

Louisiana Coastal Area Mississippi River Hydrodynamic and Delta Management Study

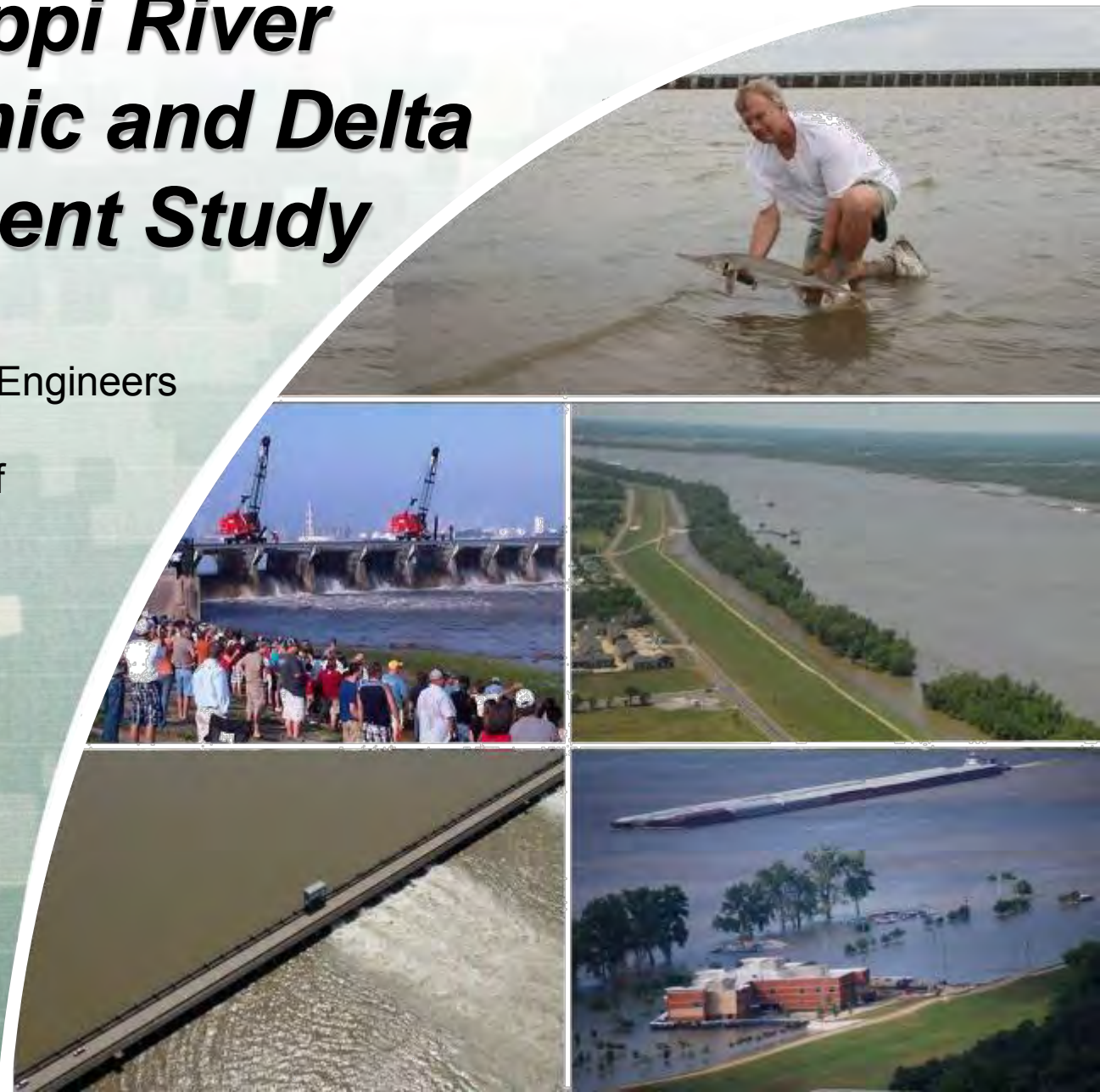
Barb Kleiss
MVD, US Army Corps of Engineers
Ehab Meselhe
Water Institute of the Gulf
July, 2014



Louisiana Coastal Protection
and Restoration Authority



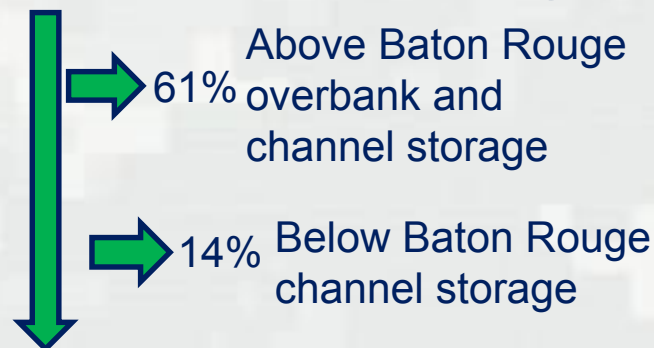
US Army Corps of Engineers
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Mississippi River Suspended Sand Budget 2008-2010

