

Mississippi River Water Quality and the Clean Water Act: Progress, Challenges, and Opportunities

**National Research Council
Water Science and Technology Board**

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Sponsor

McKnight Foundation
Minneapolis, Minnesota

10-state Mississippi River Corridor



Statement of Task

1) *Mississippi River Corridor Water Quality Problems*

Identify key water quality problems through 10-state MR system and northern Gulf of Mexico.

2) *Data Needs and System Monitoring*

Identify and discuss key water quality data needs with regard to CWA reporting requirements.

Statement of Task

3) Water Quality Indicators and Standards

Identify and discuss key challenges associated with establishing water quality indicators and standards in the 10 MR states.

Statement of Task

4) Policies and Implementation

Identify and discuss challenges in administering CWA authorities and programs

How could collaborative efforts within federal agencies, between federal agencies, and between the 10 MR states, be strengthened to enhance implementation of CWA provisions?

Statement of Task

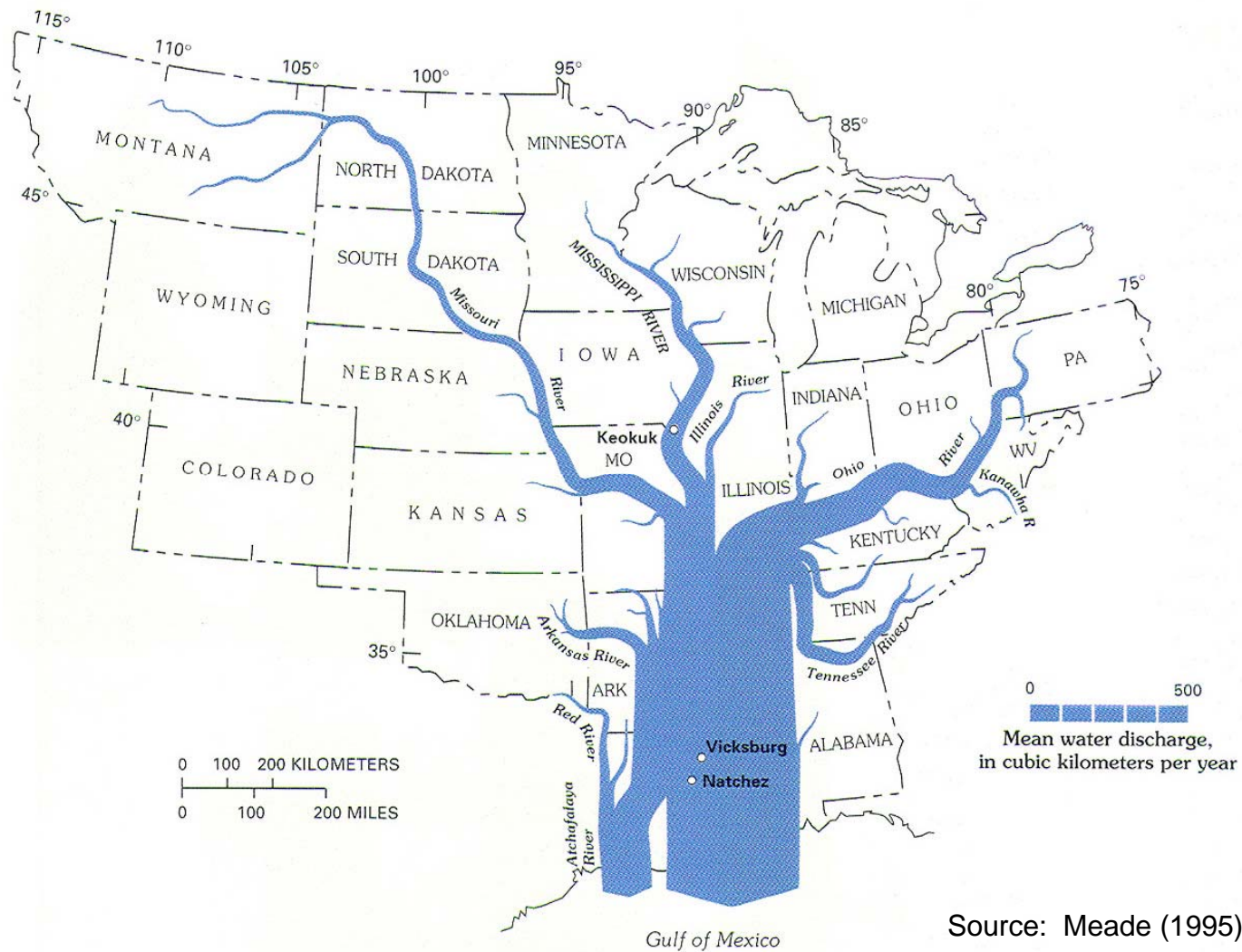
Note:

