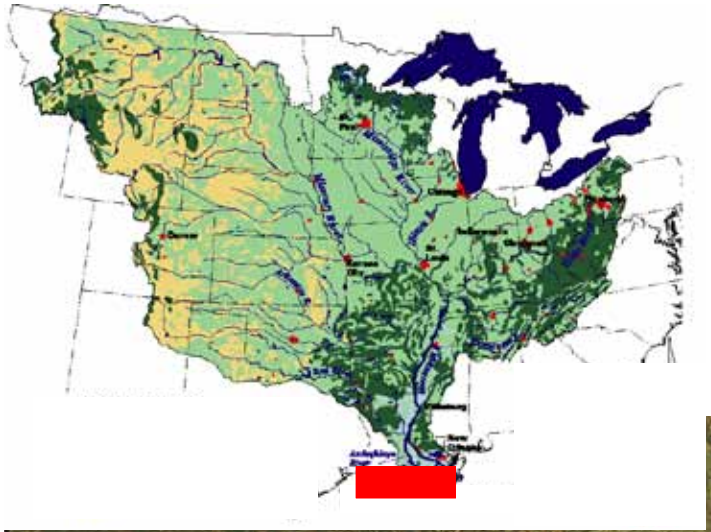


Mississippi River Watershed – Gulf of Mexico Coastal Ocean Continuum

Mississippi River

Atchafalaya River

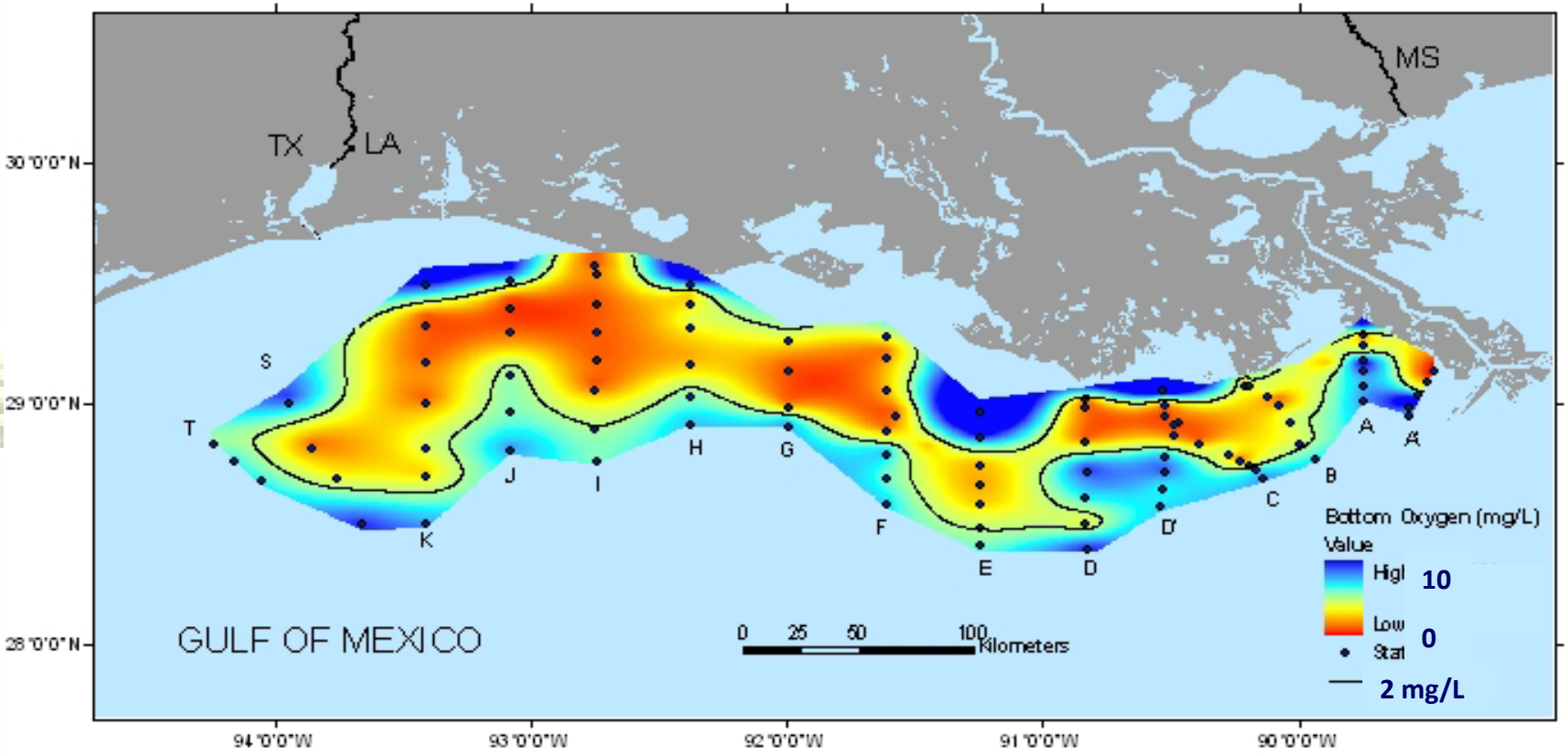
New Orleans