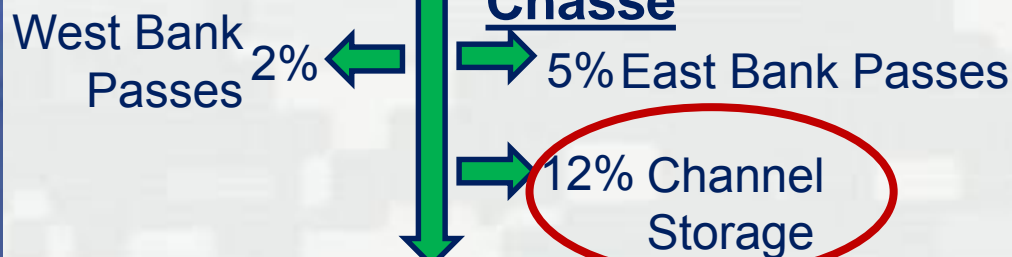


100% Tarbert Landing



25% Belle

Chasse



HoP 3%

SW Pass 2%

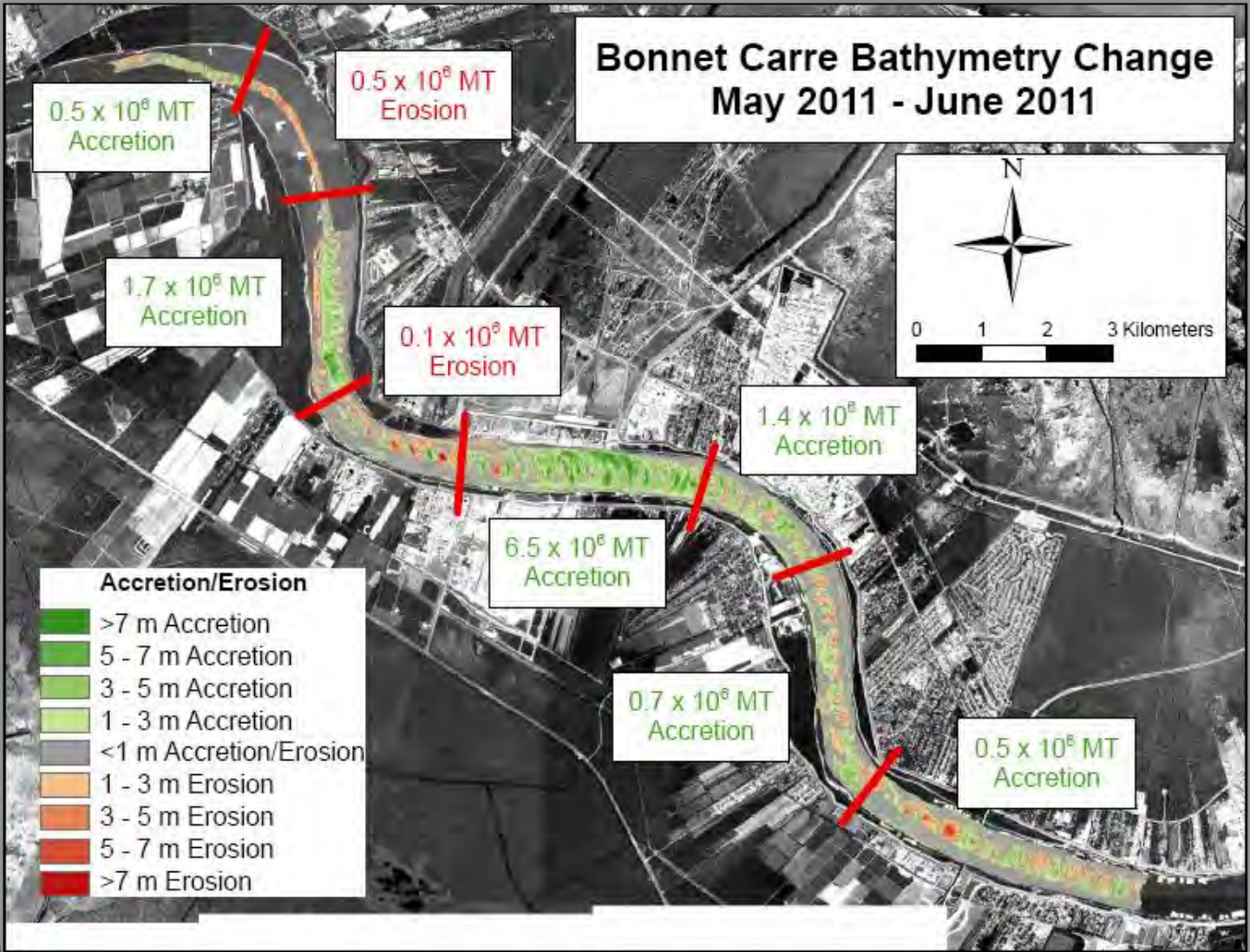
0.3% Pass a Loutre

South Pass

0.3%



Bonnet Carre Bathymetry Change May 2011 - June 2011



Objectives of the Mississippi River Hydrodynamic Study

- “The Mississippi River Hydrodynamic Study (MRH) will provide data and models to represent the existing Mississippi River below the Old River Control Structure (ORCS) is necessary to properly assess the operation and parameters of the Mississippi River & Tributaries (MR&T) system with respect to the available fresh water, nutrients and sediment transported by the river system, while considering the requirements for flood control and navigation along the river. The Mississippi River Hydrodynamic Study area encompasses the Mississippi River from the ORCS to the Gulf of Mexico.”



