Determination of Daily Sediment, Nutrient, and Sediment-Associated Chemical Concentrations and Loads for the Conterminous U.S. Piloted in the Mississippi River Basin

John R. Gray (USGS) & Chuck E. Shadie (COE)

Follow-up to the July 27 & Oct. 6, 2009, & Feb. 2, 2010 USGS-COE Quarterly Meetings

COE Institute of Water Resources

Alexandria, VA

May 24, 2010

VISION: A NATIONAL Sediment & QW Monitoring Program Cost/Benefits

- ~$75-$90M annually, 400-450 stations (Jan. 2010)
- Based on National Monitoring Network Design (ACWI)
- National Program cost <1% of estimated costs/sediment damages annually
- Mississippi River Basin Pilot about $16M/year (1/2010)
- Formal proposal submitted to COE and USGS, Feb. 2, 2010:

ftp://ftpext.usgs.gov/pub/er/va/reston/jrgray/mrb_proposal/

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National Sediment & QW Monitoring Program

- Idea proposal June 2009
- Coordination Meetings with EPA, NOAA, USDA, COE, USGS, Sept. and Nov., 2009
- Presentations at USGS-COE Quarterly Mtgs July, Oct., Feb.
- Feb. 2 Quarterly Meeting: "COE and USGS Management Will Discuss the Proposed Program"
- April 30: Proposed 2012 USGS Initiative submitted, "Large Rivers – Connection of our Land to the Sea"

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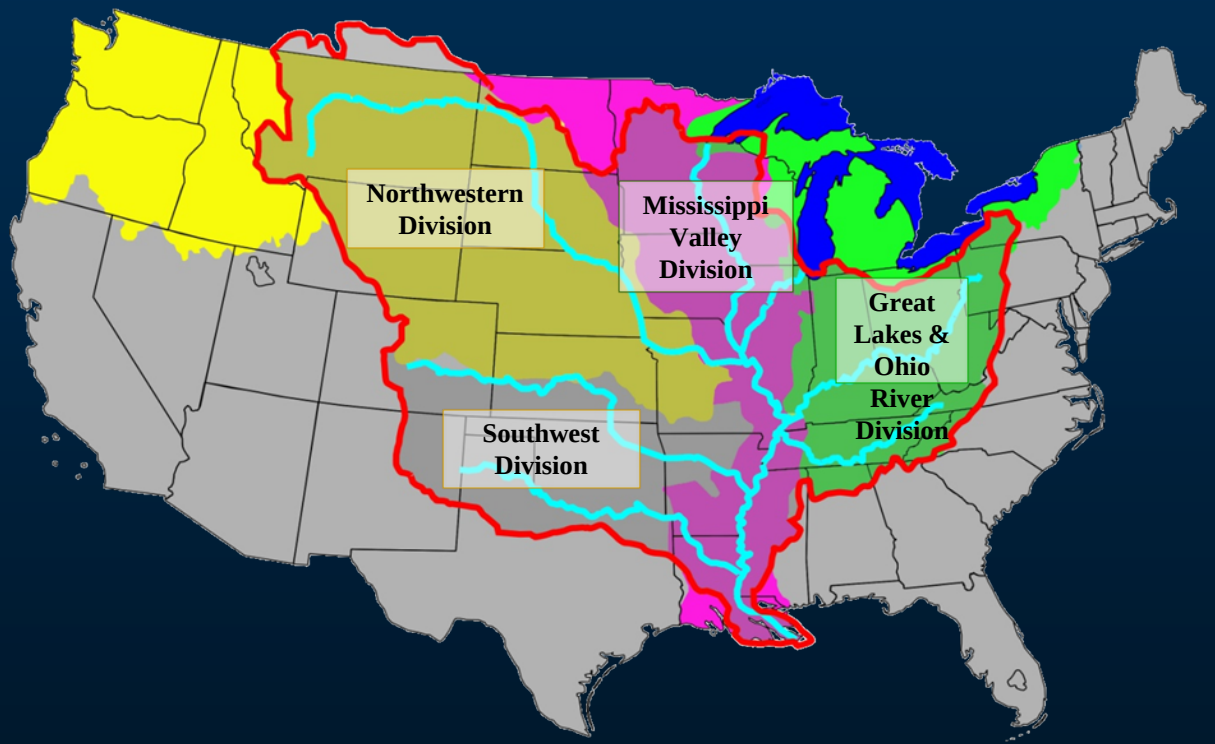
USGS/COE Proposal for a Long-Term National Monitoring Program initiated as a Mississippi River Basin Pilot Program



