
Progress on the Gulf of Mexico Hypoxia Issue

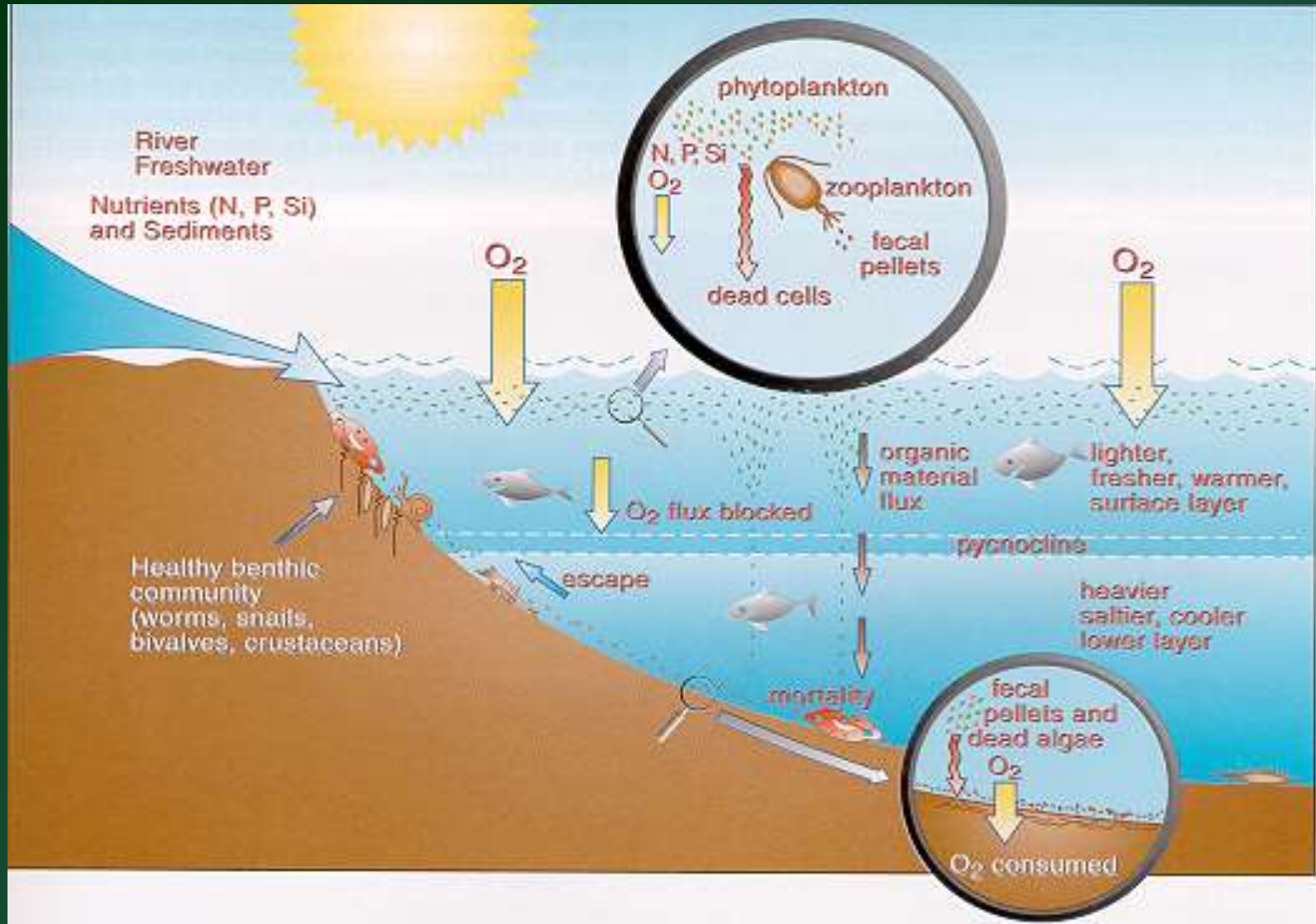
K. A. Kelling

Department of Soil Science
University of Wisconsin-
Madison

Anoxia = No oxygen

Hypoxia = Low Oxygen (<2
ppm)