Questions to be Addressed:

- The Hydro team held a workshop over 3 years ago and articulated over 100 questions that needed to be addressed in order to understand the effects of diversions and other restoration projects on the main stem of the Mississippi River. These can be broadly grouped as:
 - ▶ Questions about the spatial and temporal availability of water and sediment resources and their movement through the system; and
 - ▶ Questions about how the removal of water and sediment will effect the sustainability of the river channel and the resources required to maintain the multiple uses of the river under projected future conditions such as climate change and channel modification.



Overall Project Structure

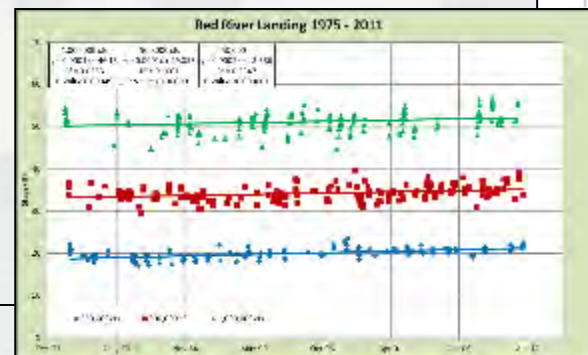
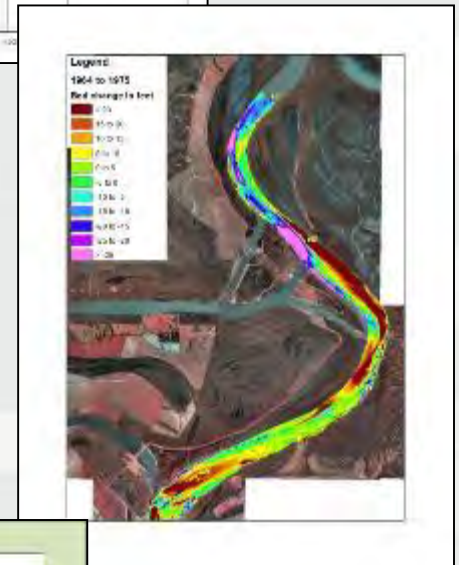
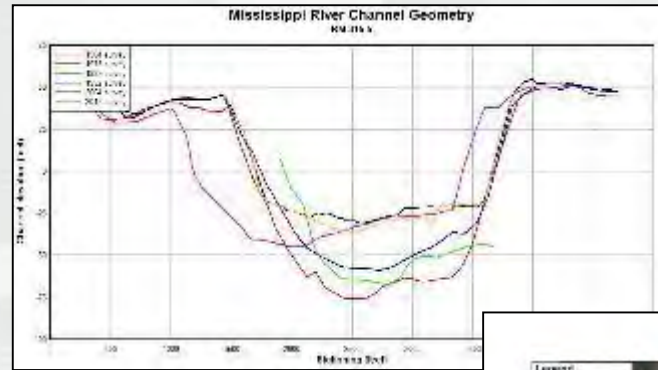
- **Task 1: Geomorphic Assessment**
- **Task 2: Data Collection and Analysis**
- **Task 3: Definition of Metrics for Assessing Model Predictive Skill**
- **Task 4: Data Management**
- **Task 5: One-Dimensional Modeling**
- **Task 6: Multi-dimensional Modeling**

Each team is co-lead by a State and Federal representative and coordinated by “Technical Leads”



Task 1. Geomorphic Assessment

- Data Compilation
- Geometric Data Analysis
- Gage and Discharge Analysis
- Analysis of Dredge Records
- Suspended Sediment Analysis
- Bed Material Analysis
- Event Timeline Analysis
- Integration



Reach Assessment 1970s to 2000s



Task 2: Data Collection and Analysis

- ▶ **The overall objective is to utilize existing data and to collect and analyze new data to enhance the understanding of hydrodynamic and sediment processes in the lower MS River in order to support numerical modeling efforts**
 - Objective 1: Trace a suspended sediment “pulse” through the system from ORCC to the deepwater passes and account for the processes that add/subtract from the water discharge and to/from the concentration and grain size composition of the suspended sediment.
 - Objective 2: Evaluate downstream transport of sand on lateral and point-bars in the lower river by assessing dune migration
 - Objective 3: Evaluate the complex behavior of water, sediment and nutrients in the Ostrica (RM24) to deepwater pass mouth(s) estuarine reach which experiences salt wedge penetration