- Committee was not charged to consider possible changes in CWA
- Committee discussed and decided to work within framework of existing CWA

Chapter 2 - Characteristics of the Mississippi River System

- Basin covers nearly 50% of continental US
- Extensive modification of the basin (land cover and land use) and of the river over past 200 years
- Construction of river control structures (levees, dams) and wetland loss influence water discharge and quality
- UMR is much smaller river than LMR, different recreational and commercial value.

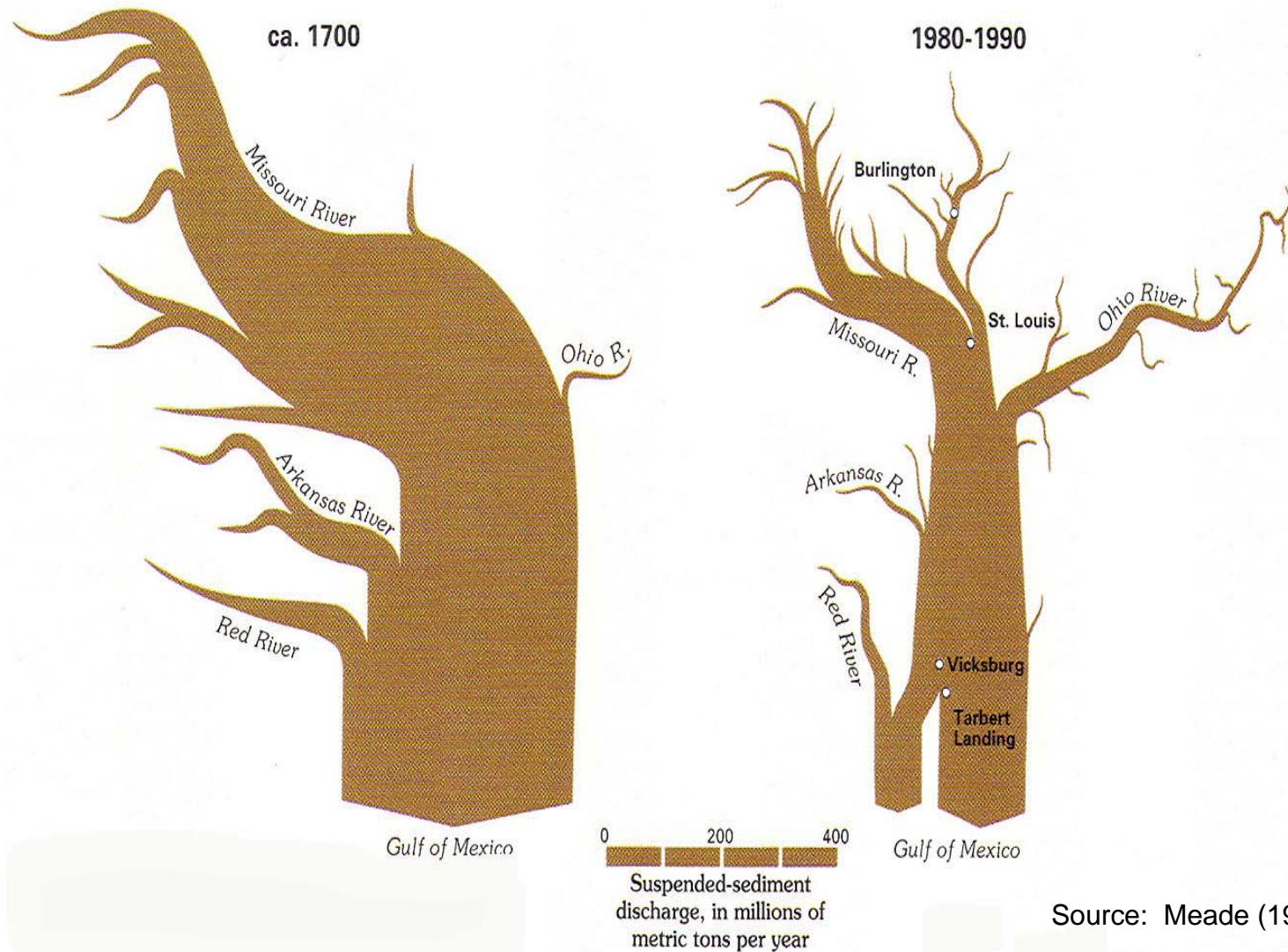
Avg Water Discharge (km³/yr)



