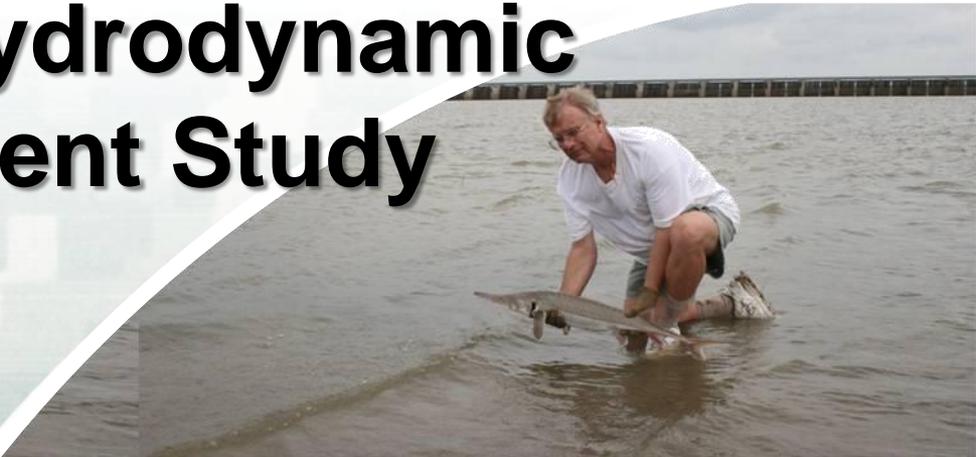# Louisiana Coastal Area Mississippi River Hydrodynamic and Delta Management Study (MRHDMS)

Carol Parsons Richards

Coastal Protection and Restoration Authority of Louisiana

US Army Corps of Engineers
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Background and Authorization

- The MRHDM study is comprised of two large-scale initiatives for the Mississippi River that were outlined in the 2004 Louisiana Coastal Area (LCA) report:
  - ► Mississippi River Hydrodynamic Study
  - ► Mississippi River Delta Management Study

- The study is authorized under Section 7003 of the Water Resources Development Act (WRDA) 2007 (Public Law 110-114).

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Project Area

LCA Mississippi River Hydrodynamic and Delta Management Study Goal

- Use Mississippi River resources (freshwater, sediment, nutrients) through natural deltaic processes to restore and sustain a healthy coastal ecosystem while maintaining a balanced river management approach.

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LCA MRHDMS Team

Over 30 Federal, State, Academic, and Private Scientists and Engineers

Biedenharn Group, LLC
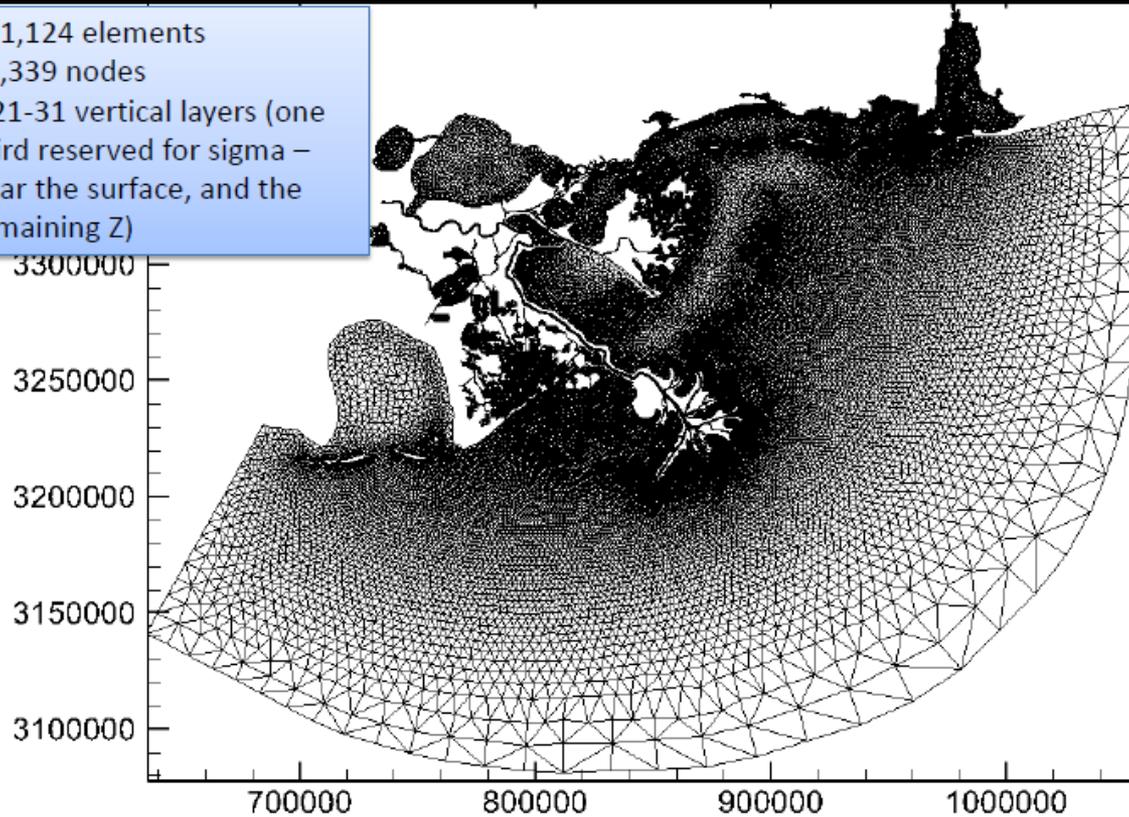
Hydrodynamic Study
State Study Manager: Carol Parsons Richards