Hypoxic Area

Birdfoot Delta

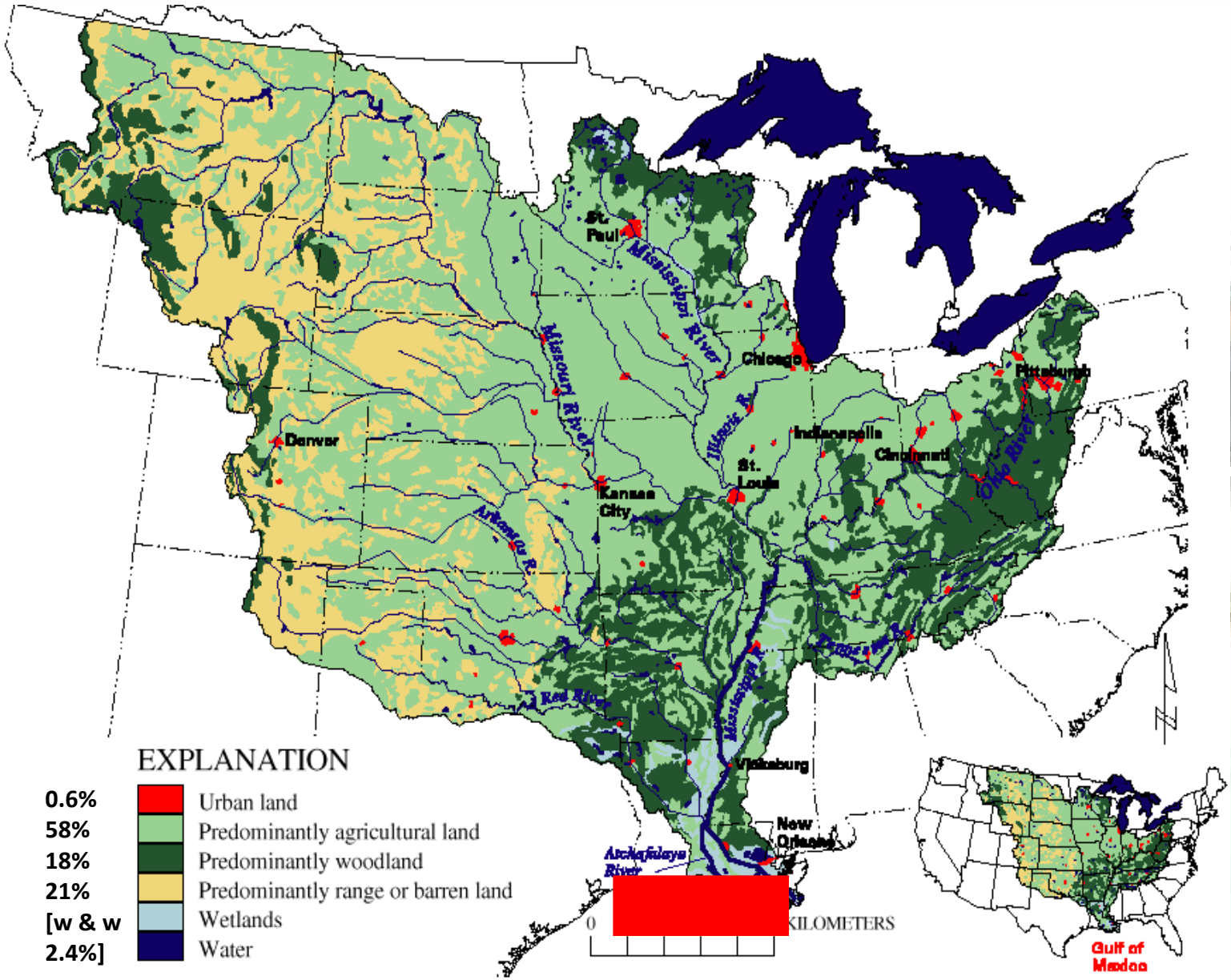
N. Rabalais, LUMCON

21 – 28 July 2007 Bottom-Water Hypoxia

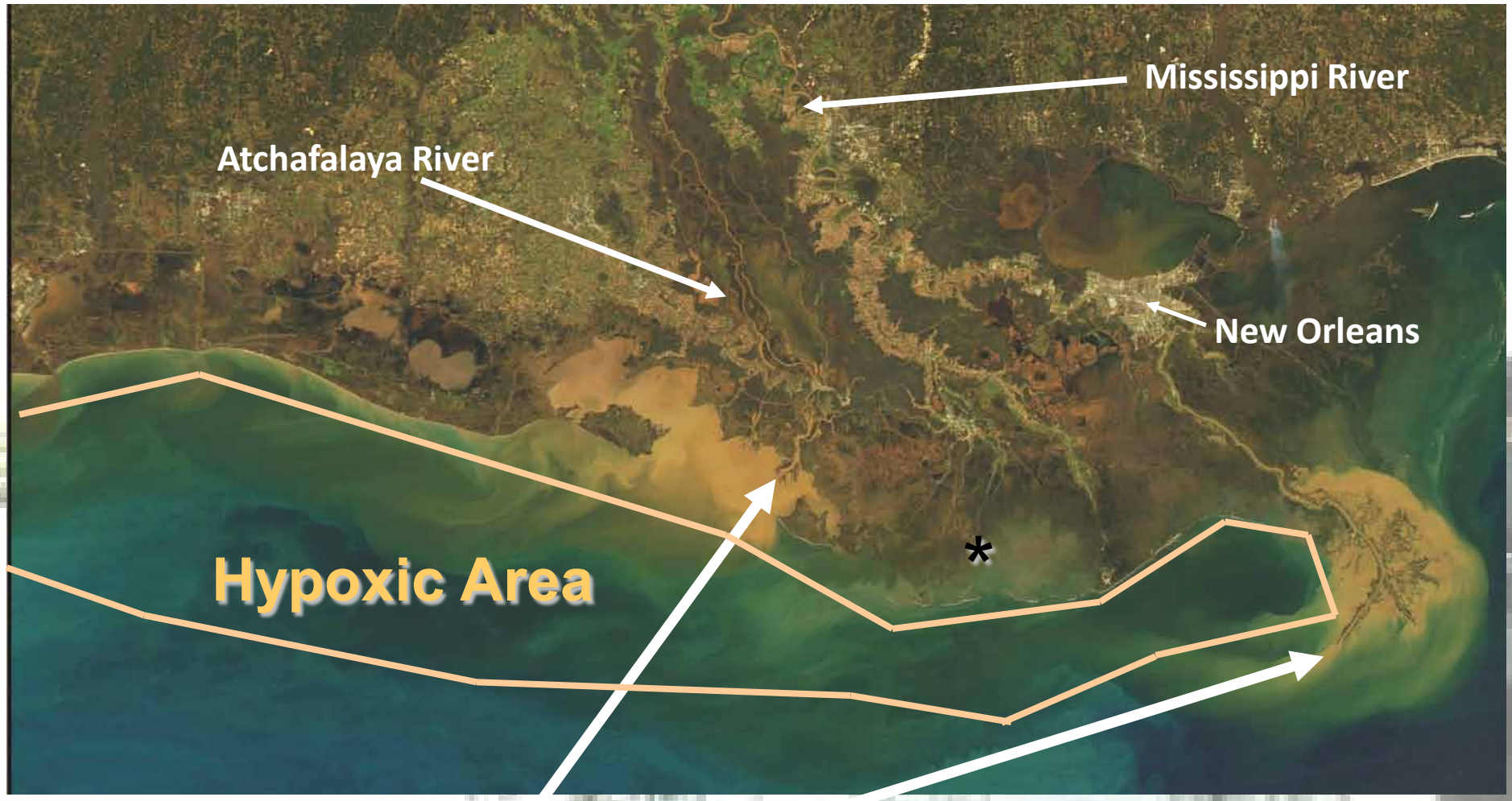


Source: N. Rabalais, LUMCON

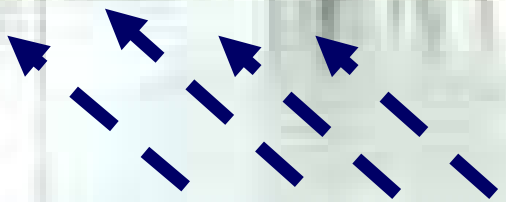
- up to 22,000 km^2
- 4 - 5 m nearshore to 35 - 45 m offshore
- 0.5 km nearshore to 100$^+$ km offshore
- widespread and severe in Jun – Sep



(Goolsby et al., 1999, Rabalais 2002)