A Proposal to Establish a Long-Term, Base-Funded, Network-Design National Monitoring Network to Generate Sediment, Nutrient, and Sediment-Associated Chemical Concentrations, Loads, Budgets and Temporal Trends

Integrated with existing networks.

U.S. Department of the Interior
U.S. Geological Survey
USGS

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MRB Pilot Program -- Scope

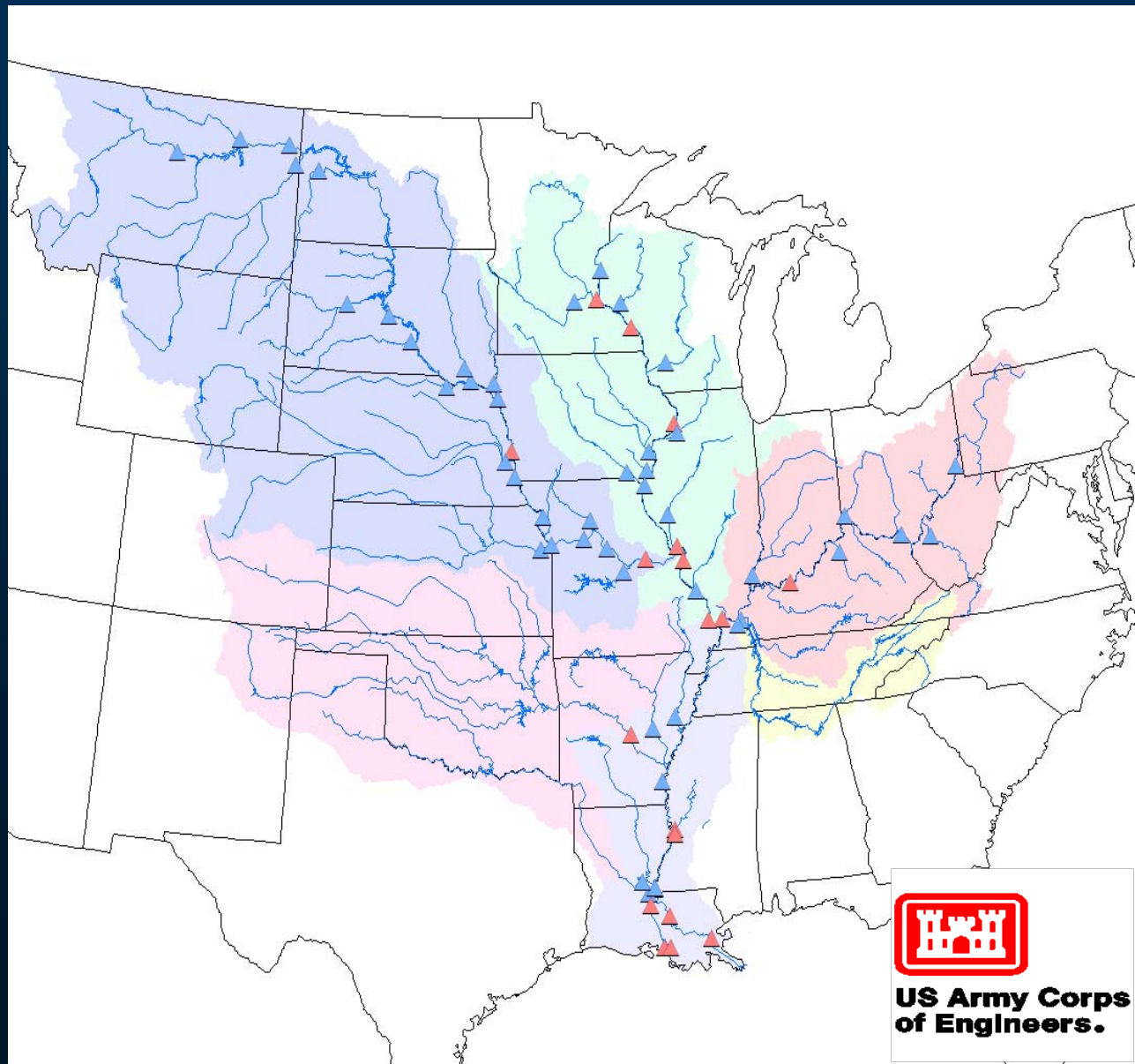
- **68 stations**
  - 20 priority 1
  - 48 priority 2
  - Max use of USGS gages & programs

