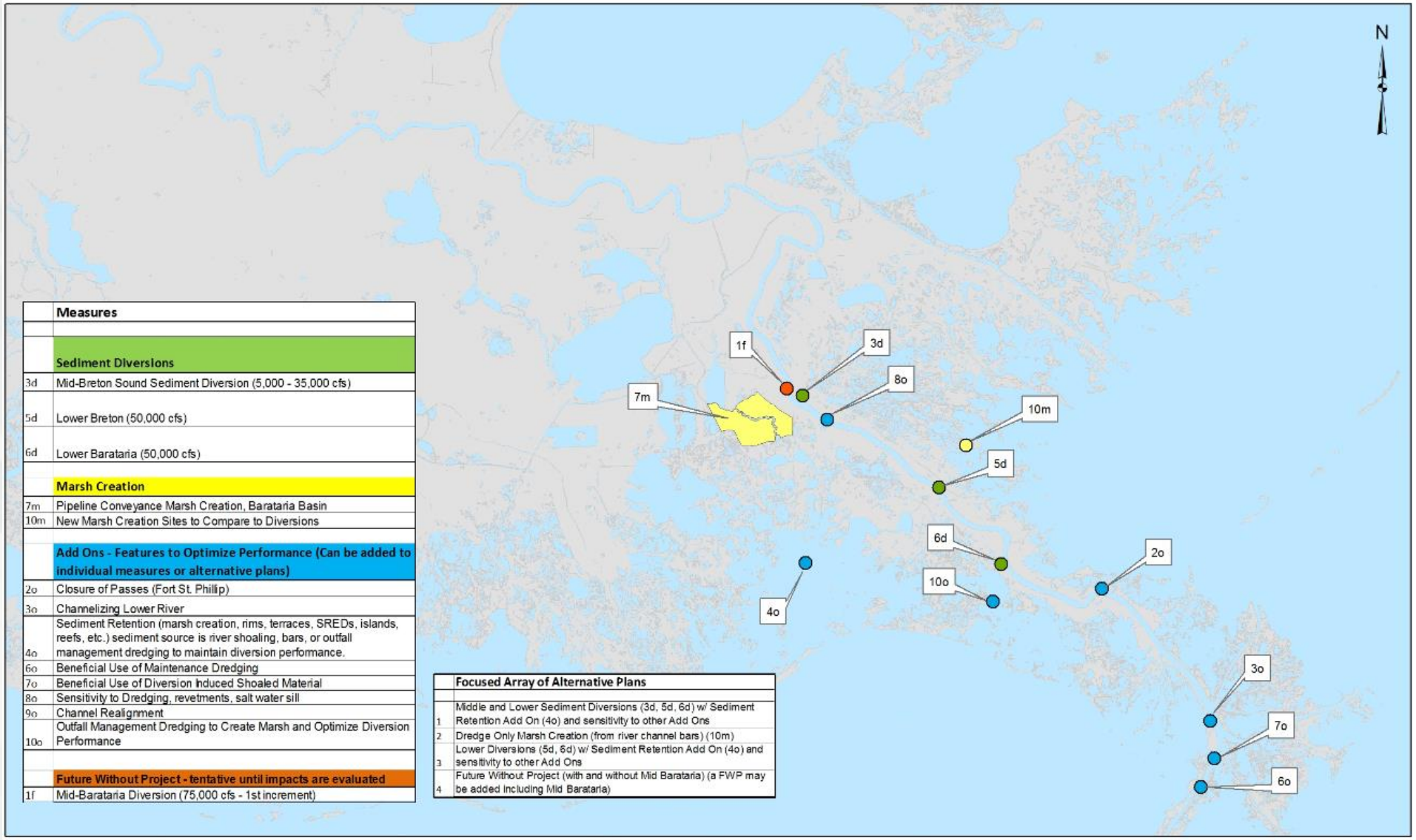
LCA Mississippi River Delta Management Study Focused Array of Measures/Alternatives



