Mississippi River
West Bay Diversion
Geomorphic Assessment and
1-D Modeling Plan

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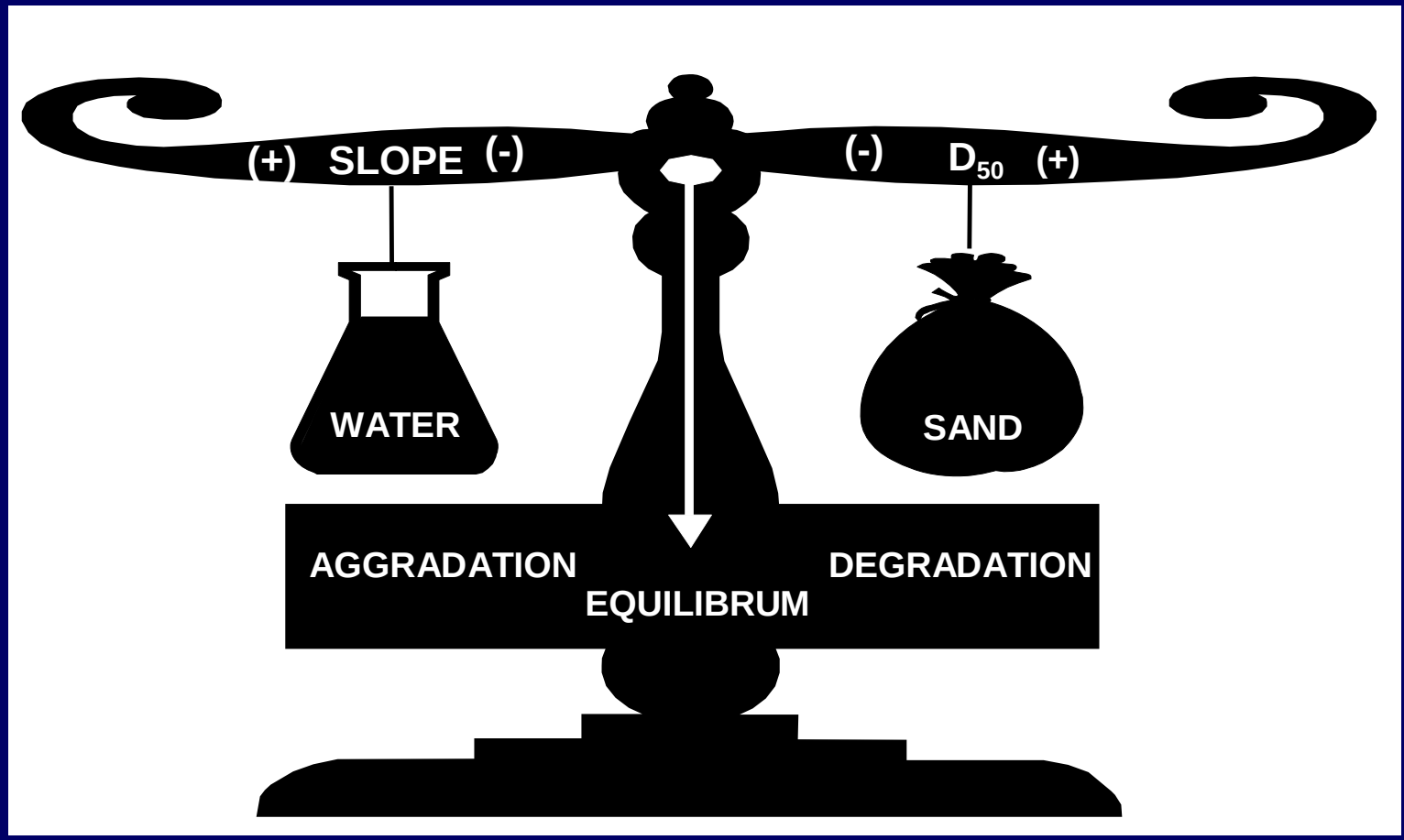
Lane's Relationship

$$Q \bullet S \sim Q_s \bullet d_{50}$$

where: Q = water discharge
S = channel gradient
Q_s = bed material load
d_{50} = median size of bed material

Lane's Balance



Geomorphic Assessment

Provides the process-based framework to define past and present watershed dynamics, develop integrated solutions, and assess the consequences of remedial actions on channel stability.