Priority 1:

Large-scale processes

Priority 2:

Watershed proc./issues



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MRB Pilot Program – Potential Partners

- EPA, NOAA, USDA-NRCS – and COE – have submitted statements of support to the USGS for a 2012 MRB "Large Rivers – Connecting Our Land to the Sea" initiative.
- Substantial interest from other agencies and organizations.
- 31 MRB States have vested interests.
- $6.25M Mississippi River Basin Healthy Watersheds Initiative – Senate vote?

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WHAT ARE THE DATA NEEDED FOR?
National Sediment & QW Issues

- Sediment Damages in North America (mostly in US) total $20-$50 BILLION annually (ARS-USGS)
- As much as 25 mi^2 Louisiana Coast lost annually
- Northern Gulf of Mexico Hypoxia
- COE dredging programs in MRB alone total ~$1Billion annually
- EPA, NOAA, USDA, others have major investments in MRB

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WHAT ARE THE DATA NEEDED FOR?
Specific COE Management Benefits

- **Understanding the "Systems" we are Seeking to Manage, Change or Impact**
- **Better definition of "Systems" Functions and Needs**
- **Improving How we conduct Planning, Design, Construction, and Operation & Maintenance of a Wide Range of Water Resources Projects**

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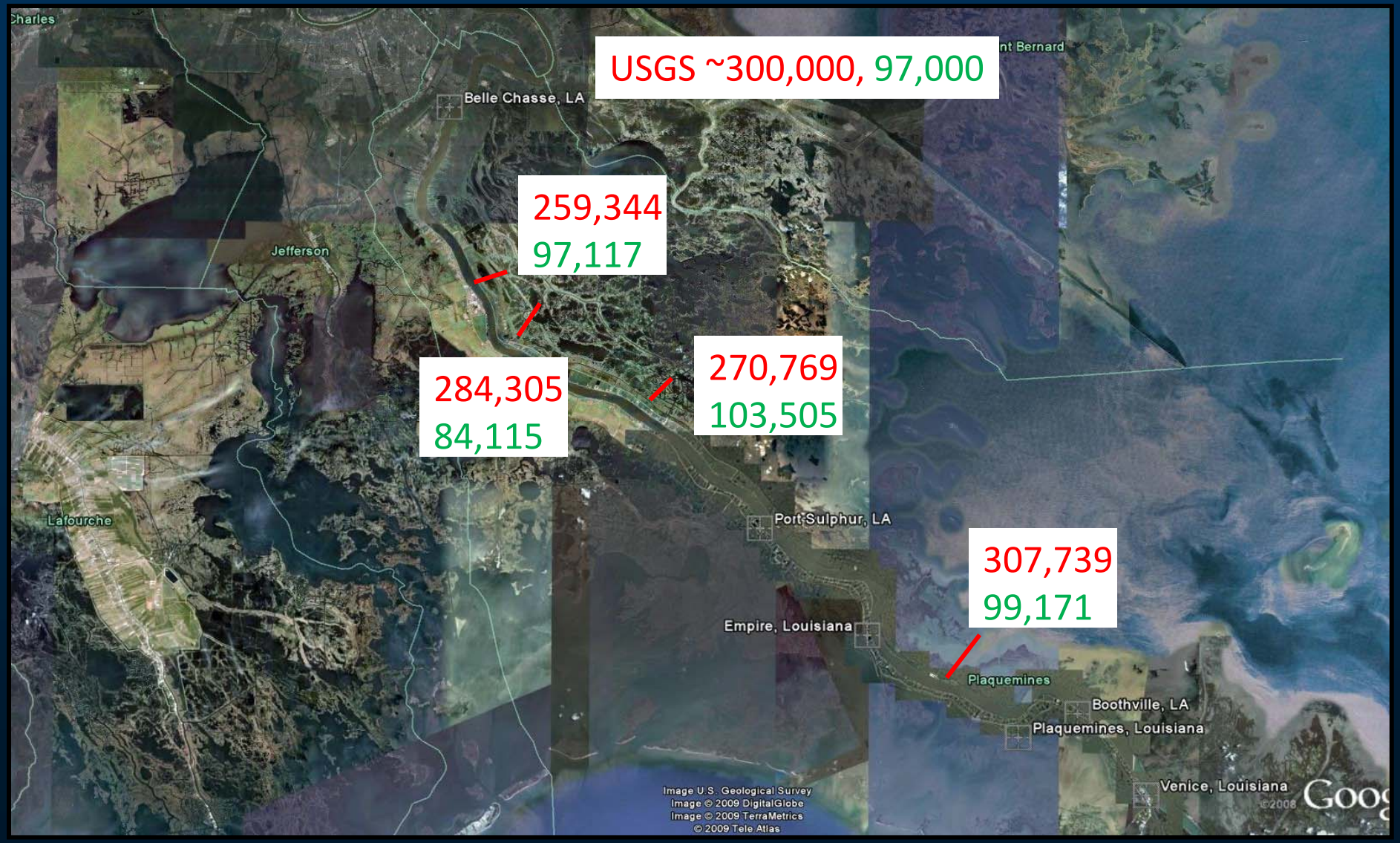
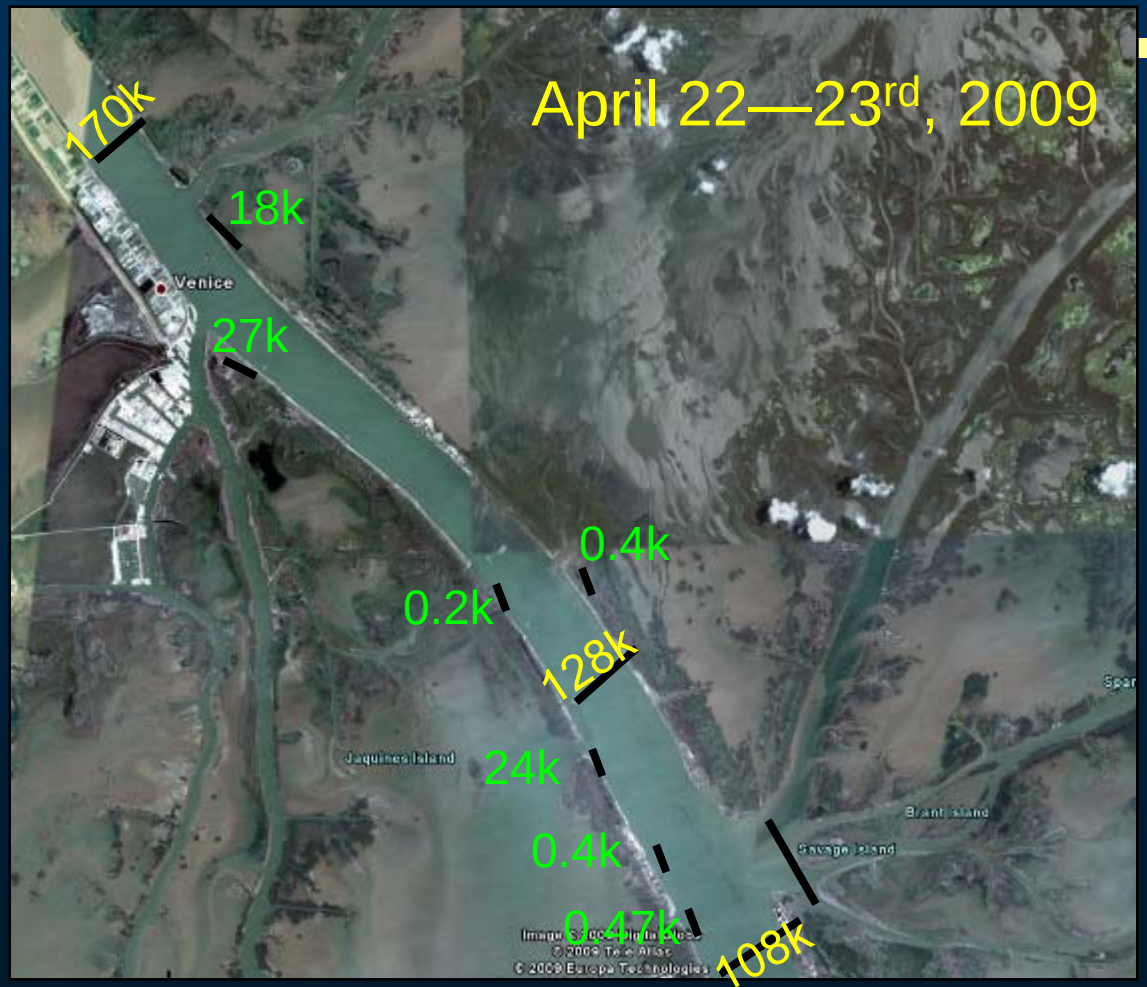
APRIL 2009 SUSPENDED LOADS (metric tons/day, mud & sand)