	Measures
	Sediment Diversions
3d	Mid-Breton Sound Sediment Diversion (5,000 - 35,000 cfs)
5d	Lower Breton (50,000 cfs)
6d	Lower Barataria (50,000 cfs)
	Marsh Creation
7m	Pipeline Conveyance Marsh Creation, Barataria Basin
10m	New Marsh Creation Sites to Compare to Diversions
	Add Ons - Features to Optimize Performance (Can be added to individual measures or alternative plans)
2o	Closure of Passes (Fort St. Philip)
3o	Channelizing Lower River
4o	Sediment Retention (marsh creation, rims, terraces, SREDs, islands, reefs, etc.) sediment source is river shoaling, bars, or outfall management dredging to maintain diversion performance.
6o	Beneficial Use of Maintenance Dredging
7o	Beneficial Use of Diversion Induced Shoaled Material
8o	Sensitivity to Dredging, revetments, salt water sill
9o	Channel Realignment
10o	Outfall Management Dredging to Create Marsh and Optimize Diversion Performance
	Future Without Project - tentative until impacts are evaluated
1f	Mid-Barataria Diversion (75,000 cfs - 1st increment)

	Focused Array of Alternative Plans
1	Middle and Lower Sediment Diversions (3d, 5d, 6d) w/ Sediment Retention Add On (4o) and sensitivity to other Add Ons
2	Dredge Only Marsh Creation (from river channel bars) (10m)
3	Lower Diversions (5d, 6d) w/ Sediment Retention Add On (4o) and sensitivity to other Add Ons
4	Future Without Project (with and without Mid Barataria) (a FWP may be added including Mid Barataria)

Looking Ahead
Getting to the TSP

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Developing the Science

Multidimensional H&H models

AdH/SEDLIB

- 2D depth-averaged model with quasi 3D sediment behavior
- Primary Productivity Model included in SEDLIB
- Simplified Box Model for water quality constituents

Delft 3D

- Hydro- and morphodynamic model, including sediment transport
- Nutrient Dynamic and Water quality component
- Linked Vegetation modules

Data Collection: Elevation, Bathymetry, Meteorological data, Stage, Temperature, Velocities, DO, Salinity, Turbidity, Above and Below Ground Biomass, Soil Organic Matter, Mineral Sediment Content, Soil Strength, etc.