Computational grid – for project

131,124 elements
73,339 nodes
* 21-31 vertical layers (one third reserved for sigma – near the surface, and the remaining Z)

Hydrodynamic Study Objectives

- Identify Mississippi River resource quantities and locations that can be effectively directed to support long term sustainable restoration in balance with multiple river and basin functions.

- Provide a decision making framework (e.g., models, etc.) and criteria for making programmatic management decisions of managing sediment and water for restoration.

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Hydrodynamic Study Tasks

- Geomorphic Assessment

- Data Collection, Analysis, and Management

- Development of One Dimensional (1D) Hydrodynamic Model of the Mississippi River

- Development of Multi-Dimensional Hydrodynamic Models

- Definition of Metrics for Assessing Model Predictive Skill

Most teams are co-led by a State and Federal representative

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Geomorphic Assessment

Purpose

- Integrate existing field surveys, gage data, sediment data, hydraulic data, hydrologic trends, and natural and anthropogenic changes to characterize process-form interactions of the river, identify control points and problem locations.
- Classify distinct reaches or areas with respect to morphology.

Status

- Draft report received June 2013, review in progress.

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Data Collection, Analysis, and Management

Purpose

- Collect bathymetry, bed morphology changes, bed load flux of sediment, sand sheet thickness, three-dimensional flow dynamics, water velocities, discharge, suspended load flux load, grain size distribution, salinity, temperature, turbidity, nutrient data.

- Data critical to development and refinement of one dimensional and multi-dimensional models.

Status

- Data collected in 2011 and 2012. Will continue in 2013.

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One-Dimensional Hydrodynamic Model

Purpose

- Evaluate long-term (years to decades) responses of Lower Mississippi River to operation of existing and proposed diversions.

- Estimates longitudinal (reach-scale) variations in sediment delivery, scour and deposition, and bed material gradation.

Status

- Future without project (FWOP) and first project production run completed. Draft FWOP report received June 2013. Review in progress.

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Multi-Dimensional Hydrodynamic Models

Purpose

- Develop multi-dimensional modeling tools: ADH-SedLib, Delft 3D, FVCOM, Flow 3D.

- Simulate hydrodynamic and transport processes and pathways that govern the behavior of the lower Mississippi River, including transport of salinity, temperature, and sediment.

Status

- FWOP analyses for all models scheduled in Summer 2013.

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Definition of Metrics for Assessing Model Predictive Skill

Purpose

- Develop metrics to assess predictive performance of numerical models.
- Ensure transparency in models performance evaluation.
- Provide objective, quantifiable measures for evaluating models performance.
- Provide uncertainty bounds on model results.

Status

- Metrics report completed March 2013.
- Metrics applied as runs completed.

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Hydrodynamic Study: Next Steps

- <u>Geomorphic analysis:</u>
  Final report Summer 2013
- <u>Data collection, analysis, and management:</u>
  Ongoing in 2013, data collection dependent on river conditions
- <u>1D hydrodynamic model:</u>
  Project production runs complete December 2013
- <u>Multi-dimensional hydrodynamic models:</u>
  FWOP & project production runs complete December 2013
- <u>Modeling Metrics:</u>
  Apply metrics to the models

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Delta Management Study
State Study Manager: Renee Bennett

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Delta Management Study Objectives

- Re-establish natural deltaic processes to restore maximum number of acres of wetlands and sustain habitats in the long term.

- Maintain dynamic diversity of the coastal wetland ecosystem delta-wide over time.