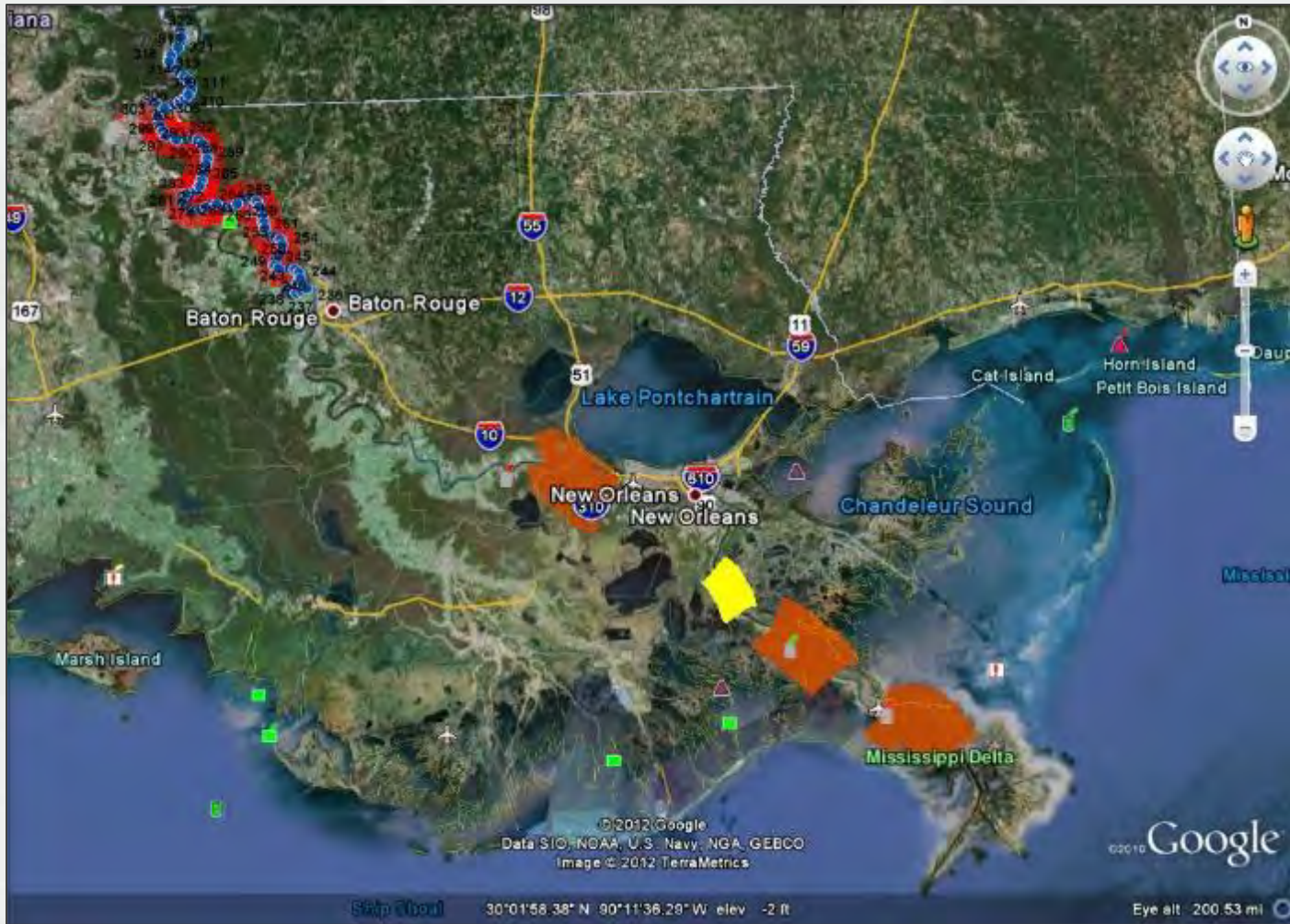


Task 3: Definition of Metrics for Assessing Model Predictive Skill

- ▶ Overall objective was to develop metrics to assess the predictive performance of the one and multi-dimensional models applied in this study. Separate metrics will be developed for each model type used in the study. The metrics will serve as a quantitative and unified tool to assess the models predictive performance.