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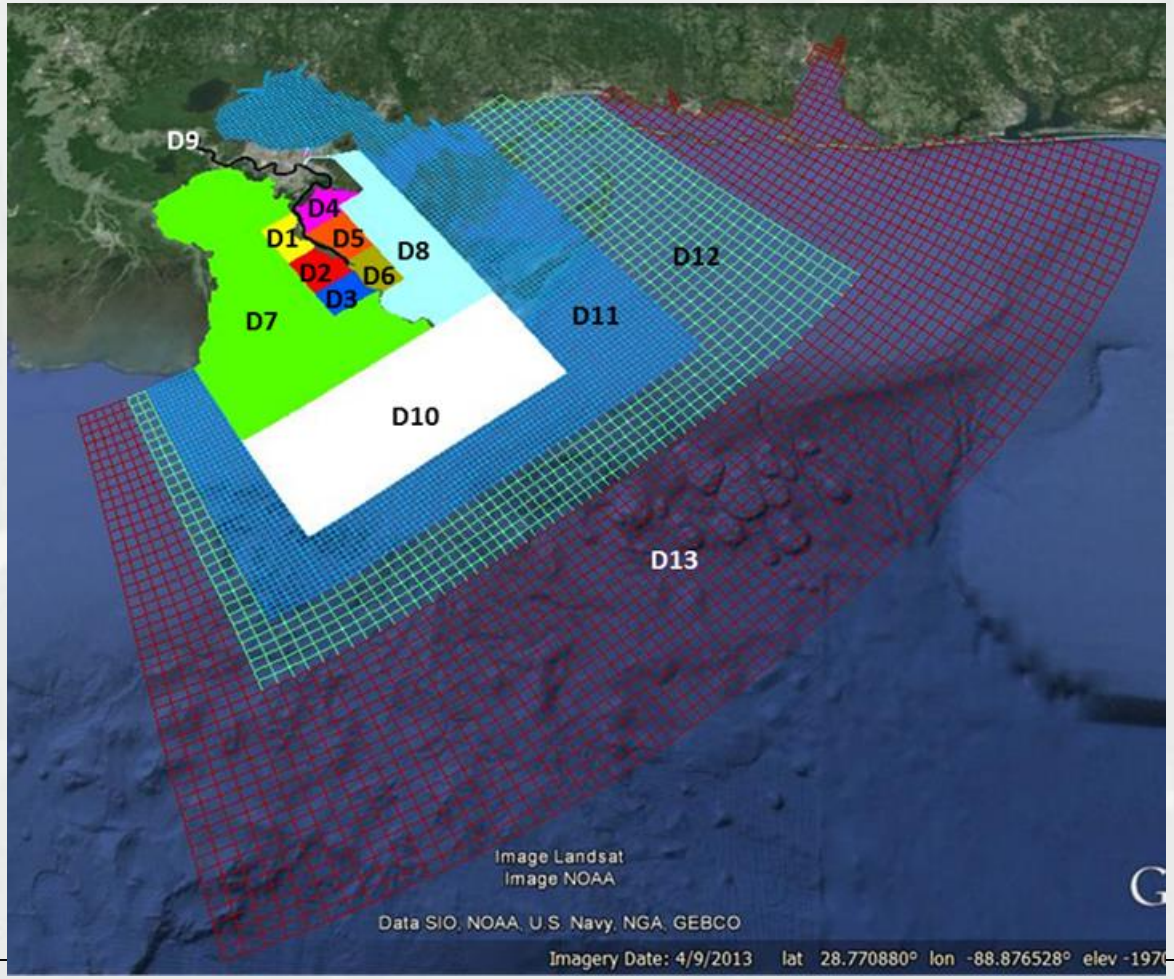
Developing the Science