Geomorphic Assessment Need

To determine if observed shoaling trends in the Pilottown Anchorage are within the influence of the large-scale, long-term morphological changes occurring within the study reach or a specific result of the impact of West Bay Diversion.

Geomorphic Assessment Objectives

1. Utilize Available Data to Document the Historic Trends and Changes In Hydrology, Hydraulics, Sedimentation, and Channel Geometry for the Lower Mississippi River

2. Summarize the Local Changes Observed at the Pilottown Anchorage Since Opening of West Bay

3. Evaluate Changes at Pilottown Anchorage with Regard to Historic Trends

Geomorphic Assessment Plan

Spatial Limits

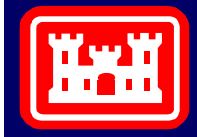
Belle Chasse (RM 75) to Head of Passes (RM 0)

Temporal Limits

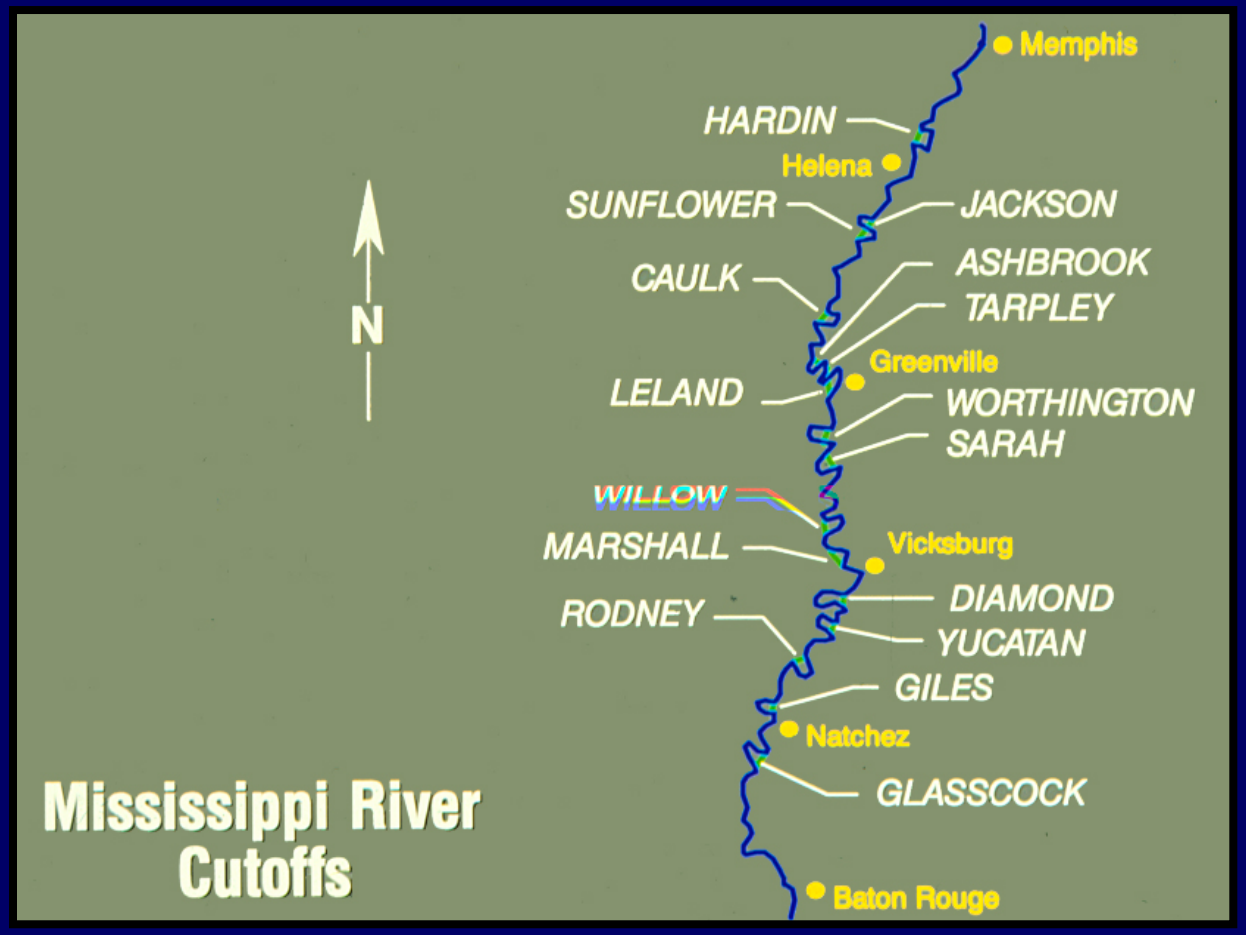
1960 to Present

Geomorphic Assessment Tasks

- Data Compilation
- Geometric Data Analysis
- Gage and Discharge Data Analysis
- Dredge Records
- Sediment Data Analysis
- Events Timeline Analysis
- Integration of Results



Geomorphic Assessment
Impact Of Cutoffs



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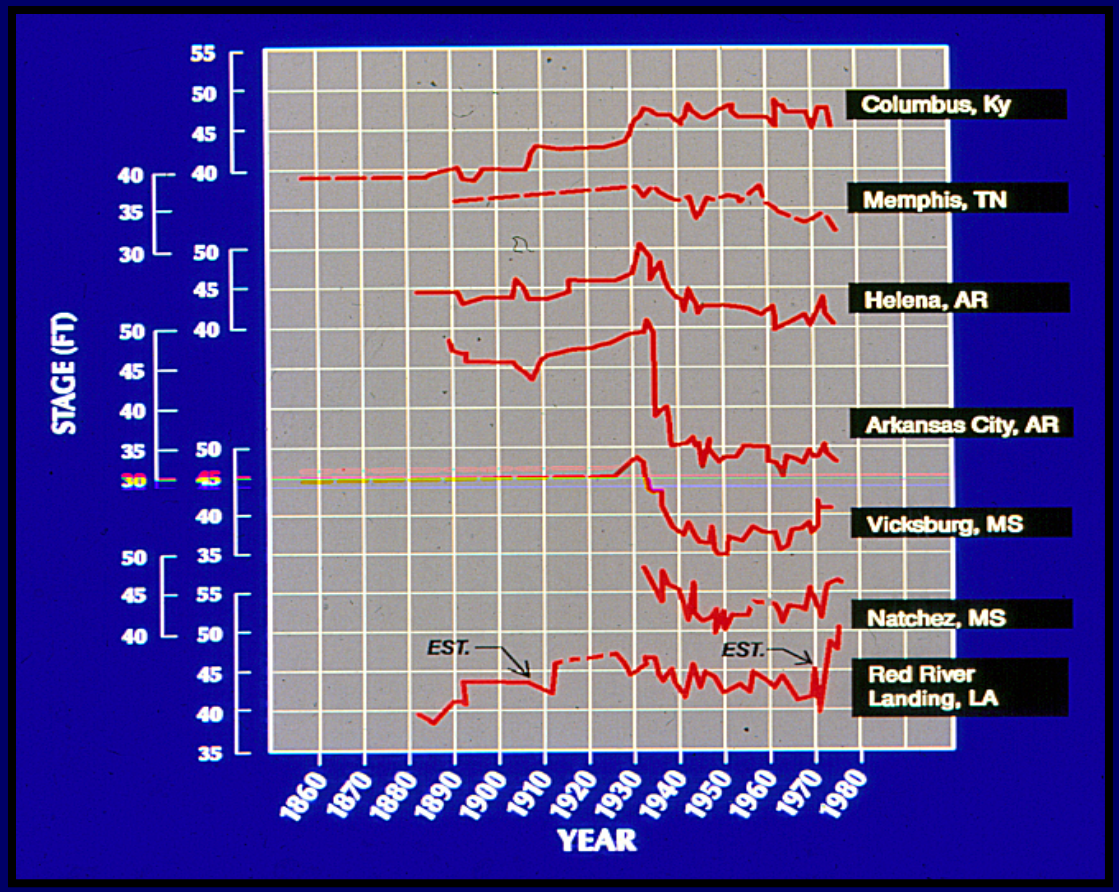
Geomorphic Assessment
Specific Gage Analysis