The hypoxic zone in the Gulf of Mexico*



*Taken from the CAST publication No. 134: Gulf of Mexico Hypoxia: Land and Sea Interactions, 1999

Causes of hypoxia:

1. Decomposition of organic matter stimulated by nutrients
2. Stratification of fresh and salt water

Factors affecting gulf hypoxia:

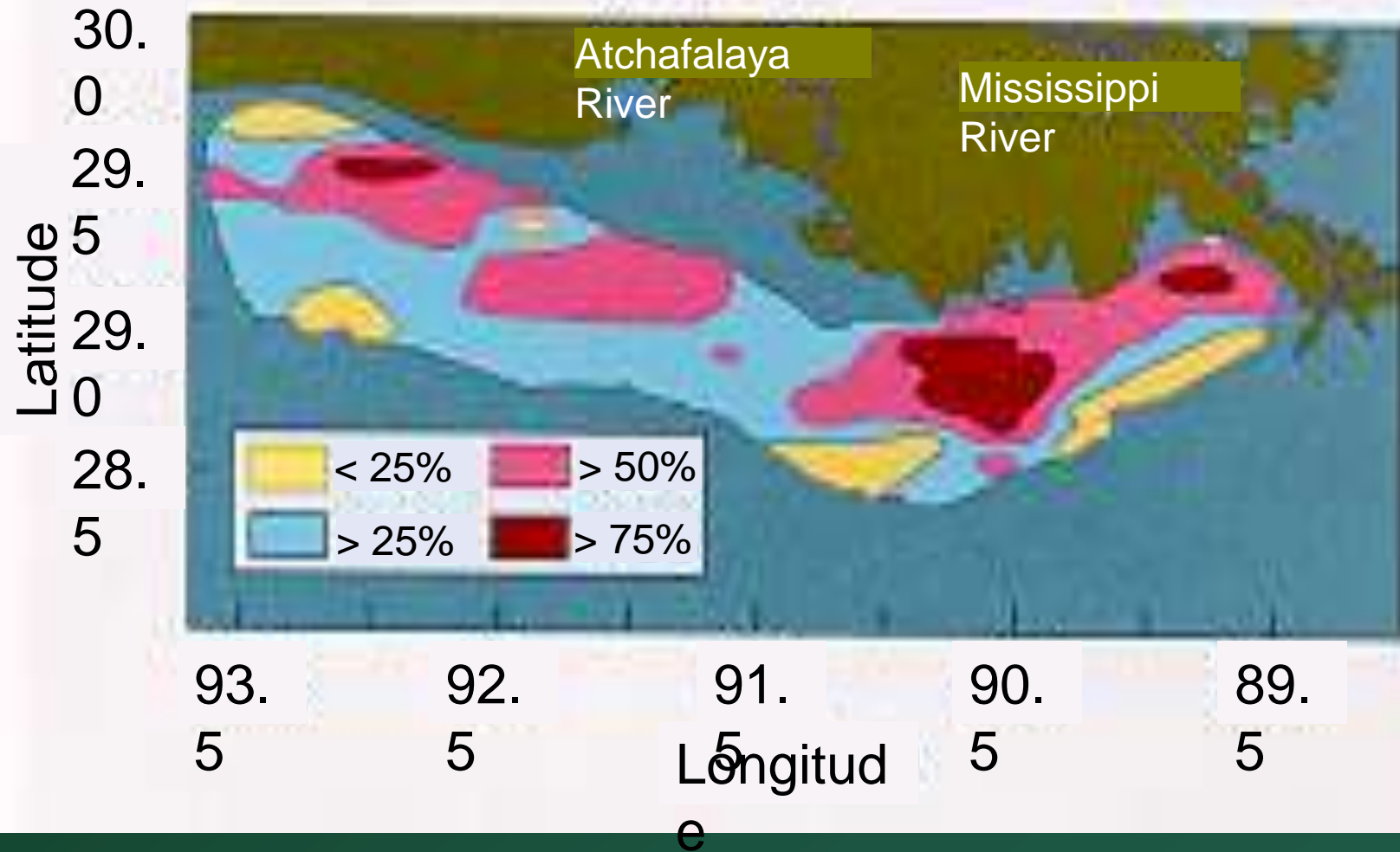
Controlling factors –

- Nitrogen load, especially nitrate
- Silicon decline
- Organic carbon loading

Contributing factors –

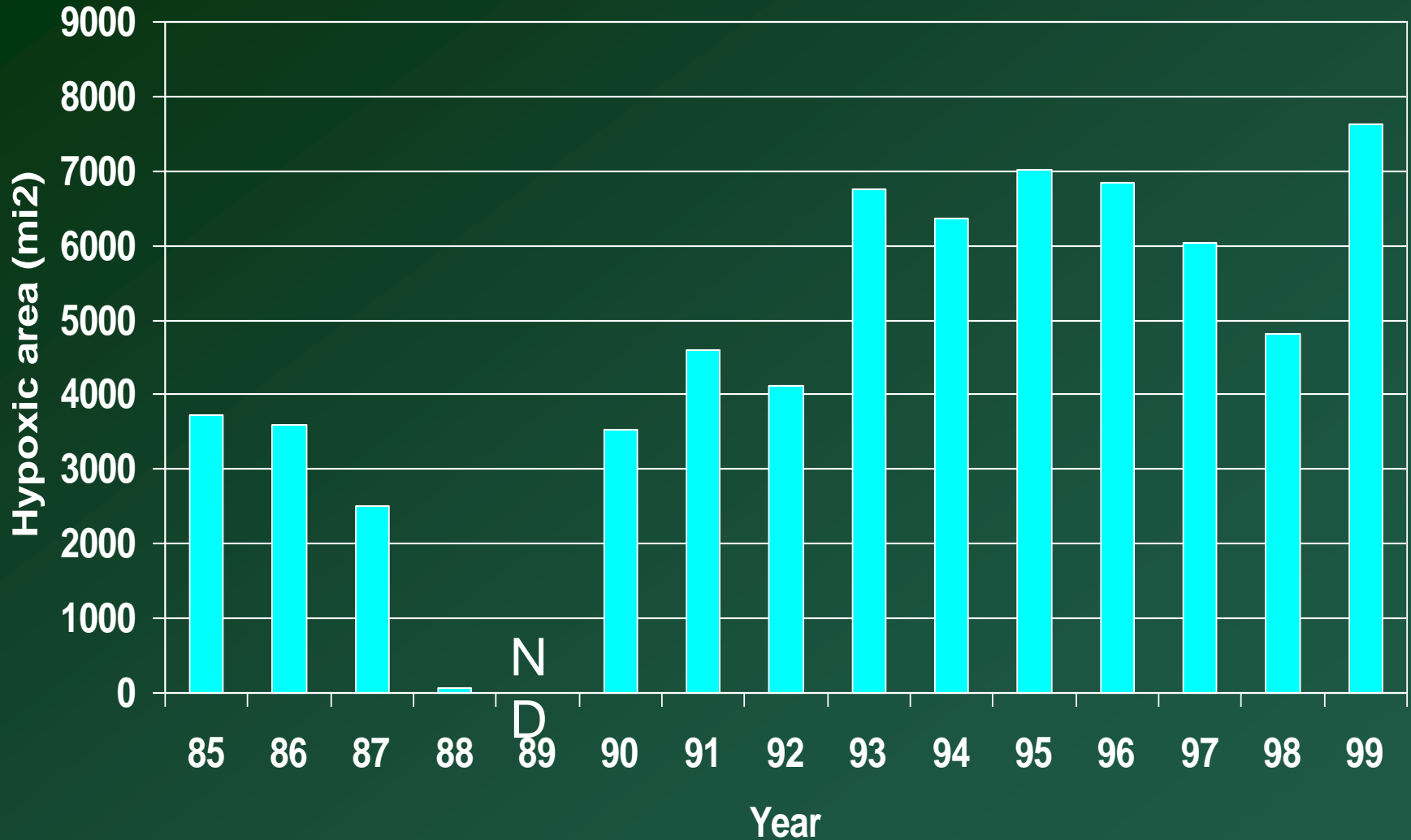
- Basin landscape changes
- Loss of coastal wetlands
- Intrusion of offshore waters
- Climatic changes