Domain for basin wide Delft 3D model



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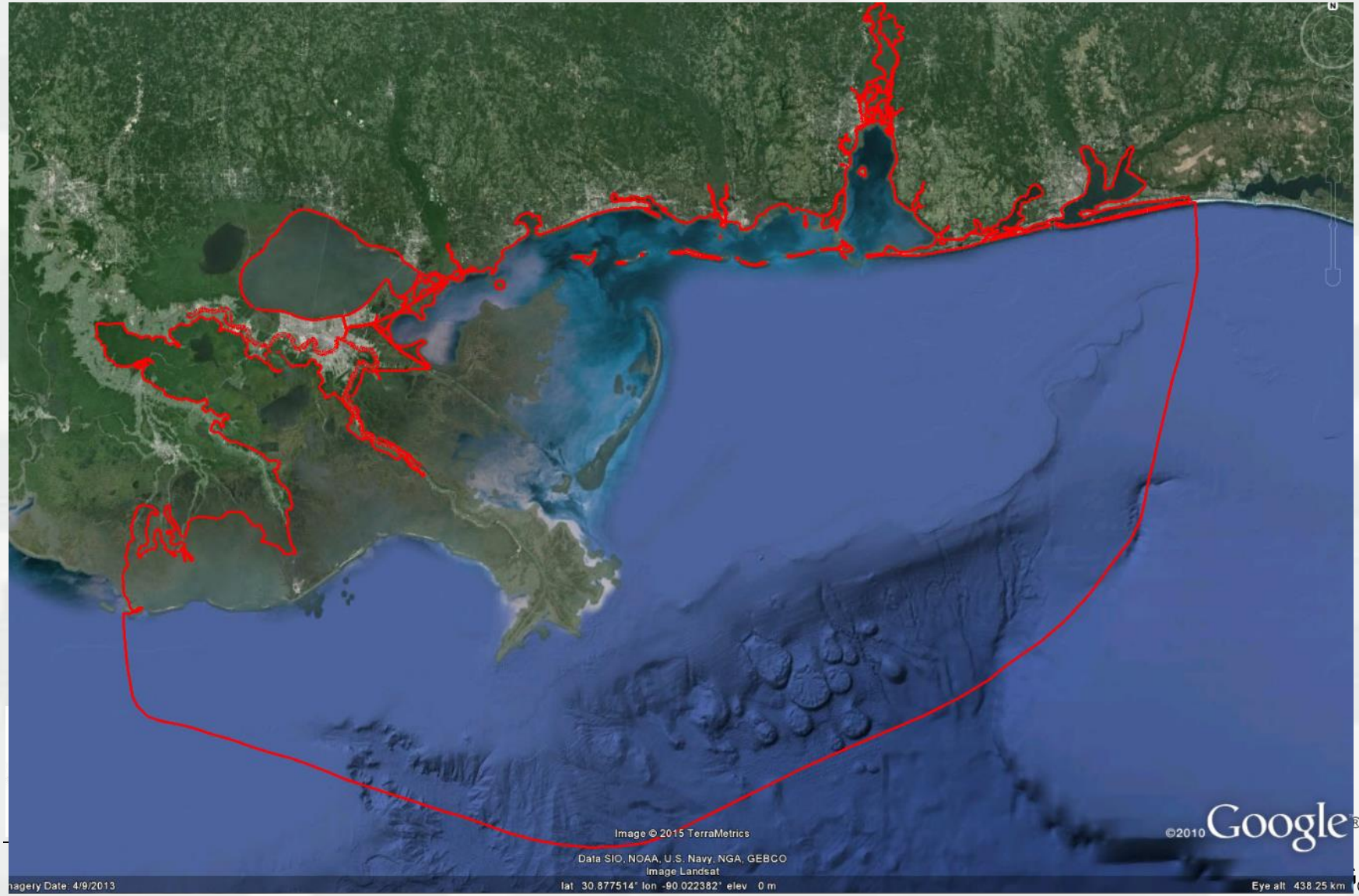
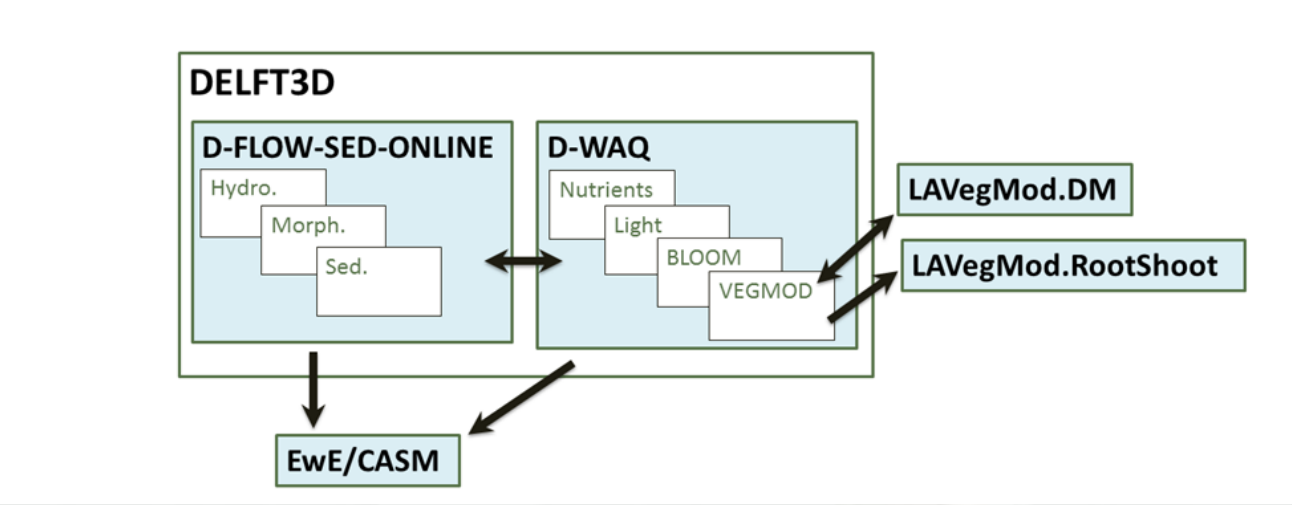
Domain for the AdH Model