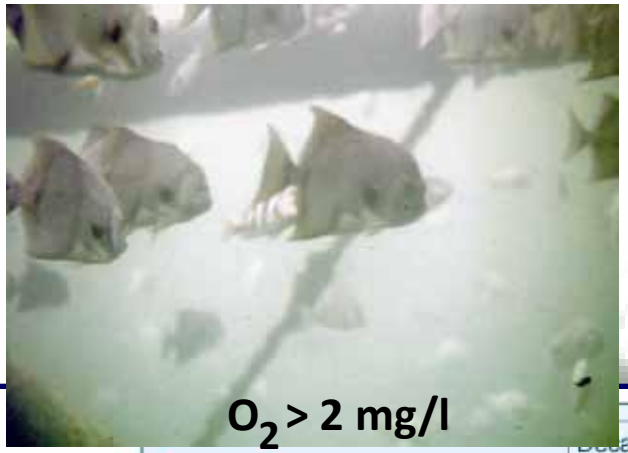
Effects are more far reaching than suspended sediment plume, esp. N & somewhat P



dominant wind direction

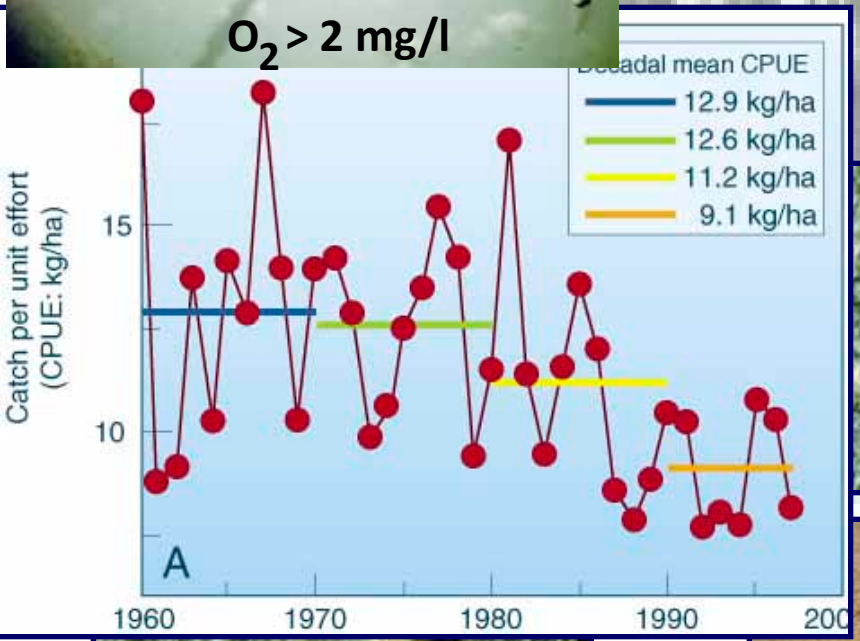
N. Rabalais, LUMCON

The “Dead Zone” is ……. not completely ‘dead.’