Map of the Louisiana coast showing areas where mid-summer hypoxia occurs most frequently*

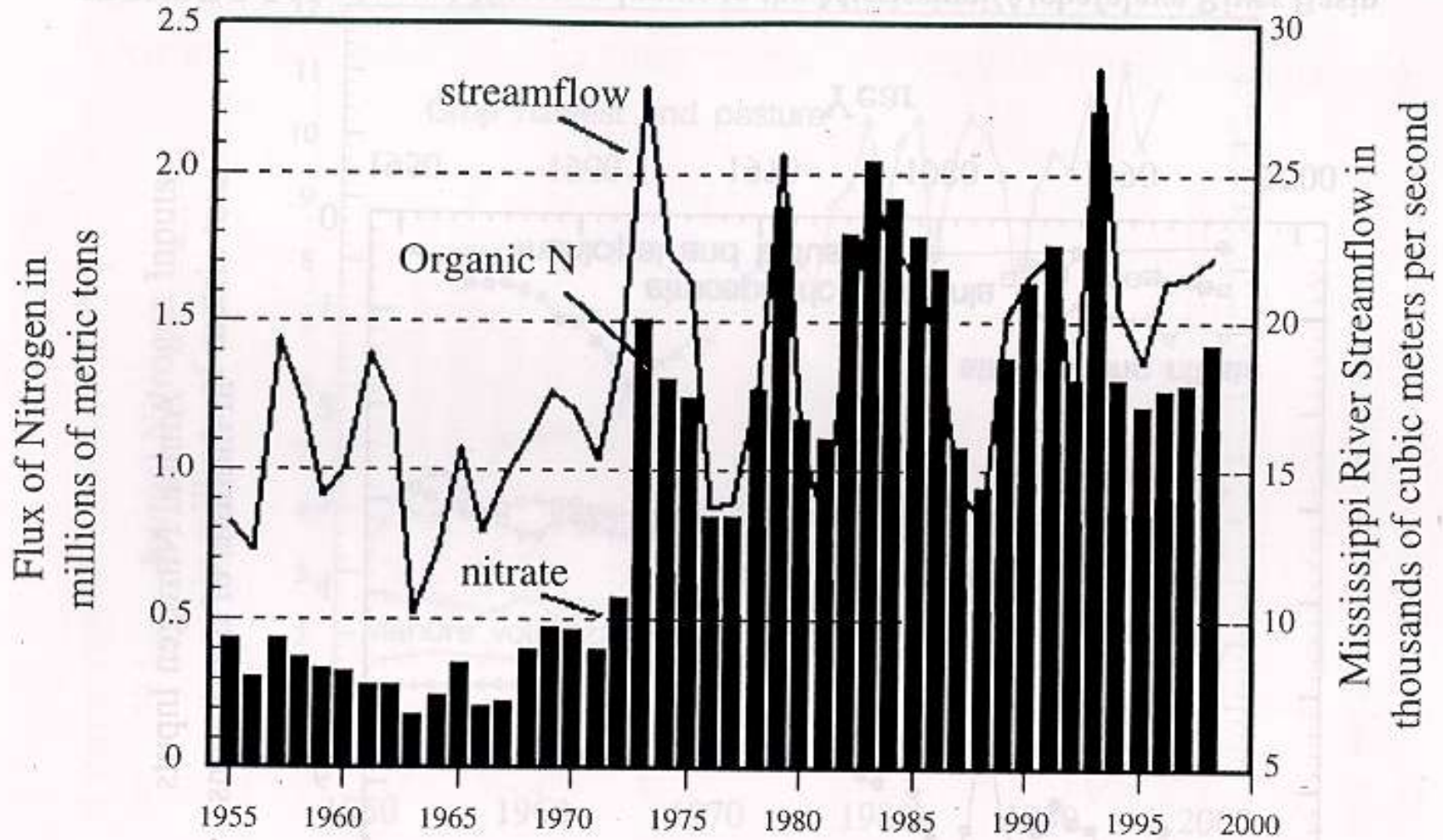


*Taken from the CAST publication No. 134: Gulf of Mexico Hypoxia: Land and Sea Interactions, 1999

Areal extent of hypoxic zone, 1985-1999 (adapted from N. Rabalais)