Task 4: Data Management

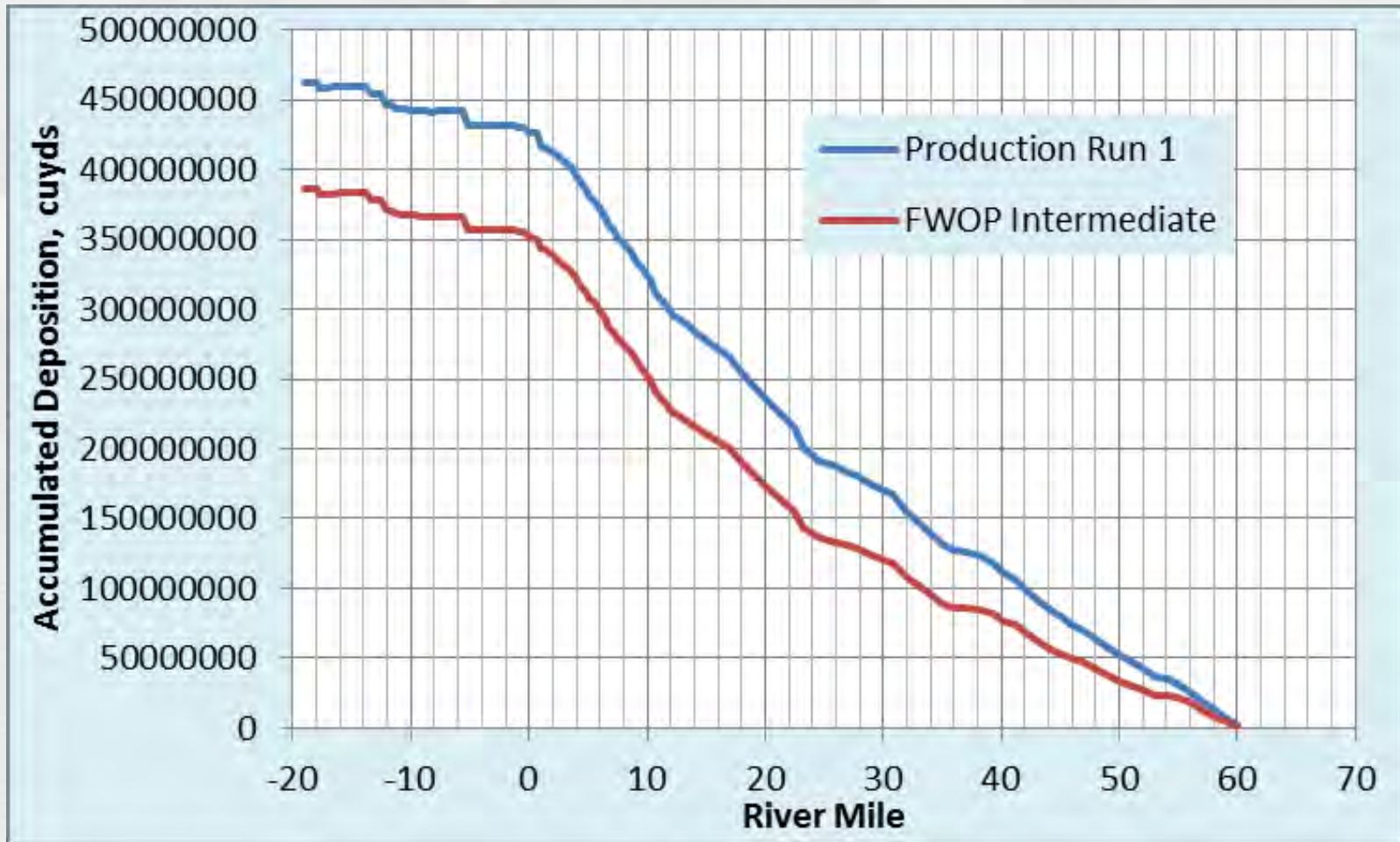


Tasks 5 and 6: One- and Multi-Dimensional Modeling

- Objectives:
 - ▶ Develop tools for the Lower Mississippi River to:
 - Understand the existing conditions
 - Evaluate FWOA
 - Assess the cumulative impacts of implementing restoration projects on authorized activities such as navigation and dredging
- Challenges:
 - ▶ Wide range of temporal and spatial scales of relevant physical processes
 - ▶ Complex water-sediment dynamics in the LMR
 - ▶ Complex coordination required among multi uses



ACCUMULATED DEPOSITION 2020 - 2079



DRAFT



Thomas, M.T. and Trawle, M. 2014. One-Dimensional Modeling of the lower Mississippi River. In press.