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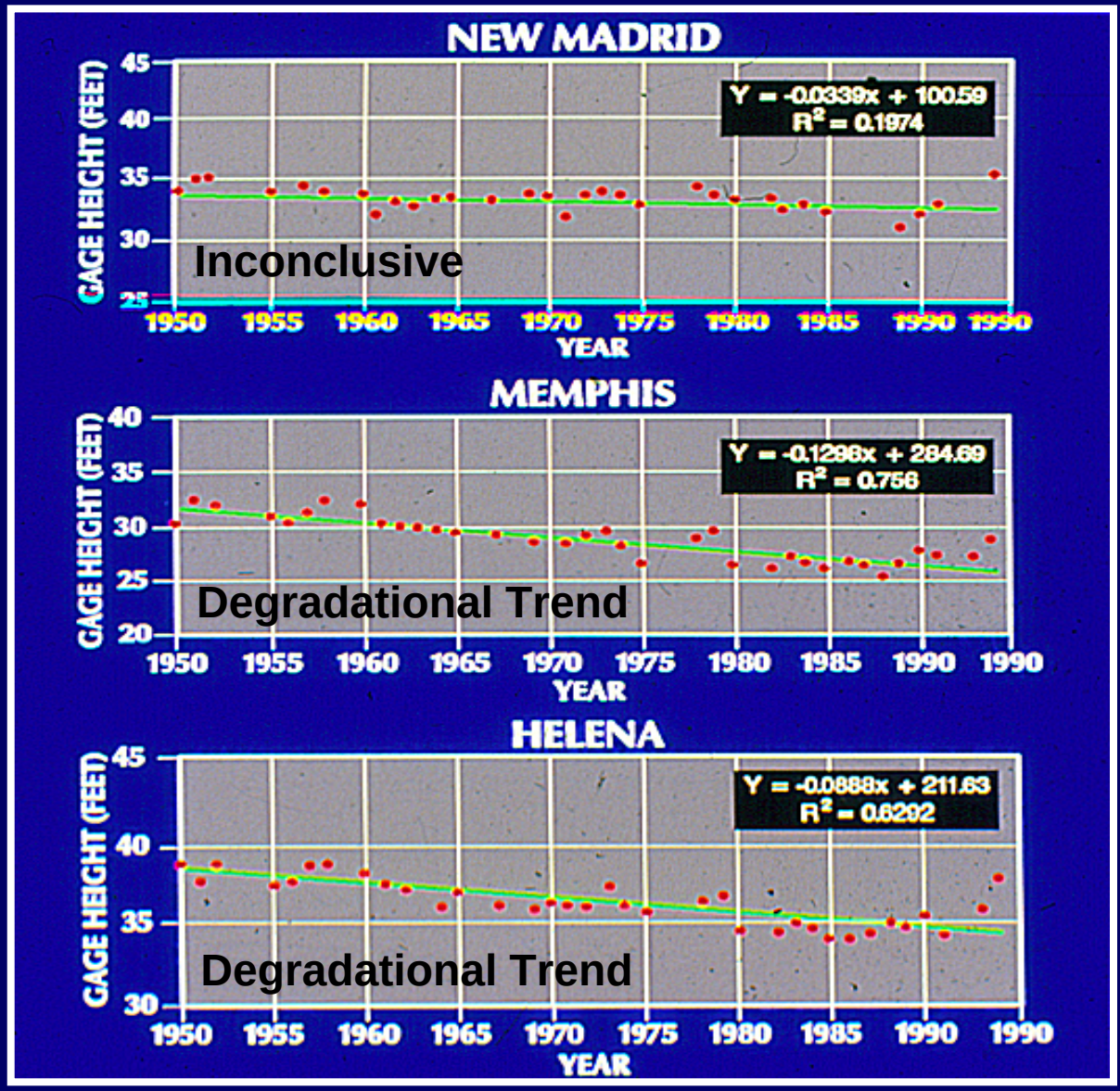
Geomorphic Assessment Specific Gage Analysis