Developing the Science

Examples of outputs :

- Water: velocity, elevation/ depth, temperature, salinity, turbidity, nutrients (DO, N, P, chlorophyll a)
- Sediment: stratigraphy, concentration, composition
- Biology: Phytoplankton taxa and biomass, Biomass and coverage of emergent vegetation and SAV



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Developing the Science

Fish and Shellfish Community Models

- **Ecopath with Ecosim and EcoSpace (EwE)**
  - Expanded from model being developed for 2017 Louisiana State Master Plan
  - Mass-balanced (Ecopath), time-dynamic (Ecosim), and spatially explicit (Ecospace)
- **Comprehensive Aquatic System Model (CASM)**
  - Expanded from model developed for LCA Myrtle Grove Study
  - Spatial component implied by incorporating multiple temporal models for subsets of the area

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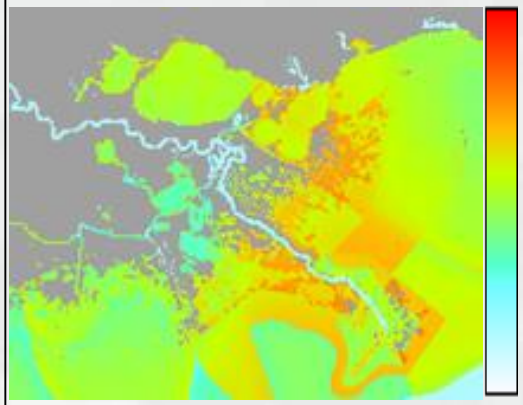
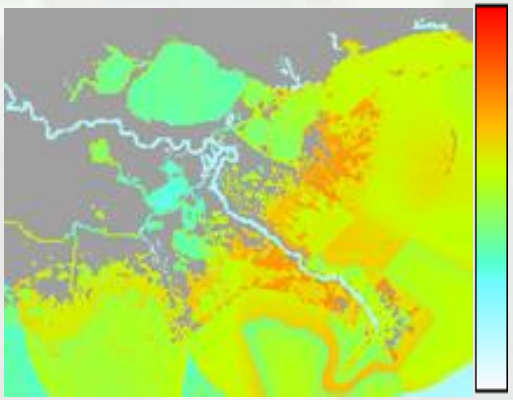
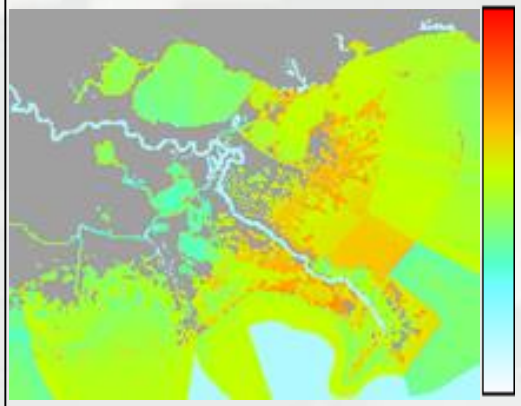
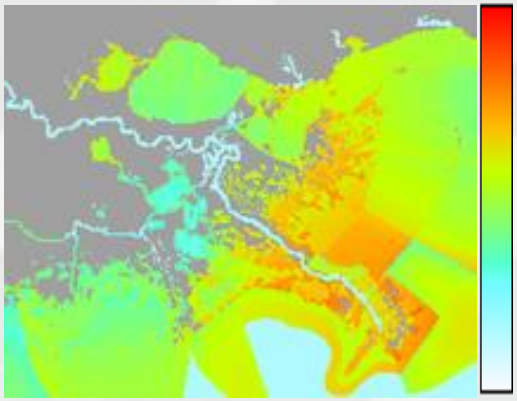
Developing the Science