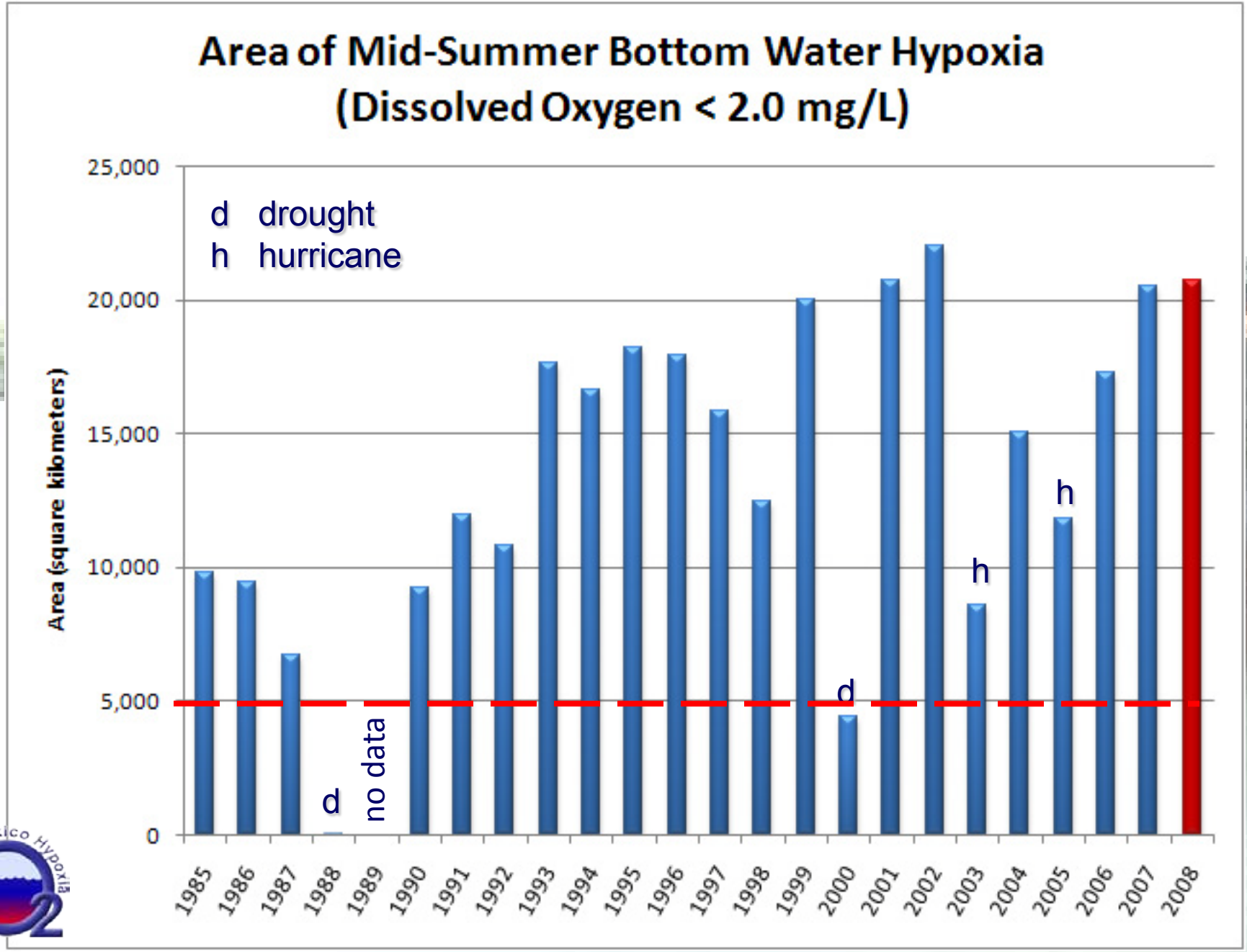


O_2 > 2 mg/l

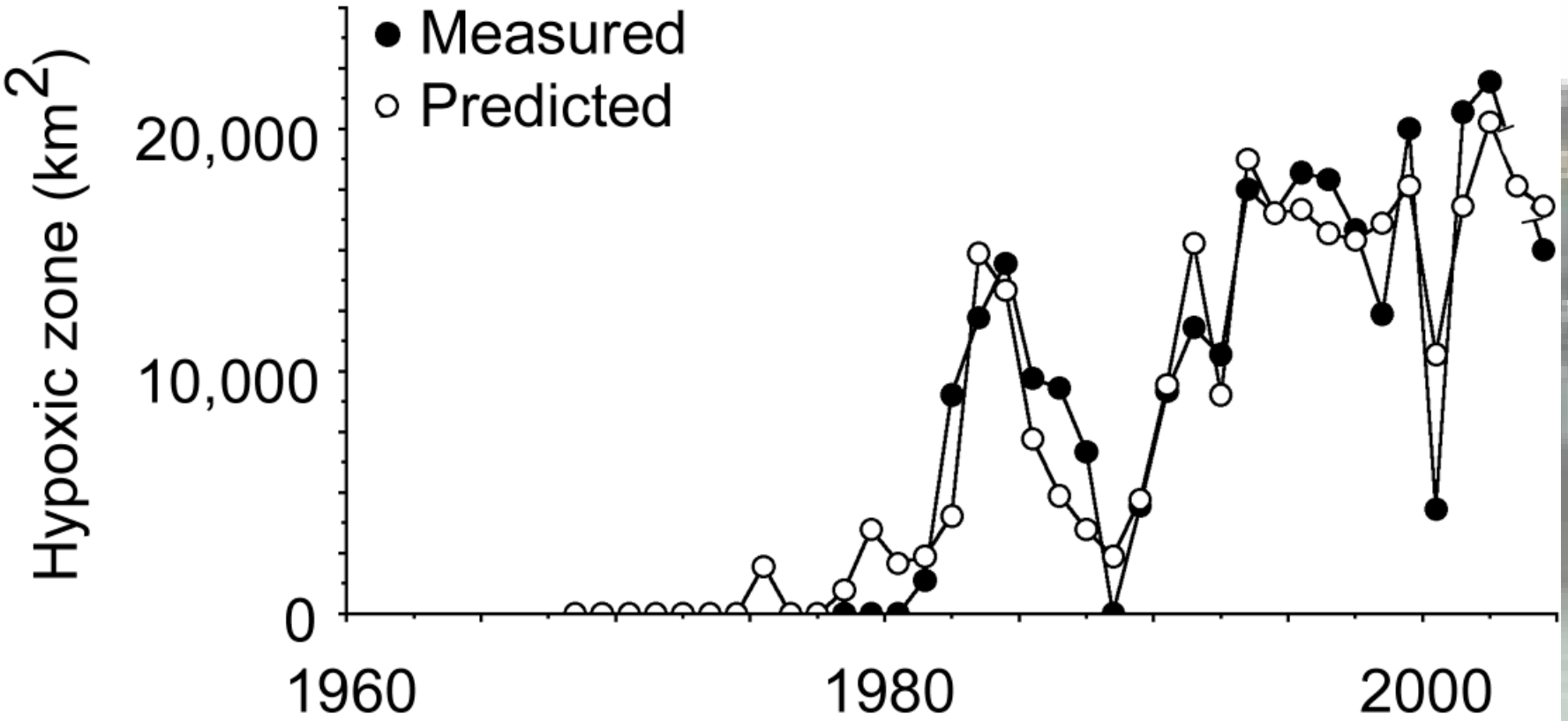
- Significant fisheries resources at risk
- Altered migration
- Reduced habitat
- Changes in food resources
- Susceptibility of early life stages
- Growth & reproduction