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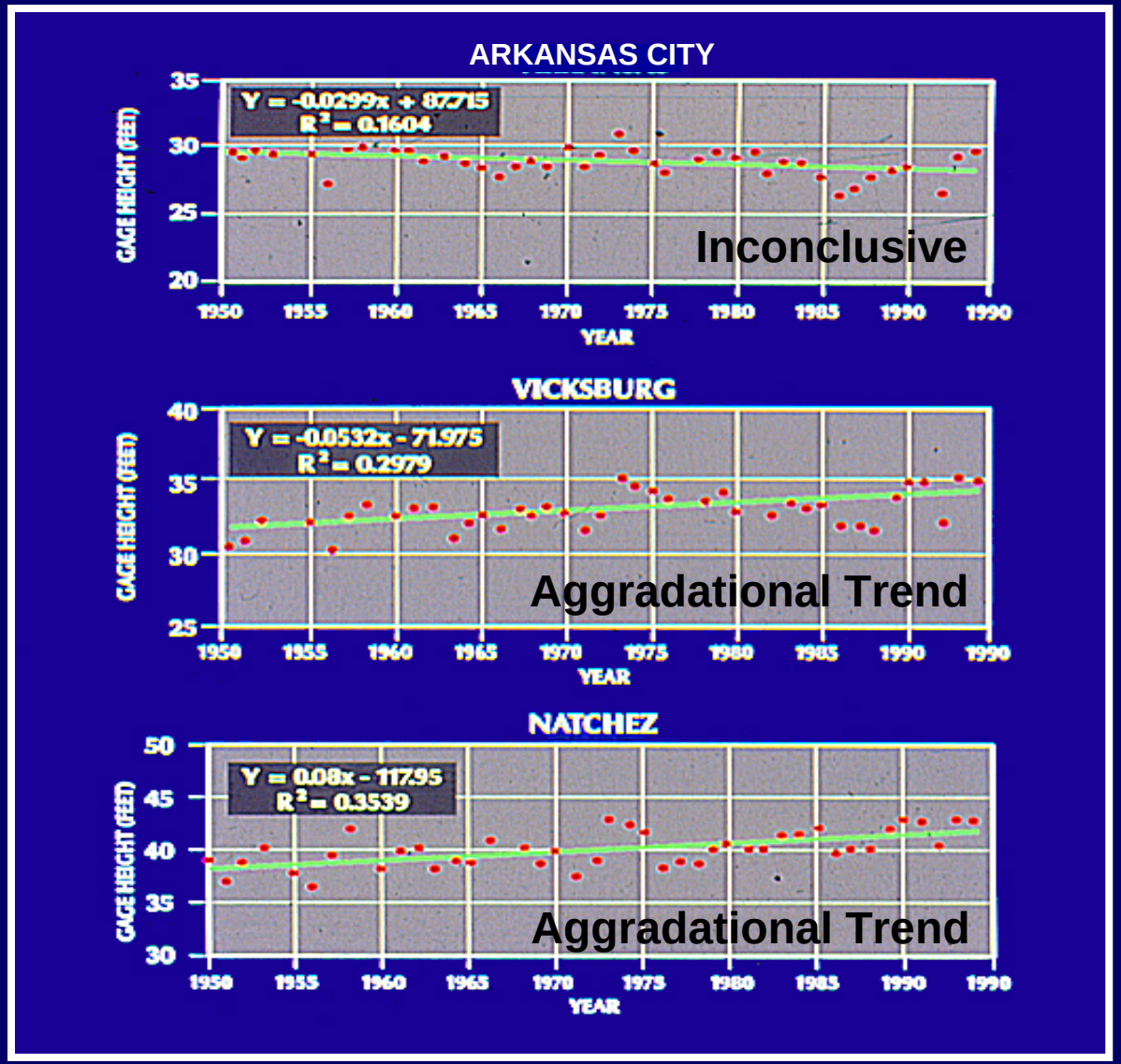
Geomorphic Assessment Specific Gage Analysis