Example output from EwE

June 2006	June 2019
	
	

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Choosing the TSP

Proposed Approach

- Develop thresholds for screening criteria (i.e. acres, flood impacts, habitat/species impacts, etc.) and process for evaluation of tradeoffs.
- Review model outputs to evaluate and compare alternatives based on screening thresholds and tradeoffs.
- Evaluate socioeconomic impacts and qualitatively assess National Economic Development impacts of each alternative.
- Determine the National Ecosystem Restoration plan that best meets the study goals and objectives and avoids constraints. The plan should also meet the four evaluation criteria of completeness, effectiveness, efficiency, and acceptability.

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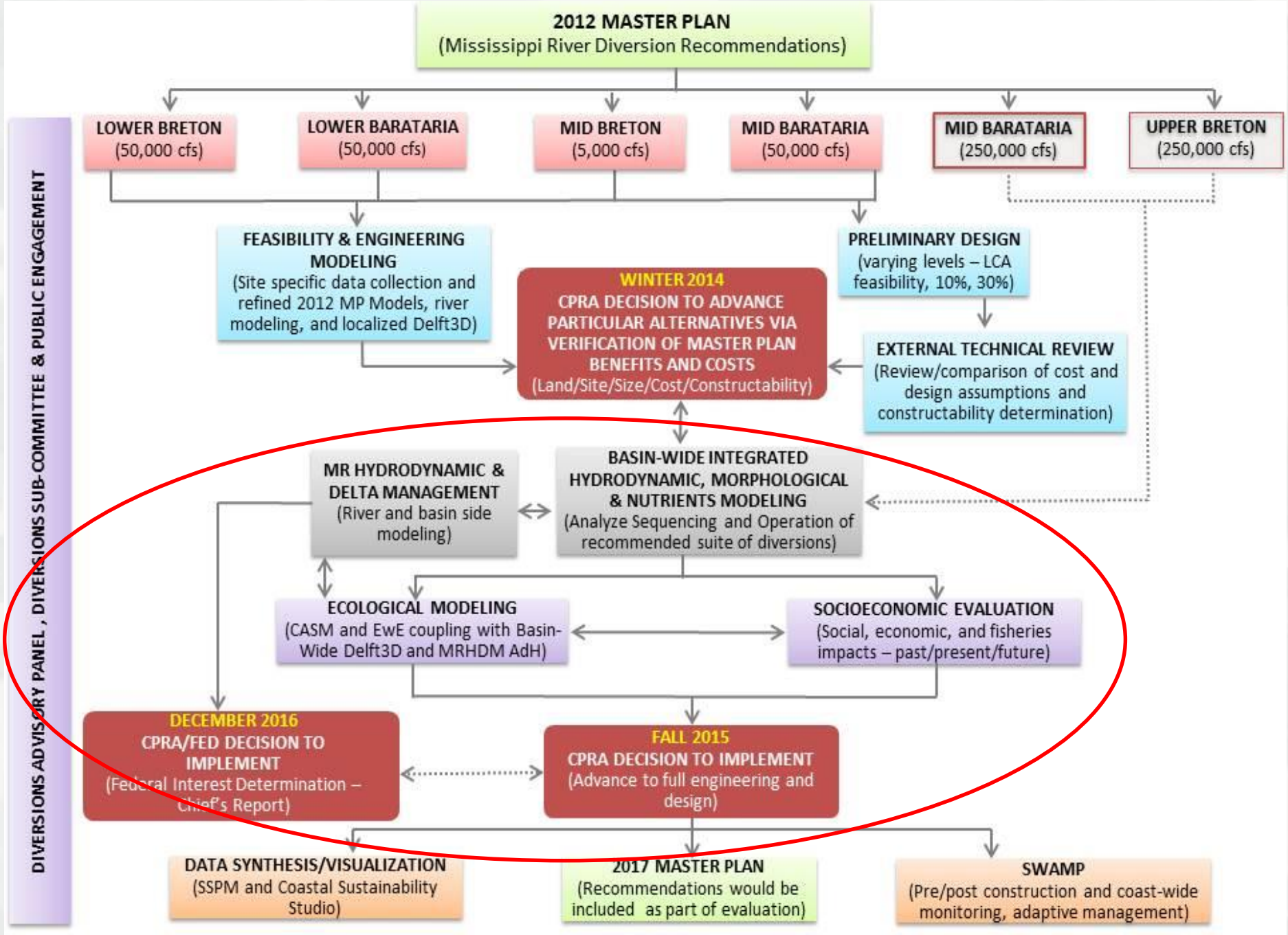
2012 MASTER PLAN
(Mississippi River Diversion Recommendations)
LOWER BRETON
(50,000 cfs)
LOWER BARATARIA
(50,000 cfs)
MID BRETON
(5,000 cfs)
MID BARATARIA
(50,000 cfs)
MID BARATARIA
(250,000 cfs)
UPPER BRETON
(250,000 cfs)
FEASIBILITY & ENGINEERING MODELING
(Site specific data collection and refined 2012 MP Models, river modeling, and localized Delft3D)
PRELIMINARY DESIGN
(varying levels – LCA feasibility, 10%, 30%)
WINTER 2014
CPRA DECISION TO ADVANCE PARTICULAR ALTERNATIVES VIA VERIFICATION OF MASTER PLAN BENEFITS AND COSTS
(Land/Site/Size/Cost/Constructability)
EXTERNAL TECHNICAL REVIEW
(Review/comparison of cost and design assumptions and constructability determination)
MR HYDRODYNAMIC & DELTA MANAGEMENT
(River and basin side modeling)
BASIN-WIDE INTEGRATED HYDRODYNAMIC, MORPHOLOGICAL & NUTRIENTS MODELING
(Analyze Sequencing and Operation of recommended suite of diversions)
ECOLOGICAL MODELING