River N load is main long-term driver of hypoxia

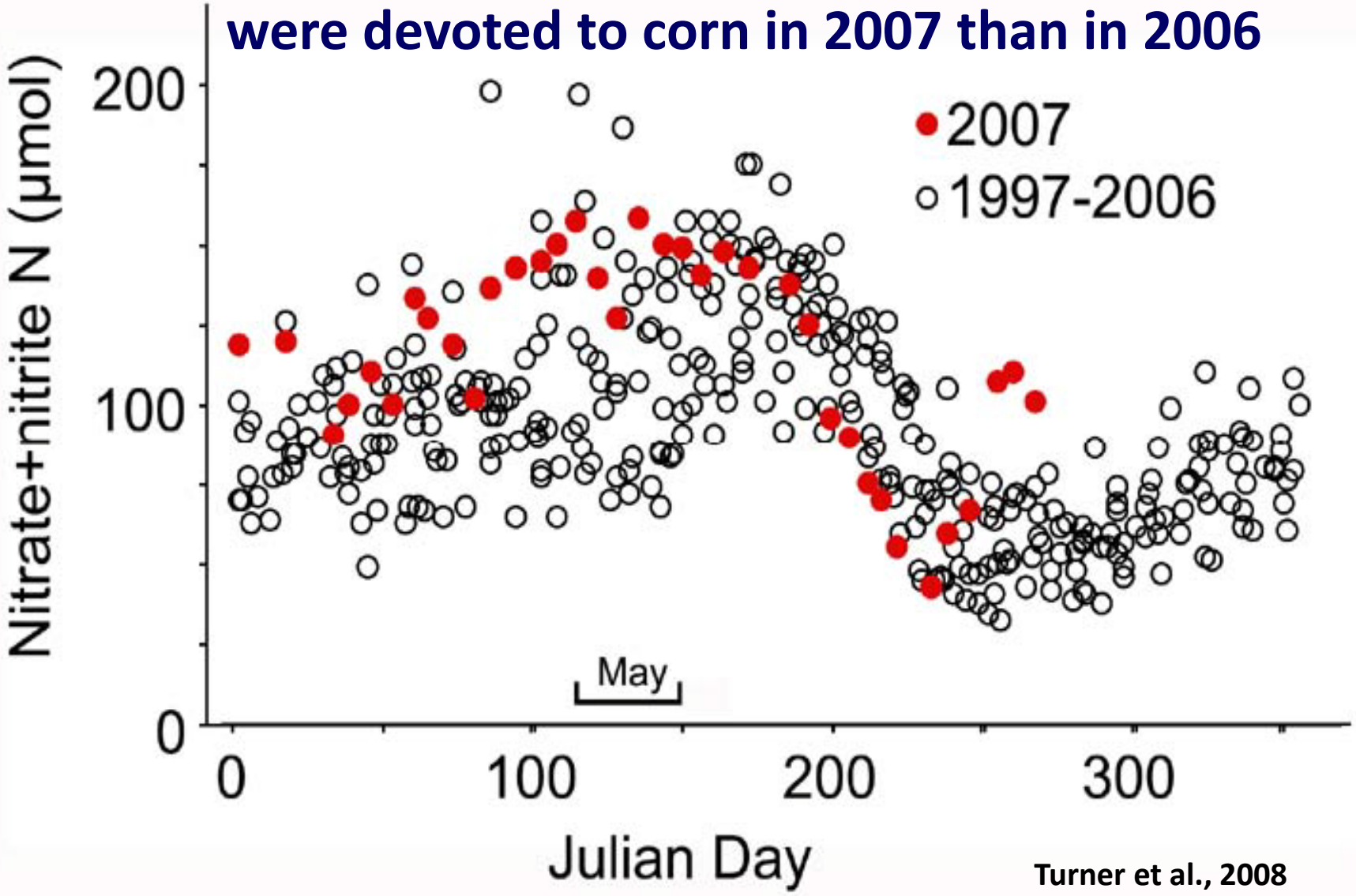


Predicting Hypoxia in summer (nitrate flux in May, year)