Historic Modifications

- UMR: locks, dams, and navigation pools
- LMR: large levees
- Entire river: draining of wetlands
- One impact – Levels of sediment transported by the MR have changed greatly

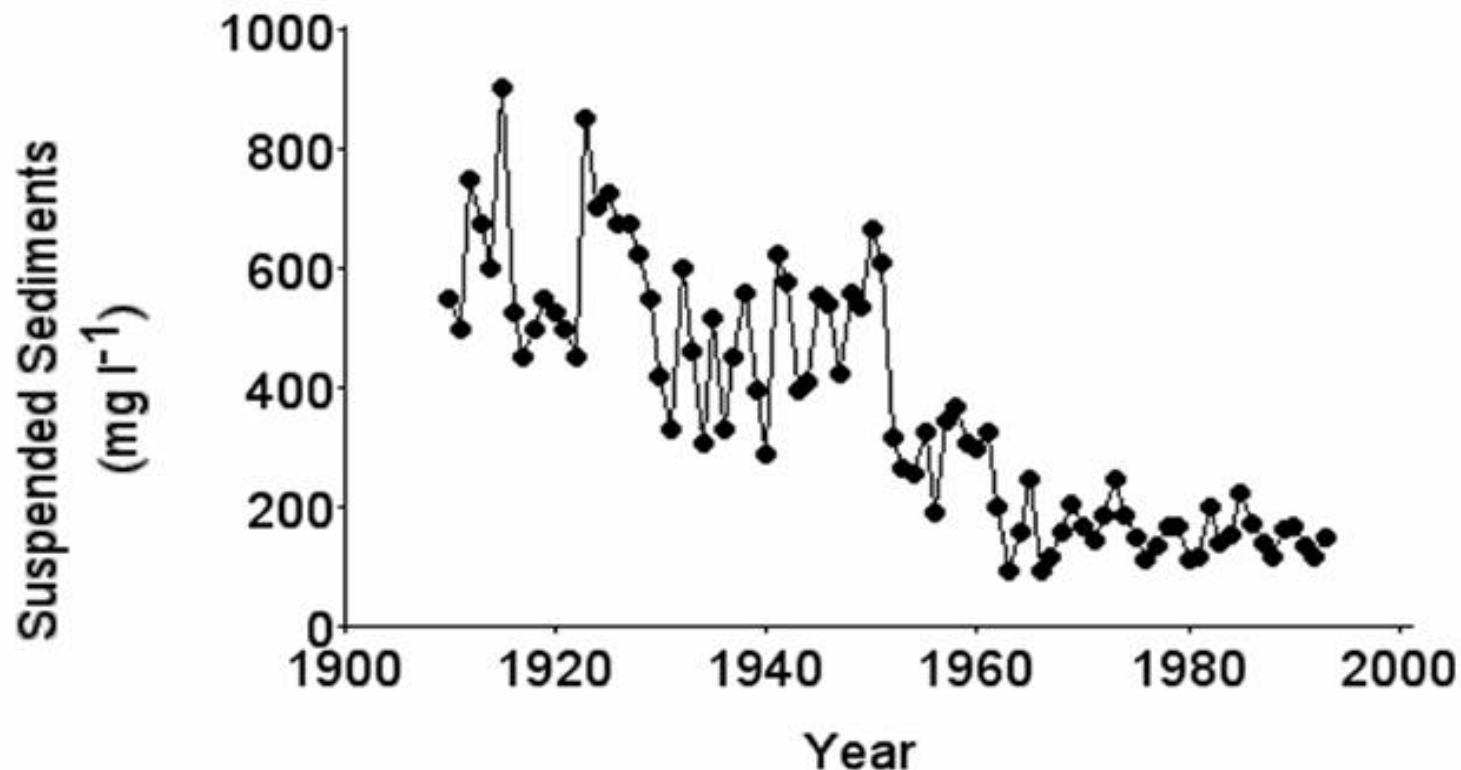