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MS River Delta Management

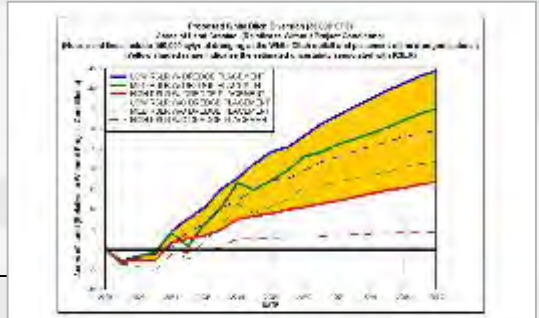
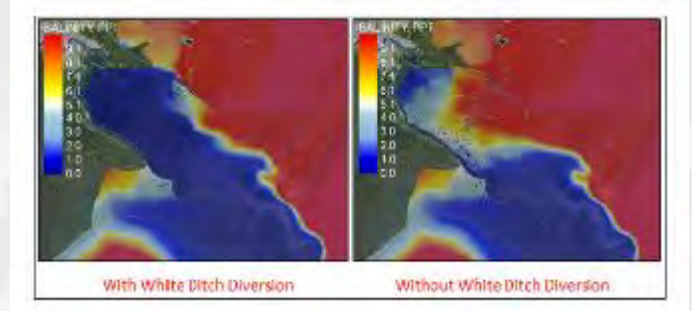
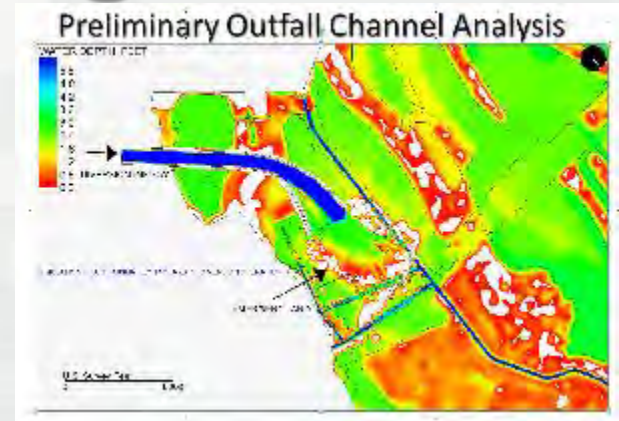
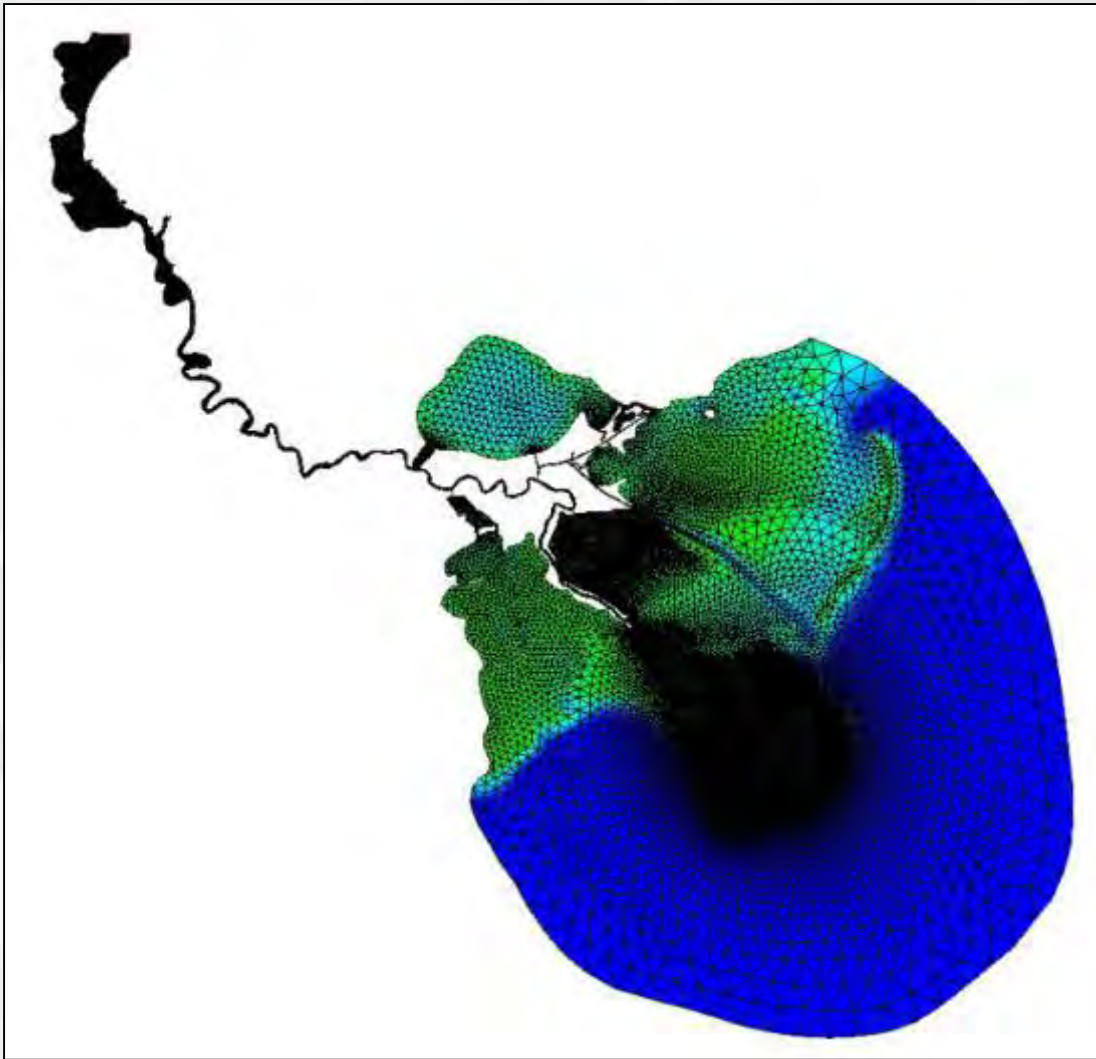


Figure 4-30: Predicted Sediment Accumulation in the Operation of Mixed Ditch Orders for Different Rates of Freshwater Inflow Rate

Objectives of the Mississippi River Delta Management Study

Objectives:

- Maintain and restore the maximum number of acres of wetlands.
 - ▶ Metric is acres
- Sustain diverse habitats in the Mississippi deltaic region over the long term.
 - ▶ Metric is salinity, habitat suitability indices and outputs from Ecological Modeling.
- Reduce tidal prisms and improve interior hydrology in Mississippi River basins over the long term.
 - ▶ Metric is salinity, stage, and circulation in the basin hydrodynamic models.



Constraints

Constraints:

- Maintain flood conveyance capacity of the Mississippi River relative to the future without project condition.
- Maintain navigation mission of the Mississippi River relative to the future without project condition.
- Minimize increase flood risk to coastal communities.
- Minimize substantial and unacceptable adverse impacts to fisheries (define threshold).