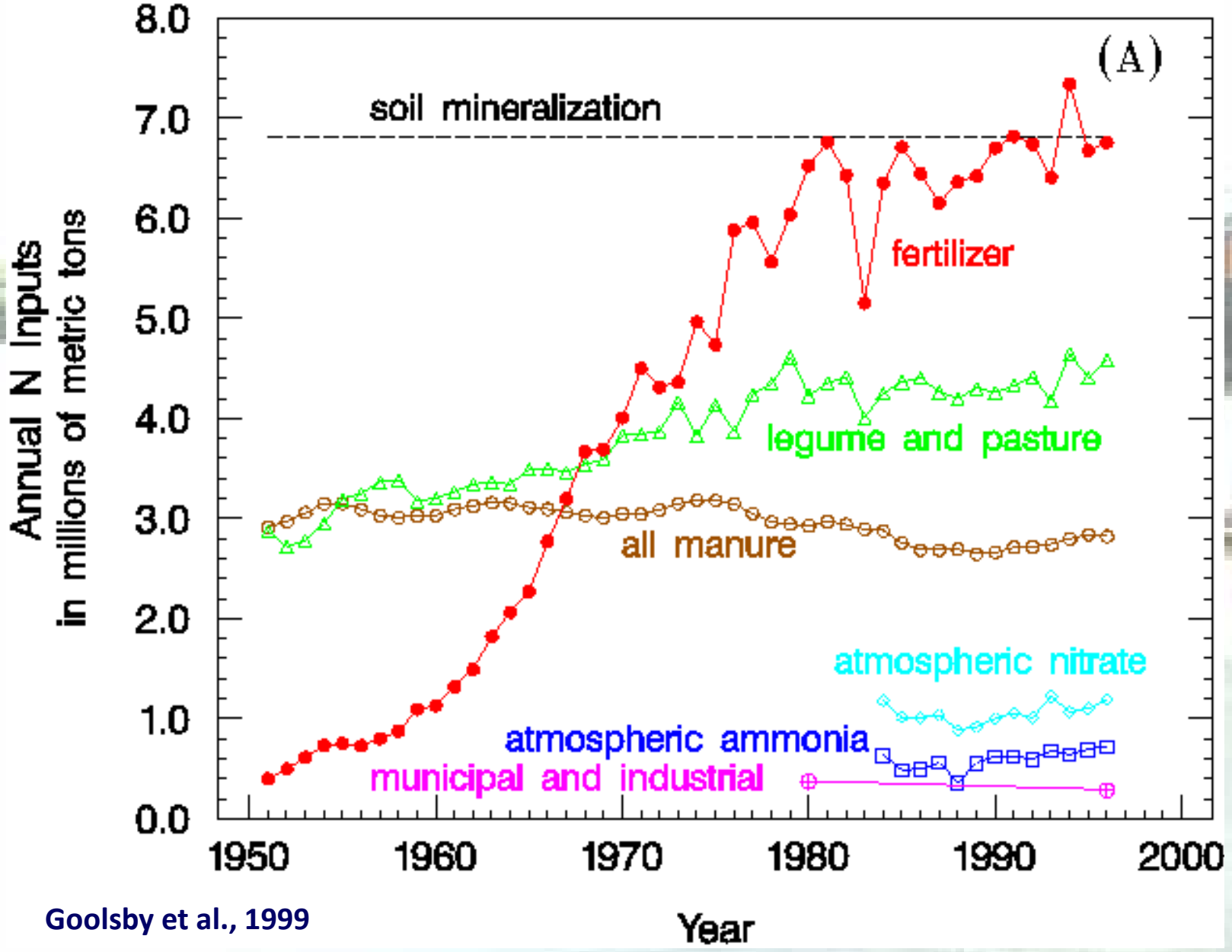
Turner et al. 2006

More than 15 million new acres of farmland were devoted to corn in 2007 than in 2006