Changes in Sediment Transport



Source: Meade (1995)

Changes in Sediment Transport

Annual average suspended sediments at New Orleans



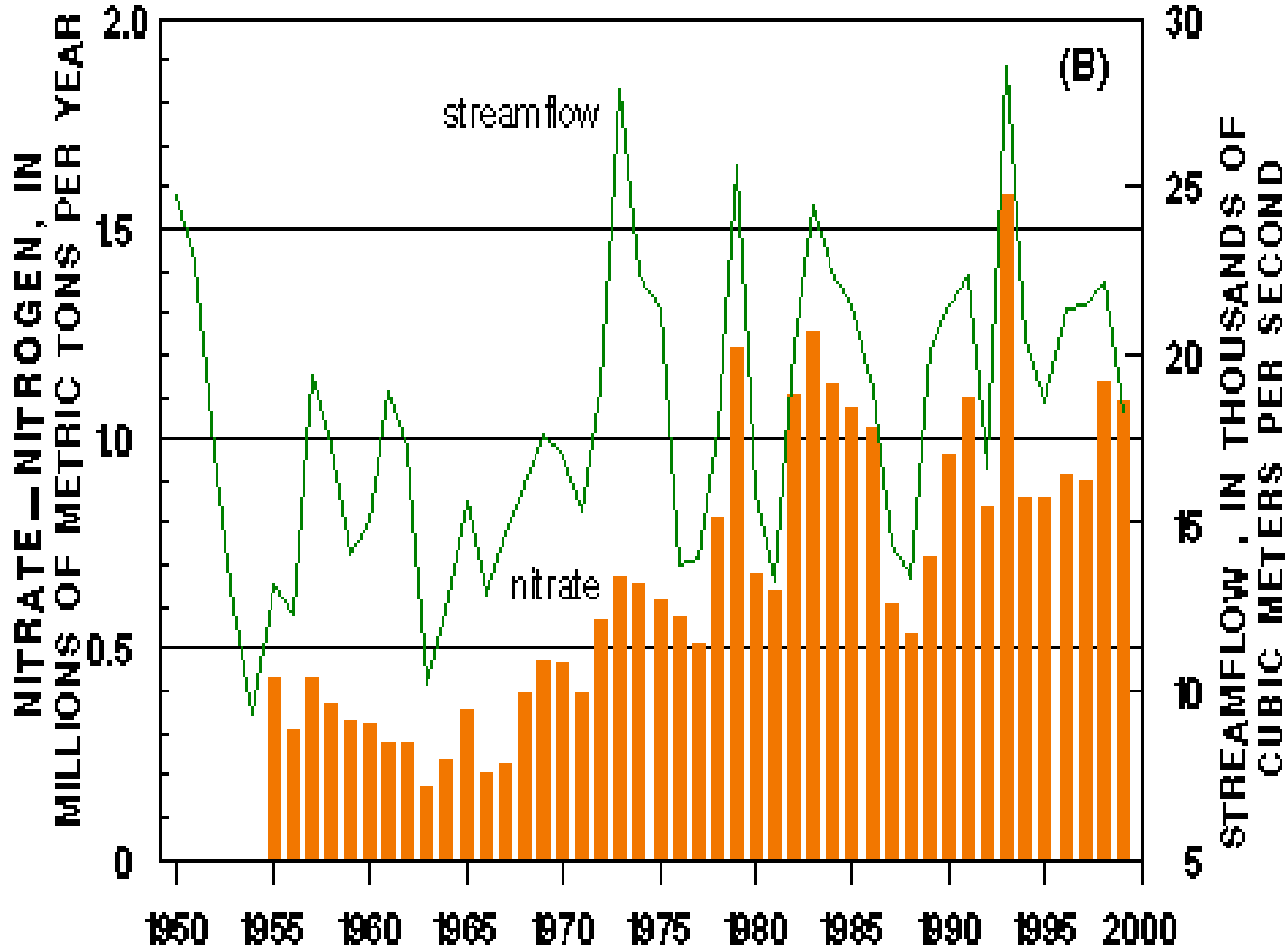
Source: Turner (2007)