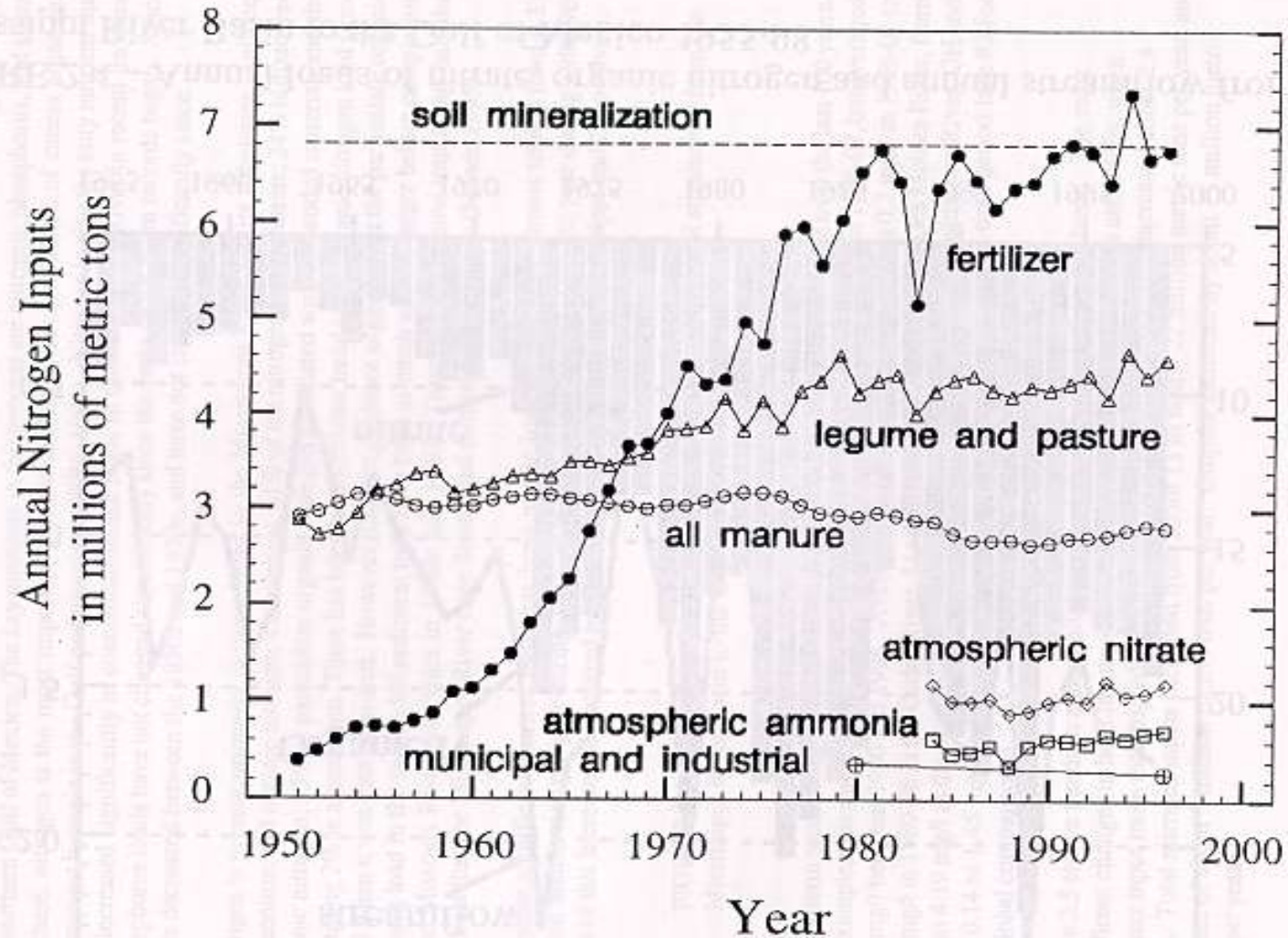


Annual loads of nitrate, organic nitrogen and annual streamflow from the Mississippi River basin to the Gulf of Mexico*