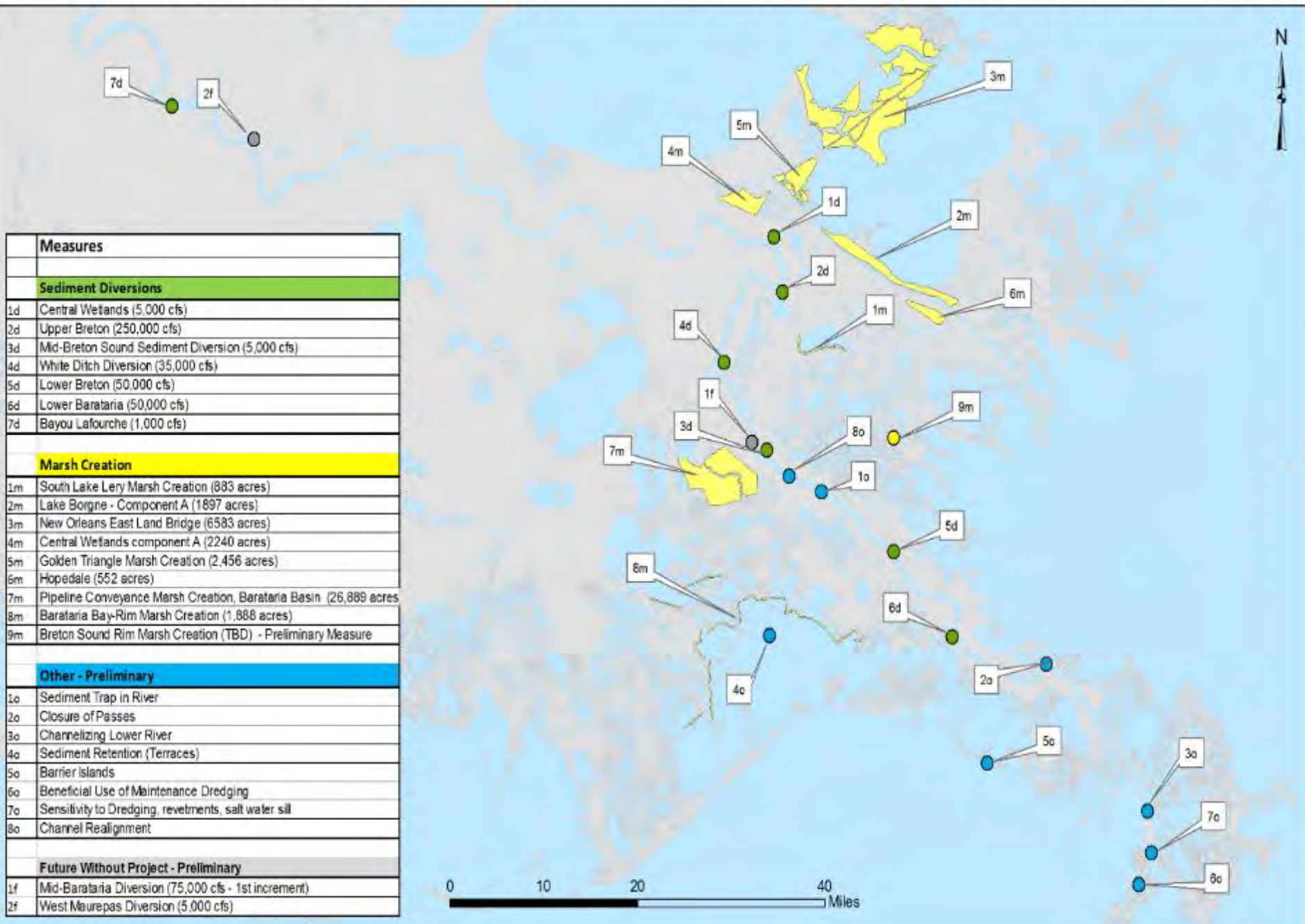
Assumptions

Assumptions:

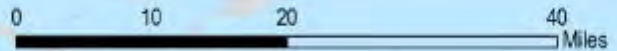
- There will be changes to the ecosystems and habitats over time. Maintaining the status quo or restoring or sustaining a historic or present landscape is neither possible nor desirable.
- Must wisely adaptively manage.
- There will be a total collapse of coastal ecosystems and habitats, and the socio-economic systems that they support, over time if we do nothing.
- This project will operate under high levels of ecological and engineering uncertainty.



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 (883 acres)
2m	Lake Borgne - Component A (1897 acres)
3m	New Orleans East Land Bridge (6583 acres)
4m	Central Wetlands component A (2240 acres)
5m	Golden Triangle Marsh Creation (2,456 acres)
6m	Hopedale (552 acres)
7m	Pipeline Conveyance Marsh Creation, Barataria Basin (26,889 acres)
8m	Barataria Bay-Rim Marsh Creation (1,886 acres)
9m	Breton Sound Rim Marsh Creation (TBD) - Preliminary Measure
Other - Preliminary	
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	Sensitivity to Dredging, revetments, salt water sill
8o	Channel Realignment
Future Without Project - Preliminary	
1f	Mid-Barataria Diversion (75,000 cfs - 1st increment)
2f	West Maurepas Diversion (5,000 cfs)



Screening of Initial Array

- Use the Hydrodynamic river models to screen alternatives by river resource (sediment and water) availability and impacts.
- Use best professional judgment, and existing basin modeling outputs (stage, salinity, velocities, and land building) from the LCA Myrtle Grove and White Ditch models, and the LA State Master Plan
- Screen initial array down to manageable final array (6 -7 alternatives).