Miss. River Water Quality Problems

Mississippi River affected by many water quality problems - three categories:

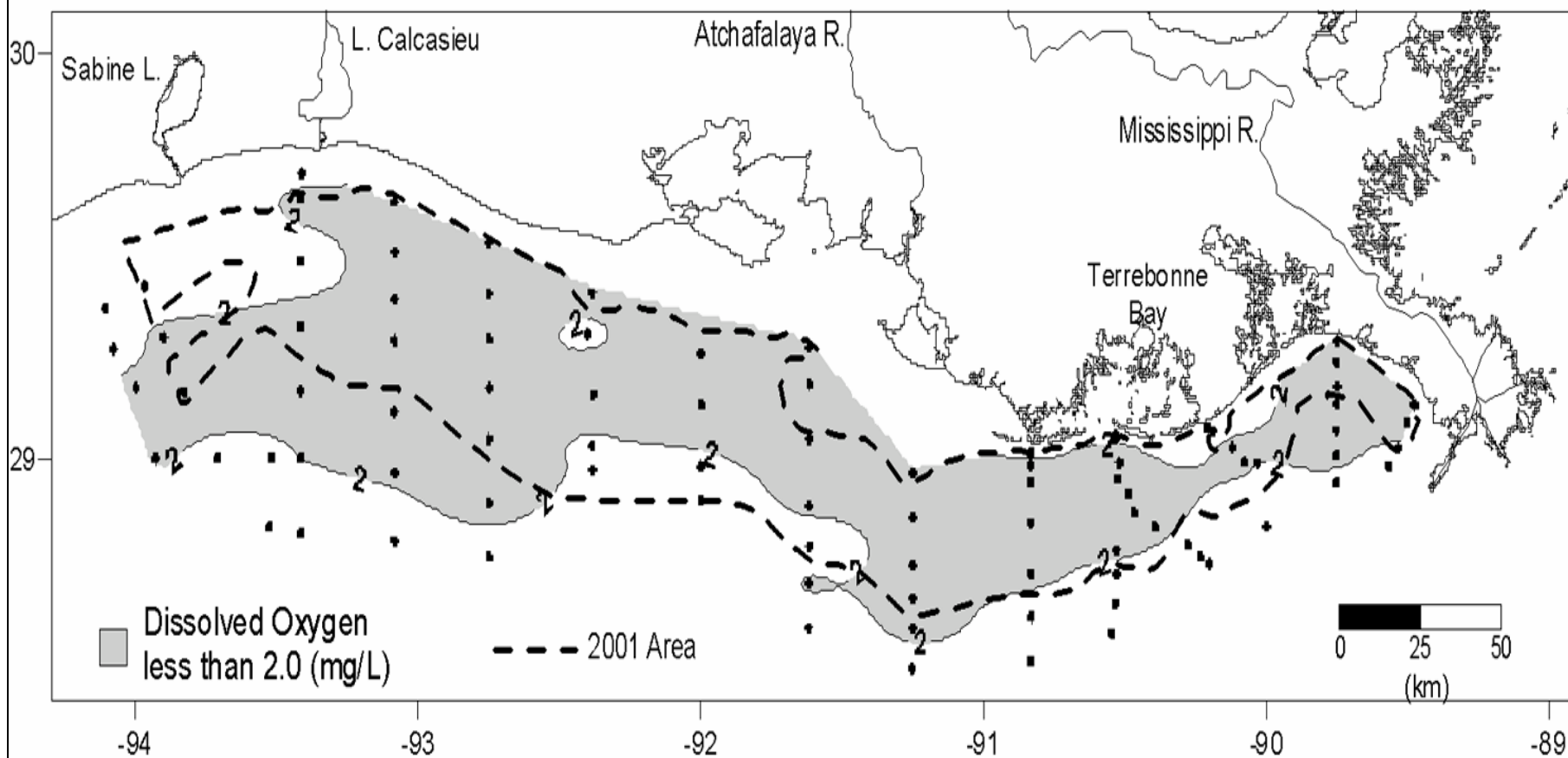
- contaminants with increasing inputs along the river and that accumulate downstream (e.g., nutrients, pesticides);
- legacy contaminants stored in the sediments (e.g., PCBs, DDT);
- “intermittent” contaminants (e.g., sediments, fecal bacteria).