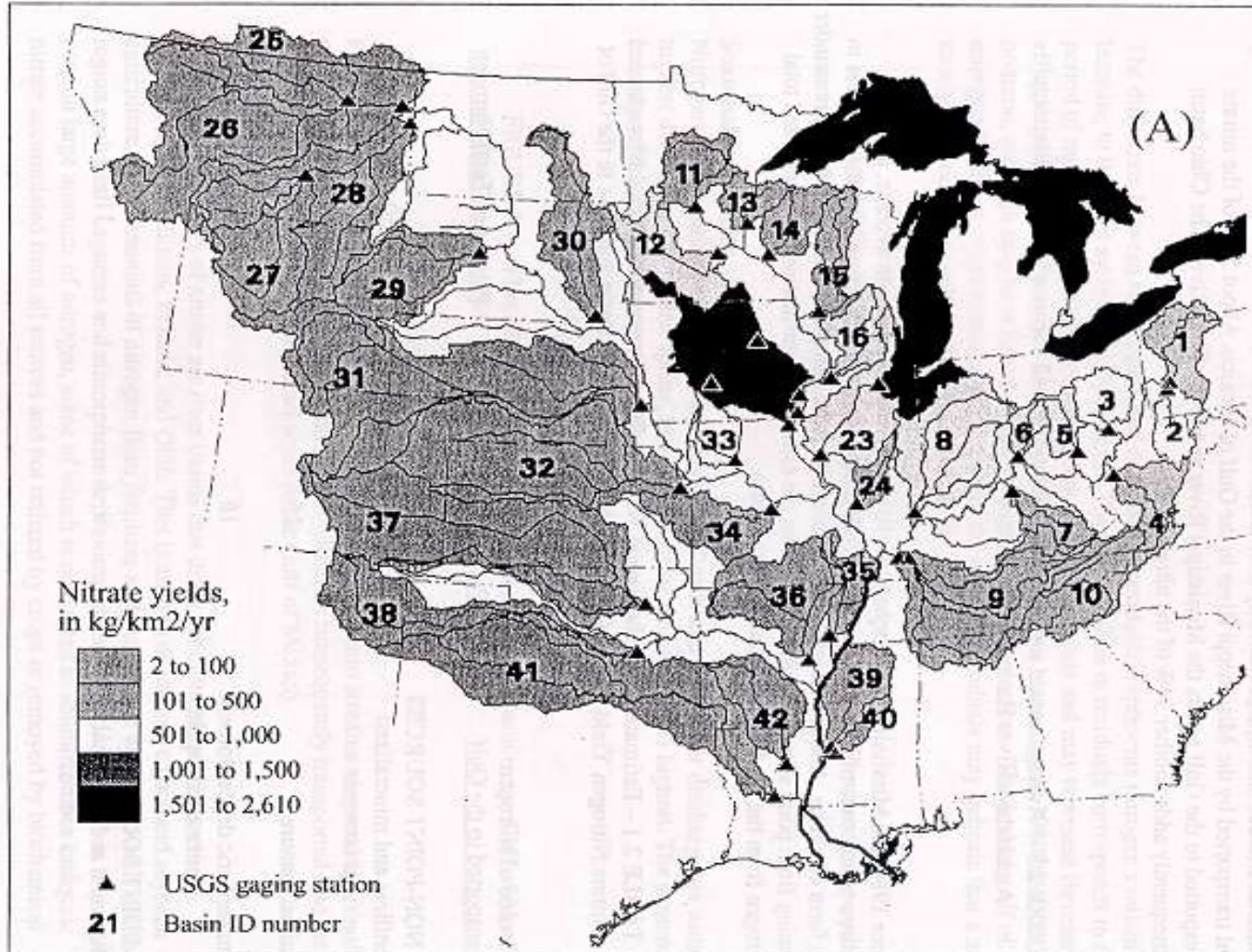
* Taken from CENR publication "Draft: Integrated Assessment of Hypoxia in the northern Gulf of Mexico."