From E. Meselhe, ULL and M. Allison, UT

Data from ERDC, 2009

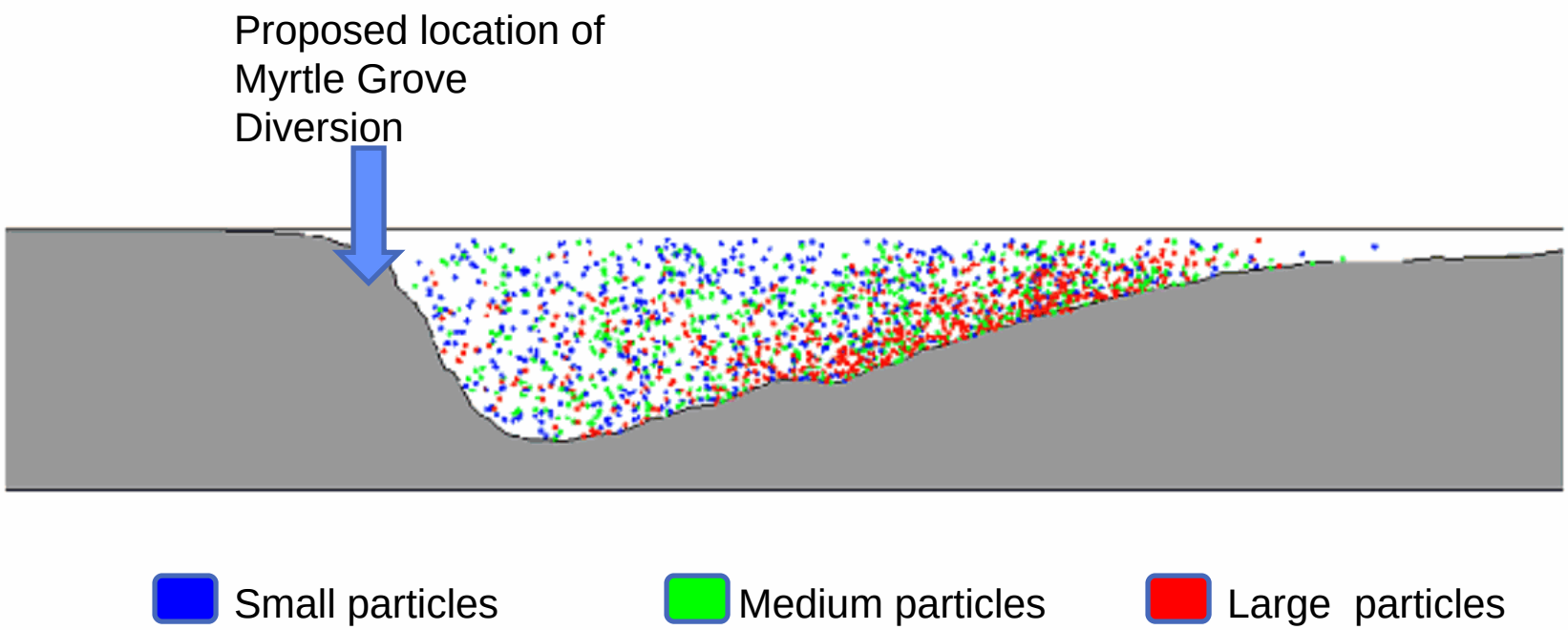
Sediment Flux Measurements



Data from ERDC, 2009

- **Field data efforts have shown that as much as 45% of the discharge of the river at RM 12 and a roughly equivalent amount of suspended sediment is captured by Grand Pass, Baptiste Collete, West Bay, Cubit's Gap and other small cuts is lost from the river before Head of Passes. The figure shows sediment flux and a decrease from 170K tons/day above Venice to 108K tons/day south of Cubit's Gap.**

Particle Sizes in Suspension in X-Section near Myrtle Grove, LA



From E. Meselhe, ULL and M. Allison, UT

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Other Science Questions

- **GULF & COASTAL SEDIMENT ISSUES**
  - How accurate are current models for sediment movement and hypoxia formation in the Gulf of Mexico?
  - How much sediment/sand is and has been available for wetlands on the Gulf Coast?
  - Does sand dredging measurably effect sediment/sand loads?
  - What are the likely geomorphic and sedimentary effects of the COEs planned diversions in the lower MRB and will they be effective in addressing coastal restoration?
  - What are the errors in our sediment load estimates?
  - What errors are associated with the various hypoxia models and what is the ideal temporal resolution for sediment/nutrient data relative to those model outputs.

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Other Science Questions