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Geomorphic Assessment Provides

- Status of Current River Water and Sediment Resources
- Characteristics of Sediment Transport in the Lower River
- Historic Sedimentation Trends and Future Projections
- Establishment of Baseline Conditions Critical To Hydrodynamic and Sediment Routing Modeling Efforts
- Formulation of a Conceptual Model to Assess Cause and Effect Within the River in Response to the West Bay Diversion

HEC-6T 1-Dimensional Model

Moveable boundary open channel flow model designed to estimate long term response of the channel (scour and deposition) to a predicted series of water and sediment supply.

1-Dimensional Model
Need

Previous 1-D modeling efforts have lacked measured sediment concentrations that exit the river through diversions. Sensitivity level analyses have been conducted. Measured sediment data at the diversion will greatly improve the models capability to accurately predict sediment aggradation / degradation trends downstream.

Previous 1-Dimensional Modeling

Effect Of Constant 10 Percent Water Diversion At RM 6.7 On Dredging and Sediment Deposition In Southwest Pass

Sand Concentration in Diversion as Percent of River Concentration	Increase in Mean Annual Dredging*		Increase in Mean Annual Dredging and Deposition*	
	$yd^3 \times 10^6$	Percent	$yd^3 \times 10^6$	Percent
100	0.44	8.1	0.76	13.0
50	0.65	12.0	1.01	17.2
0	0.87	16.0	1.26	21.5

* Based on 1975–82 hydrograph repeated four times for 32-year period of record.

Technical Report HL-92-6, Lower Mississippi River Tarbert Landing To East Jetty Sedimentation Study, Copeland and Thomas, June 1992