Annual nitrogen inputs to the Mississippi/Atchafalaya River Basin*



* Taken from CENR publication "Draft: Integrated Assessment of Hypoxia in the northern Gulf of Mexico."

Average annual nitrate yields (1980-96) for 42 basins within the Mississippi/Atchafalaya River Basin*



* Taken from CENR publication "Draft: Integrated Assessment of Hypoxia in the northern Gulf of Mexico."

Documents available:

- CAST Task Force Report 134: Gulf of Mexico Hypoxia, Land and Sea Interactions.
J. A. Downing (chair)
- CENR Hypoxia Assessment Reports
 1. Characterization of hypoxia
 2. Consequences of hypoxia
 3. Nutrient flux and sources
 4. Effects of reducing nutrient loads
 5. Methods to reduce nutrient loads
 6. Cost and benefit analysis

Approaches to reduce, mitigate and control hypoxia:

1. Reduce nitrogen inputs
2. Restore and enhance denitrification and nitrogen retention

Suggested actions to reduce N loading:

- Limit N to recommended rates
- Apply all N in spring
- Manage manure N
- Include perennials in cropping system
- Plant cover crops
- Switch to conservation tillage
- Increase tile spacing
- Control water table to promote denitrification
- Route drainage through wetland

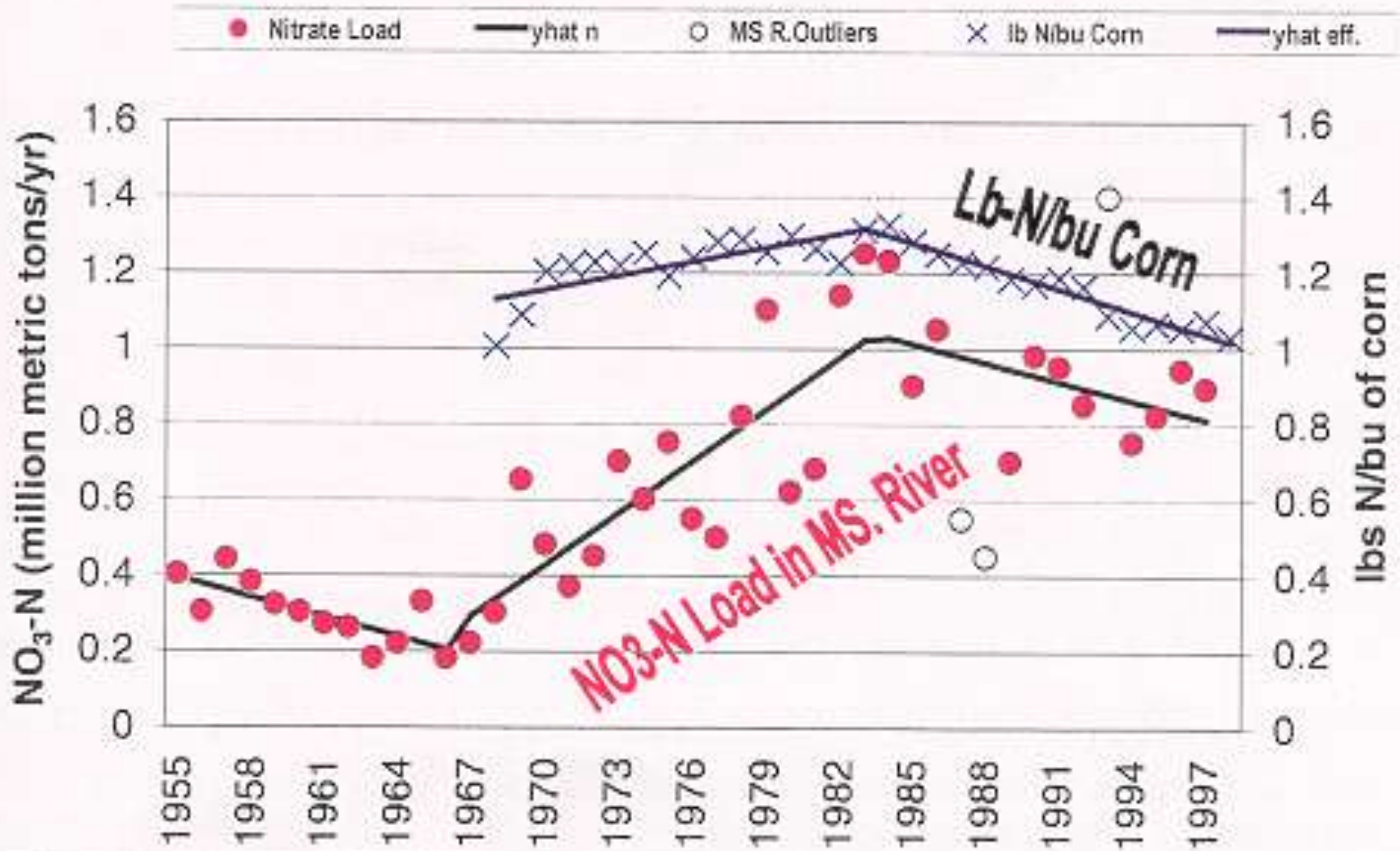
Special emphasis:

1. Reduce nitrogen fertilizer by 20% (eliminate “insurance;” take credits; use N tests; better timing/placement)
2. Alternative cropping systems (10% less corn/soybean)
