## 1-D Modeling

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**Team Participants:** USACE New Orleans District, USACE Engineer Research and Development Center, USACE Hydrologic Engineering Center, BCG Engineering, Coastal Protection and Restoration Authority of Louisiana

**Purpose:**

- Evaluate long-term (years to decades) responses of the Lower Mississippi River (LMR) to the operation of existing and proposed diversions.
- Estimate reach-scale variations in sediment delivery, scour and deposition, and bed material gradation along the LMR over the project life of proposed diversions.

**Objectives:**

- Adapt existing LMR HEC-6T quasi-unsteady flow model to conduct a 50-year simulation of the Future Without Project conditions and to evaluate sedimentation processes and system response to diversions.
- Develop HEC-RAS unsteady flow model and evaluate response of sedimentation processes to unsteady flow computations. .
- Extend model domain to Vicksburg, allowing incorporation of the Old River Control structures into the study area.
- Document insights into system behavior gained from model simulations.
- Analysis will focus on:
  - Annual water, clay, silt, and sand yield to each diversion site
  - Stage-duration curve for the river at diversion sites
  - Dredging volume at sites along the deep draft navigation channel
  - Specific gage analysis at critical locations along the river channel
  - Insights into sediment budget and geomorphic adjustments for the LMR

**Challenges:**

- Wide range of temporal and spatial scales of relevant physical processes
- Complex water-sediment dynamics in the LMR

**Study Status:**

- Future Without Project and several diversion scenarios are completed. The 1-D team will conduct additional model runs and results analysis through the end of 2013.
- The modeling team is working on using field data from the data collection team and insights from the geomorphic assessment and multi-D models to improve input assumptions.
- Developing HEC-RAS model and integrating 1-D and multi-D models

Anyone seeking additional information on the MRHDM Study can visit the LCA program website at ***www.lca.gov***, the New Orleans District LCA website at ***www.mvn.usace.army.mil/Missions/Environmental/LouisianaCoastalArea.aspx***, or the CPRA website at ***http://coastal.louisiana.gov***.

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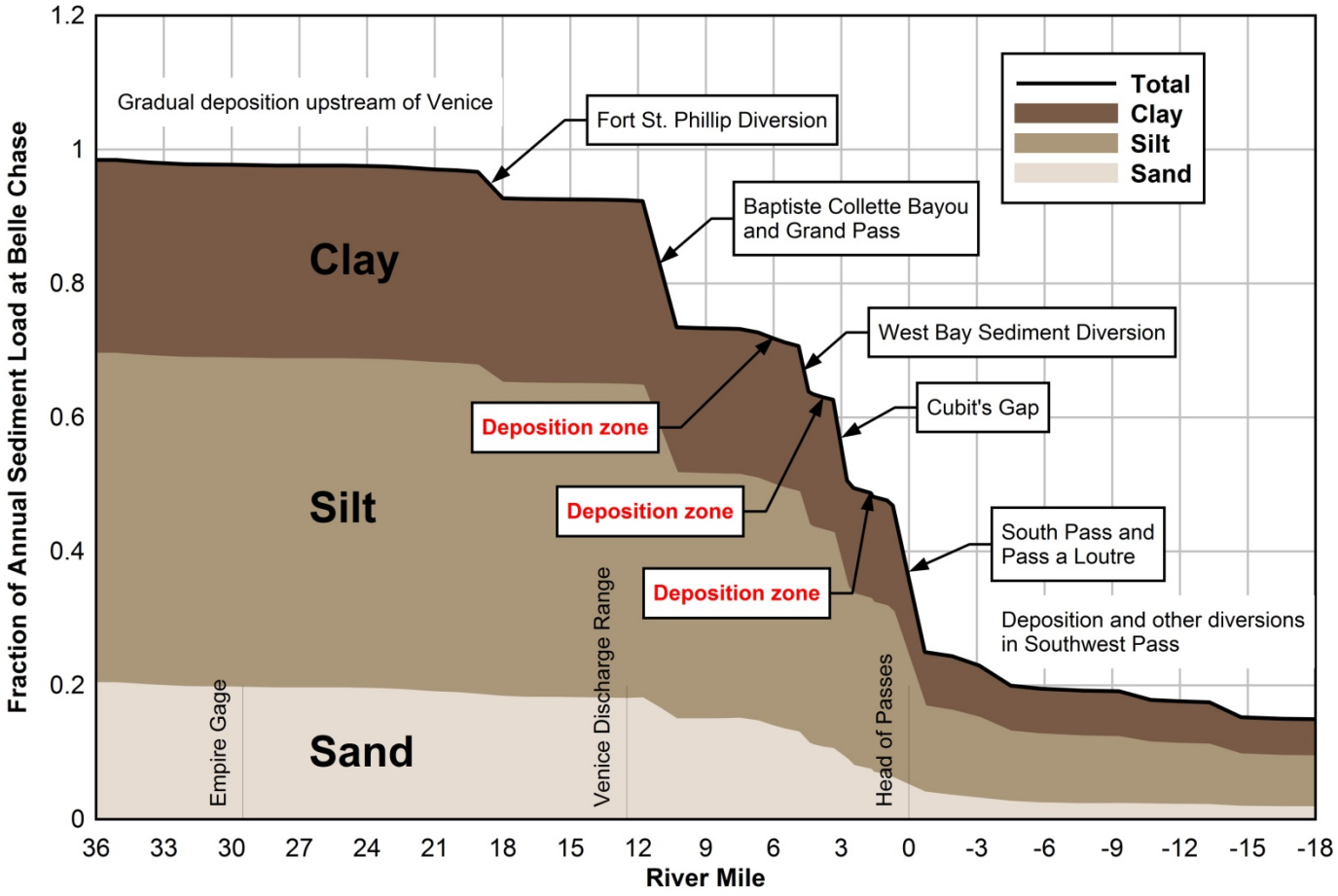


Variation of computed sediment loads by sediment type from a long-term, one-dimensional model (HEC-6T) simulation of the Lower Mississippi River is described by this graph. To ease comparison of multiple simulations, the computed loads were converted to mean annual values and normalized to the sediment load at Belle Chase, LA. Annual sediment loads vary greatly from year to year.

The relatively large decreases in sediment load correspond to existing diversions of water and sediment, e.g., West Bay Sediment Diversion. Approximately half of the water and sediment passing the Venice Discharge Range, RM 12.5, is diverted from the river by existing diversions upstream of Pass a Loutre. While the clay load responds primarily to the volume of water being diverted, the quantities of sand diverted are more variable and depend on the hydraulic characteristics and geometry of individual diversions.

The smaller, gradual declines in sediment load represent sediment being deposited in the river channel with steeper declines corresponding to greater long-term deposition rates. While most of this portion of the river is depositional, Southwest Pass and the reach downstream of Cubit's Gap experienced the largest deposition rates and require frequent dredging to maintain navigation.