- **CHANNEL SEDIMENT CAPACITIES & CONVEYANCE**
  - What are the long-term trends in sediment/sand loads and concentrations?
  - Are soil conservation efforts in the U.S successful in decreasing sediment concentrations and loads in large rivers? If so, is this uniformly “good”?
  - How do sediment-associated chemical constituents affect water quality in the MRB?
  - What effects on sediment/sand concentrations and loads can be expected from global warming?

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Other Science Questions

CHANNEL SEDIMENT CAPACITIES & CONVEYANCE (cont)

- Can aggrading and degrading reaches be explained or predicted with daily sediment/sand budgets?
- How far downstream do floods move sediment in a flood, or, how long does it take for sediment/sand to move from South Dakota to the Gulf?
- Where is the sediment/sand coming from? What the dominant sources and can they be expected to remain unchanged?

RESERVOIRS

- What are the cumulative effects of impoundments on sediment, turbidity, and sediment/sand loads in large rivers?
- At what rates are reservoirs losing capacity?

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Summary

- MRB Pilot Program, 2012++, ~16M/year until subsumed by ~$75-$90M/yr National Program.
- Submitted as a 2012 USGS Initiative
- Will contribute to knowledge on a wide range of sediment & QW issues
- Provide technically supportable basis for modeling and management.
- Provide improved information for decision-makers on various projects in the MRB.