3. Manage feedlot runoff

Summary of costs for N reduction actions:

Scenario		Reduction in N loss	Cost per lb N saved
		Thousand ton/yr	\$/lb N loss
Edge of field nitration	20%	1037	0.36
	40%	2074	1.45
	60%	3110	3.29
Fertilizer reduction	20%	554	0.30
	45%	1132	1.25
500% fertilizer tax		1132	6.47
Wetland restoration	1 M acres	74	-0.98
	5 M acres	386	0.45
	10 M acres	786	1.25
Adapted CENR Report 5	(19 M acres)	763	11.62
Riparian buffers			

Nitrate Loading in Mississippi River is Declining, as are the Pounds of Nitrogen Used to Produce a Bushel of Corn.



Taken from "Comments of the American Farm Bureau Federation To Gulf of Mexico Hypoxia Working Group," 1999.

Reactions:

The Fertilizer Institute

Potash/Phosphate Institute

American Farm Bureau Federation

Illinois Geologic Survey

You?

Next steps:

- Review comments on Integrated Assessment
- Debate positions
- Create action plan
 - Open for comment
 - Finalize recommendations

CENR Hypoxia Report Location

www.nos.noaa.gov

Wisconsin Implications

- Voluntary or Regulatory
 - 20% N fertilizer reductions
 - 10% more forage
 - Control feedlot runoff
 - Limit ag drainage
- WDATCP ATCP 50 rewrite
 - Requires NM plan
 - Certified soil labs
 - Limits unincorporated manure applications

Provisions of Nutrient Management Plan

- All fields
- Qualified planner
- Based on soil tests
- Nutrient recommendations may not exceed UW recommendations
- Complies with NRCS 590