Nutrient Inputs



Source: Goolsby (2000)

Hypoxic (low O₂) Zone in Gulf



Source: Rabalais (2007)

Primary Water Quality Problems

- At the scale of the entire river, **nutrients** and **sediment** are two primary water quality problems
- Nutrient and sediment inputs derive mostly from nonpoint sources, and mostly from agriculture
- Sediment: excess sediment loads in UMR, sediment deprivation in LMR

Chapter 3 – The Clean Water Act

- Cornerstone of surface water quality protection in US; 35 years old
- Contains variety of reg and non-reg tools
- Technol-based standards for point-source discharges
- CWA has been effective in addressing point sources of water pollutants
- CWA addresses nonpoint source pollution only in a limited manner

Chapter 3 – The Clean Water Act

- Primary mechanism for nonpoint source control: total max daily load (TMDL) process to establish loads that will achieve water quality standards
- CWA requires states or EPA to establish water quality standards and develop TMDLs for water bodies that do not meet standards
- For water quality standards and TMDLs to be effectively implemented in interstate waters like the MR, essential that interstate pollutant loadings be fully considered

Chapter 3 – The Clean Water Act

- CWA directs EPA to stimulate and support interstate cooperation
- EPA has not exercised its authority under CWA to provide adequate coordination
- CWA cannot be the sole legal vehicle used to achieve water quality objectives for the MR (e.g., most agriculture discharges exempted)
- CWA provides a legal framework that if comprehensively implemented can effectively achieve many aspects of interstate pollution

Chapter 3 – The Clean Water Act

- CWA assigns most interstate water quality coordination authority to the EPA.
- CWA provides the EPA with multiple authorities that would allow EPA to assume a stronger leadership role in addressing Mississippi River and Gulf of Mexico water quality.

Chapter 4 – Implementing the CWA Along the Mississippi River

- MR not monitored as single unit by any entity.
- States along the river devote varying levels of resources to its monitoring.
- Efforts to coordinate state efforts are spotty and vary along the river.
- MR is an “orphan” from a water quality monitoring and assessment perspective.