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Delta Management Study Tasks

- Compilation of Existing Information
- Document Existing Conditions
- Forecast Future Conditions
- Utilize Models Developed Under Hydrodynamic Study to Document Future Conditions
- Develop Ecological Models to Document Impacts to Biological Resources
- Complete NEPA Documentation
- Public Outreach/Stakeholder Engagement

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Delta Management: Next Steps

Waiver to USACE Smart Planning (3x3x3) has recently been granted.

- Renegotiate the PMP, develop measures and an initial array of alternatives.

- Finalize tools to be used to screen alternatives and for documentation of impacts.

- Increase public outreach activities.

- Chief's Report expected in 3.5 years, completion anticipated Summer/Fall 2016.

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Questions?
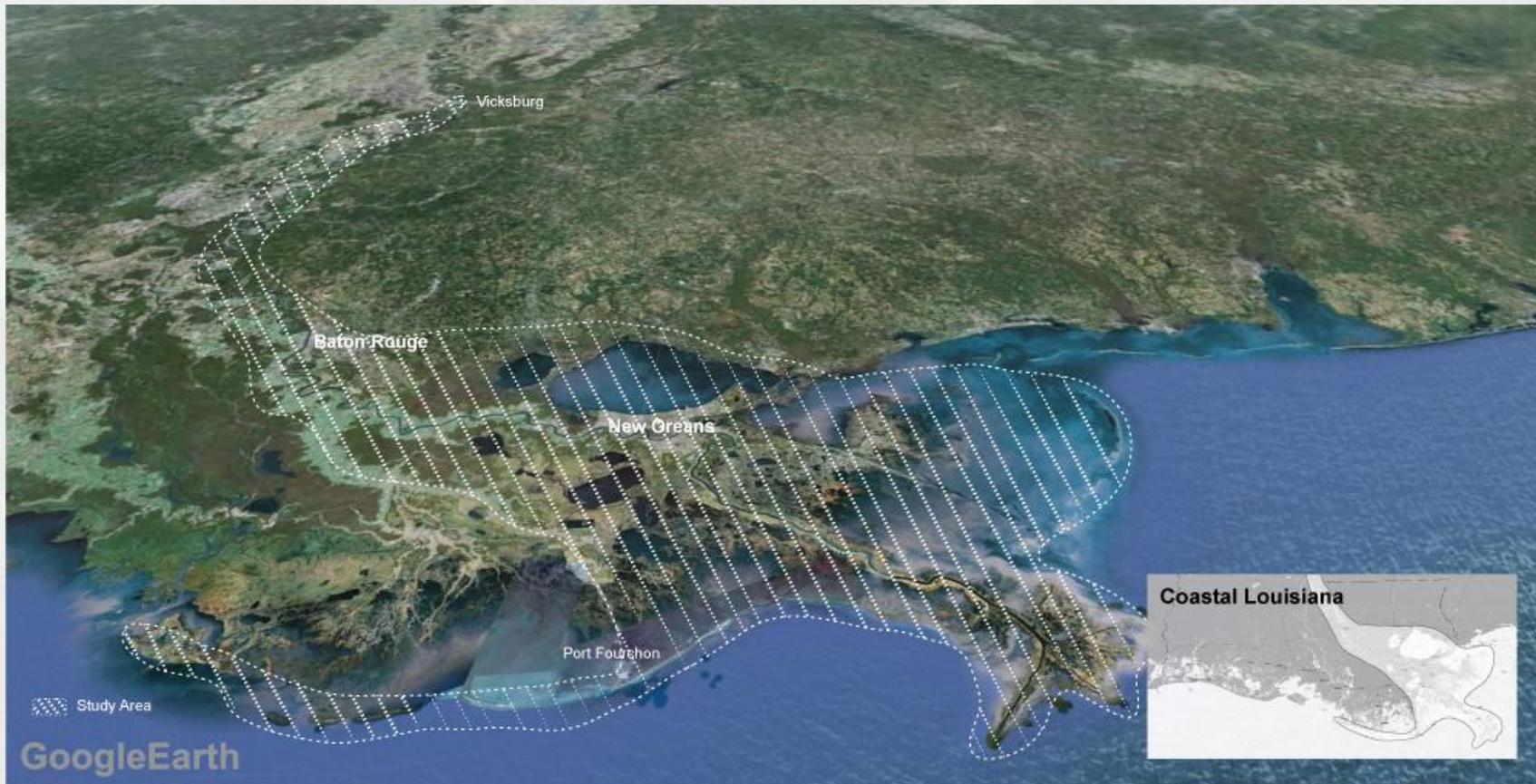
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