(CASM and EwE coupling with Basin-Wide Delft3D and MRHDM AdH)
SOCIOECONOMIC EVALUATION
(Social, economic, and fisheries impacts – past/present/future)
DECEMBER 2016
CPRA/FED DECISION TO IMPLEMENT
(Federal Interest Determination – Chief's Report)
FALL 2015
CPRA DECISION TO IMPLEMENT
(Advance to full engineering and design)
DATA SYNTHESIS/VISUALIZATION
(SSPM and Coastal Sustainability Studio)
2017 MASTER PLAN
(Recommendations would be included as part of evaluation)
SWAMP
(Pre/post construction and coast-wide monitoring, adaptive management)
DIVERSIONS ADVISORY PANEL , DIVERSIONS SUB-COMMITTEE & PUBLIC ENGAGEMENT

MRDM and the LA Coastal Master Plan (MP)

- ***Modeling***
  - MRDM uses modified versions of some of the MP model components (LaVeg, EwE)
  - MP also includes other model components (box models, HSIs, planning tool, etc.).
  - MRDM includes new models components (Delft 3D, AdH, CASM, WVA, and IWR).
  - The MP analysis will be available after the TSP milestone; expect differences in outputs

- ***Other analyses***
  - The PDT is coordinating socioeconomics analyses for MRDM much as possible with MP and other efforts (e.g., NOAA)

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MRDM and the LA Coastal Master Plan (MP)

- ***Planning Process***
  - MRDM follows Corps planning guidance from National policy and legislation and the Principles and Guidelines and Corps Engineering Regulations for conducting Civil Works studies.
  - MRHDM is considering a 50 year economic period of analysis and a planning horizon of 100 years (to assess stability, maintenance and operation) because of the national investment.
  - MRHDM and MP both used risk-based analysis
  - MRHDM and MP both consider adaptive management.