Previous 1-Dimensional Modeling

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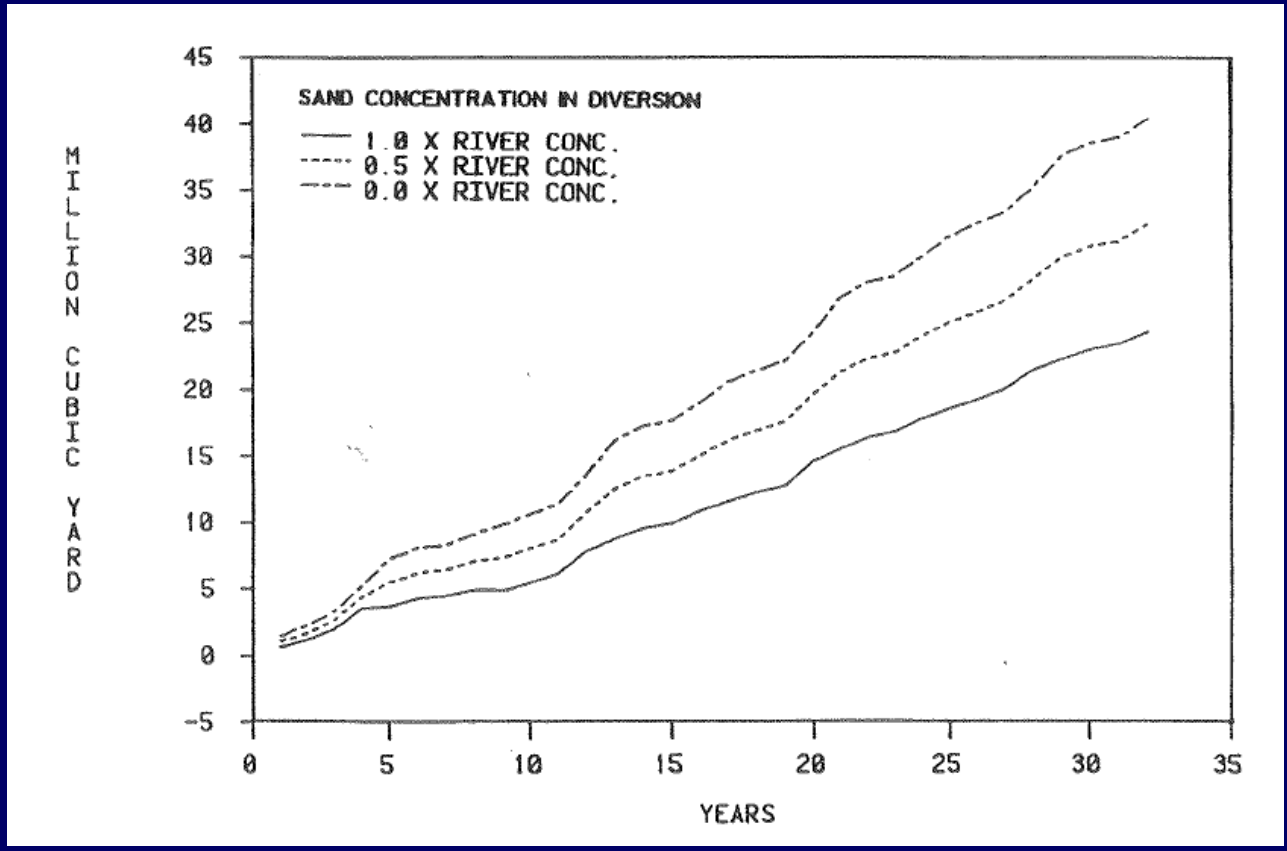

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HEC-6T 1-Dimensional Modeling

Advantages

1. Allows for long term simulations
2. Includes a dredging option

Disadvantages

1. Uses 1-D to simulate 3-D processes
2. Uniform erosion / deposition across the channel section
3. Sediment concentrations for diversions are a user input

HEC-6T Model Input Requirements

- Channel Geometry
- Mainstem Flow Data
- Mainstem Sediment Data
- Diversion Flow Data
- Diversion Sediment Data

HEC-6T Model Calibration

- Water Surface Profiles calibrated to know flow events.
- Bed Changes calibrated to more recent channel surveys

HEC-6T Model Spatial Limits

- Regional Model from Vicksburg, MS to East Jetty
- Utilize Belle Chasse to Head of Passes reach

HEC-6T Model Simulations

- Add Major Distributaries
- 50 Year Simulation Based on a Selected “Typical Hydrograph”
- Without West Bay Diversion
- With West Bay Diversion
- Utilize Dredge Option

1-Dimensional Modeling Provides

- More Detailed Prediction of Potential Long Term Channel Morphological Changes, Comparing Those for the With and Without West Bay Diversion
- Estimates of Potential Dredge Locations and Volumes, Comparing Those for the With and Without West Bay Diversion
- Boundary Conditions for Multi-Dimensional Modeling

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Questions / Comments?