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LOUISIANA COASTAL AREA

Mississippi River Hydrodynamic and Delta Management Study

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Project Description



The Mississippi River Hydrodynamic and Delta Management (MRHDM) Study is the first large-scale, long-term restoration assessment investigated under the LCA Program. This study will identify and evaluate a combination of large-scale management and restoration features to address the long-term sustainability of the lower Mississippi River Deltaic Plain, as authorized under Section 7003 of the Water Resource Development Act (WRDA) 2007. The MRHDM Study area covers the lower Mississippi River and the surrounding deltaic regions. The hydrodynamic study effort will focus on the Mississippi River, while the delta management study effort will focus on the adjacent basins.



[Submit a Comment/Question](#)

Key Documents

Full Document Library

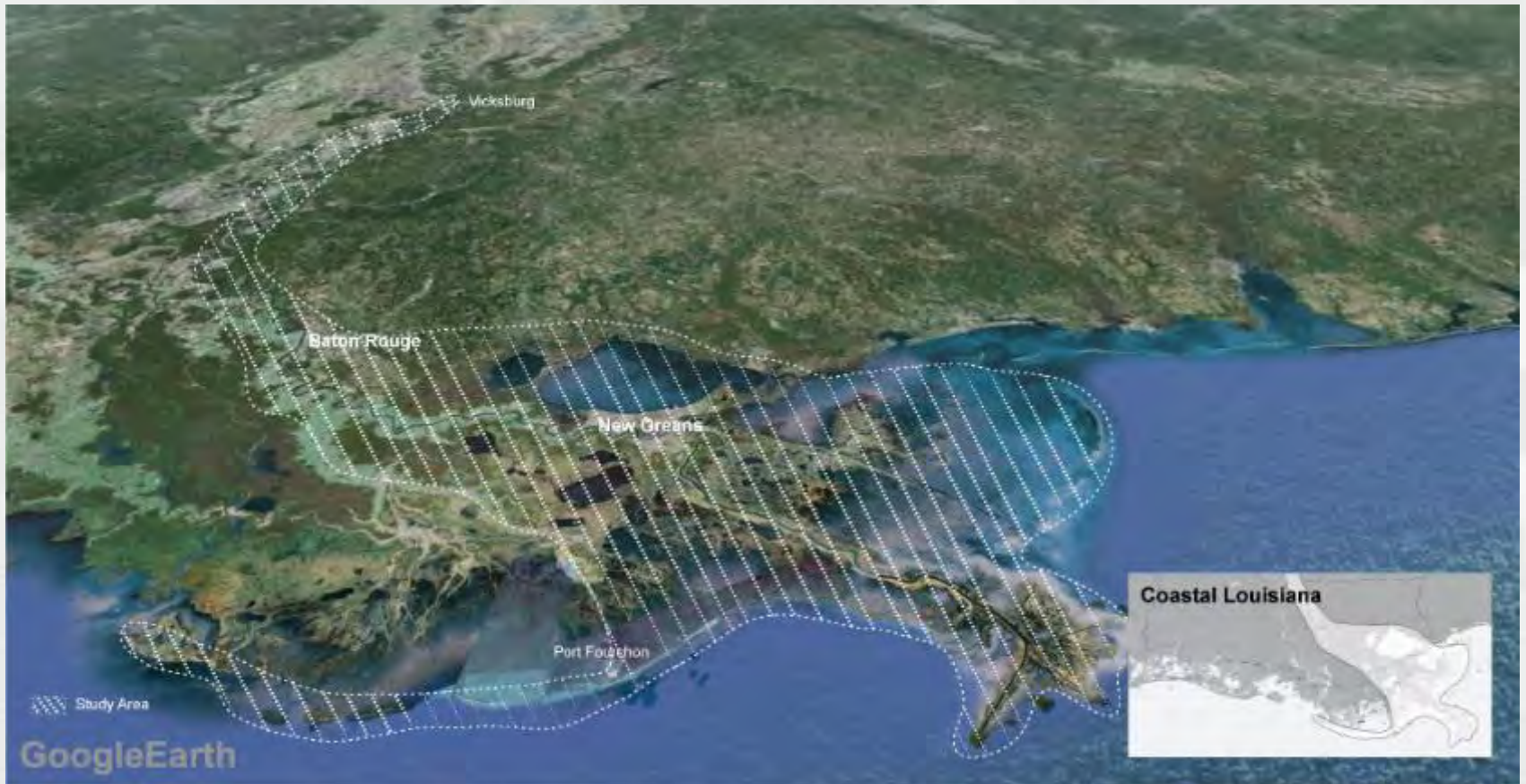
- [MRHDM Fact Sheet Oct 2012](#)
- [State of the Coast Conference Presentations](#)
- [MRHDM Scoping Meetings Presentation April 2012 FINAL](#)
- [MRHDM Study Area Map](#)

Upcoming Events

Project Calendar

- [Apr 10](#) LCA MRHDM Public Scoping Meeting - Baton Rouge
6:00 PM-8:00 PM
- [Apr 12](#) LCA MRHDM Public Scoping Meeting - New Orleans
6:00 PM-8:00 PM
- [Apr 17](#) LCA MRHDM Public Scoping Meeting - Larose
6:00 PM-8:00 PM
- [Apr 19](#) LCA MRHDM Public Scoping Meeting - Boothville-Venice
6:00 PM-8:00 PM

Questions?



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