Pollutants and Impaired Waters in the Mississippi River by State

State	Pollutants
Minnesota	Mercury, PCBs, Turbidity, Fecal Coliform, Nutrients
Wisconsin	Mercury, PCBs
Iowa	Arsenic, Nutrients
Illinois	PCBs, Fecal Coliform, Manganese, Sulfates
Missouri	Lead, Zinc, PCBs, Chlordane
Kentucky	
Tennessee	PCBs, Dioxin, Chlordane, Nitrate, Siltation
Arkansas	
Mississippi	
Louisiana	Bacteria

TMDLs for Mississippi River

State	EPA-Approved TMDLs	Pollutants Addressed	% of Miss River in State covered by TMDLs
Minnesota	3	Mercury, PCBs, Nutrients	Not available
Wisconsin	0		0
Iowa	0		0
Illinois	0		0
Missouri	1	PCBs, Chlordane	100
Kentucky	0		0
Tennessee	0		0
Arkansas	0		0
Mississippi	0		0
Louisiana	0		0

Chapter 4 – Implementing the CWA Along the Mississippi River

- EPA has failed to use its CWA authorities to provide adequate interstate coordination and oversight of state CWA activities
- EPA should act aggressively to ensure improved cooperation regarding CWA-related programs.

Chapter 4 – Implementing the CWA Along the Mississippi River

- EPA should develop water quality criteria for nutrients in the MR and north Gulf of Mexico.
- EPA should ensure that states establish standards (designated uses and water quality criteria) and TMDLs to protect these waters from excessive nutrient pollution.
- EPA should develop a federal TMDL or its equivalent, using a process similar to that developed for the Chesapeake Bay.

Mississippi River Basin



**Numerical
Nutrient
criteria**

**State or regional
nutrient caps to
reduce nutrient
flow to Gulf**

Chapter 5 – Evaluating Mississippi River Water Quality

- Lack of a centralized Mississippi River water quality information system and data gathering program hinders effective CWA application
- Clear need for federal leadership in system-wide monitoring of the Mississippi River
- EPA should take the lead in establishing a water quality data-sharing system for the length of the Mississippi River.

Chapter 6 – Agricultural Practices and MR Water Quality

- Reduction in pollutant loadings from agriculture, especially nutrients, crucial for improving MR water quality
- USDA has important role to play through its land and water conservation programs (CRP, EQIP, CSP)
- Important that USDA conservation programs be aggressively targeted at areas of high sediment and nutrient input

Chapter 6 – Agricultural Practices and MR Water Quality

- EPA and USDA should strengthen their cooperative activities
- For example, EPA can help USDA identify land that should receive priority attention for USDA conservation programs

Chapter 7 – Collaboration for Water Quality Improvement

- Levels of interstate cooperation on water quality issues vary along the river.
- UMR states are members of the Upper MR Basin Association (UMRBA), which involves formal multi-state agreement and high-level state support
- LMR states participate in the Lower MR Conservation Committee (LMRCC), which is narrowly focused (river biology and habitat restoration) and does not have gubernatorial appointees like the UMRBA.
- LMR states should strive toward creating a better cooperative mechanism similar to the UMRBA

Chapter 7 – Collaboration for Water Quality Improvement

- EPA should encourage and support better coordination among all 10 Mississippi River states and facilitate stronger integration of state level programs.
- EPA Administrator should ensure that 4 EPA regions with jurisdiction over portions of the MR act consistently in regard to water quality issues along the river and the northern Gulf of Mexico.

Key Recommendations

- Better coordination among all 10 MR states is necessary to realize improvements in MR water quality and in monitoring activities.
- LMR states should work toward a better cooperative mechanism, similar to UMRBA
- EPA should coordinate the efforts of the 10 MR states in water quality monitoring and planning. EPA should take the lead in coordinating data gathering and establishing a data sharing system for the entire river.
- EPA Administrator should ensure coordination among the 4 EPA regions with jurisdiction over MR water quality.

Key Recommendations

- USDA should target land and water conservation programs (CRP, EQIP, CSP) at critical areas
- EPA and USDA should strengthen cooperative activities, e.g., EPA can help identify land to receive priority attention

Key Recommendations

- EPA should develop water quality criteria for nutrients in the MR and northern Gulf.
- EPA should ensure that states establish standards and TMDLs to protect MR and Gulf from excessive nutrient pollution.
- EPA also should develop a TMDL, or its functional equivalent, for the MR and the northern Gulf.
- EPA should emulate the EPA-state cooperative model for Chesapeake Bay water quality and nutrient management

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