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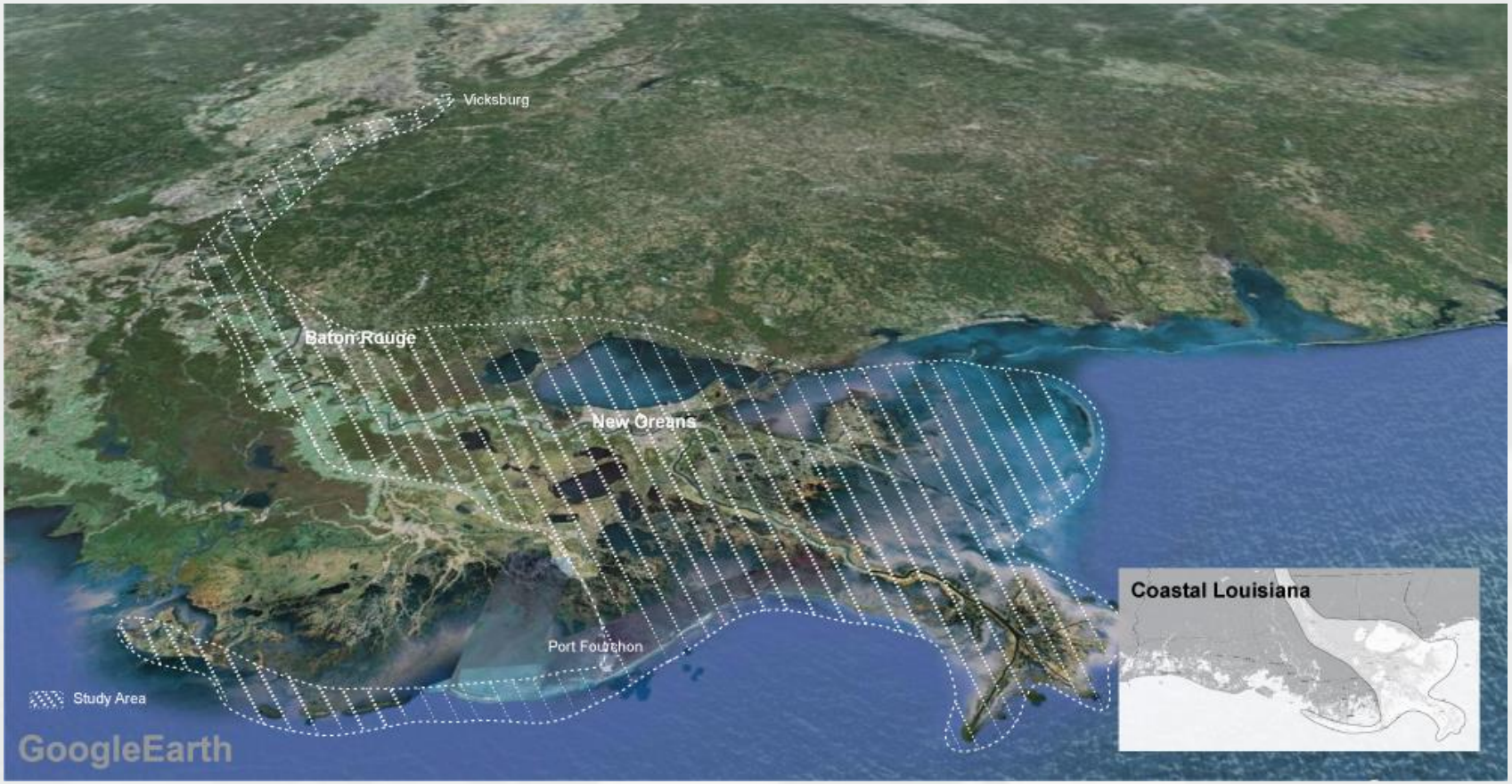
Questions?



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