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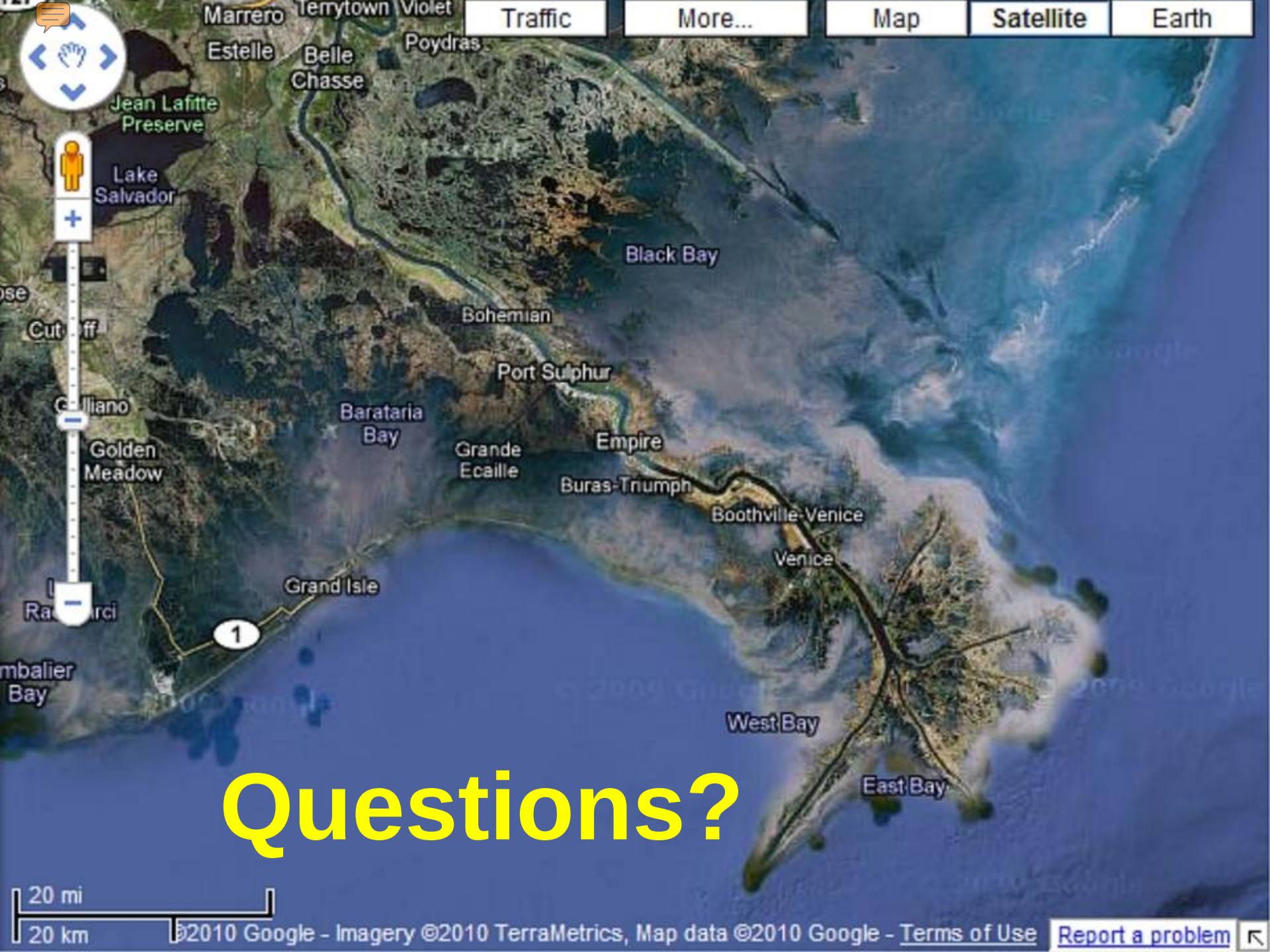
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Baratania Bay
Grande Ecaille
Empire
Buras-Triumph
Boothville-Venice
Venice
Golden Meadow
Grand Isle
West Bay
East Bay
Questions?
20 mi
20 km
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