Turner et al., 2008

Nitrogen Inputs to Mississippi Watershed

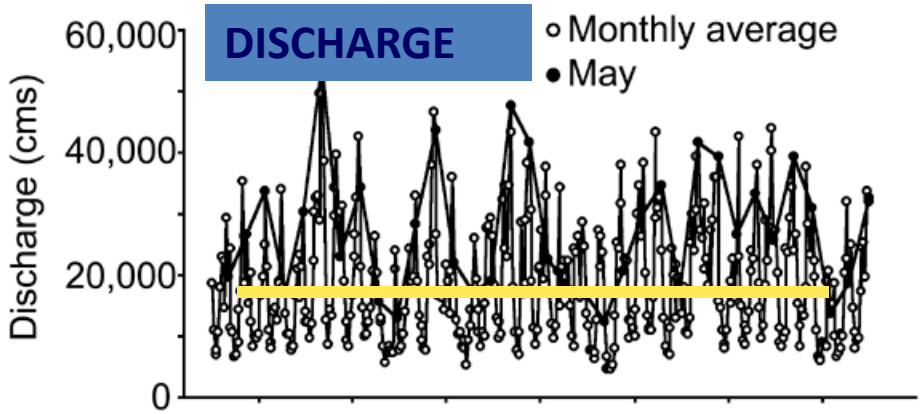


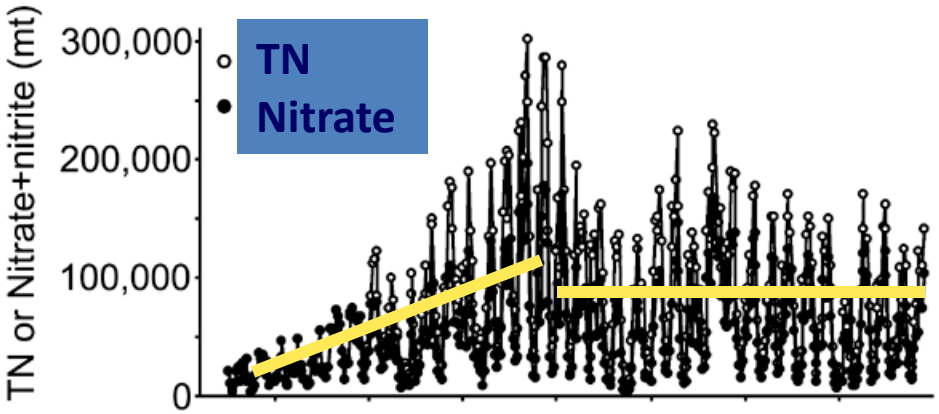
Goolsby et al., 1999

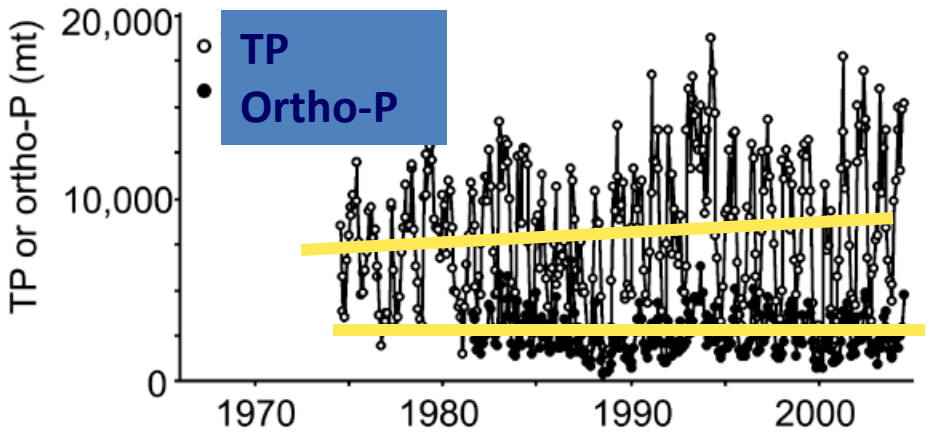
300% increase in N load

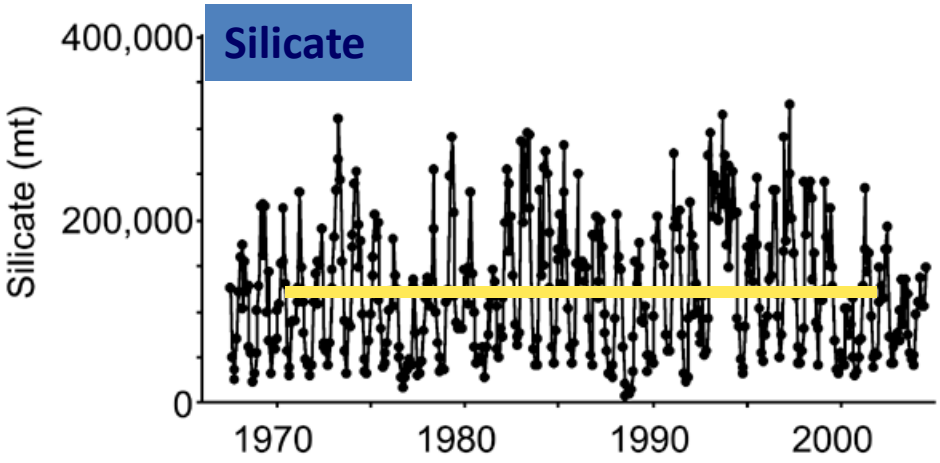
80% due to NO_3^- concentration ↑

20% due to discharge ↑









Turner et al. 2007

More Nutrients >>>

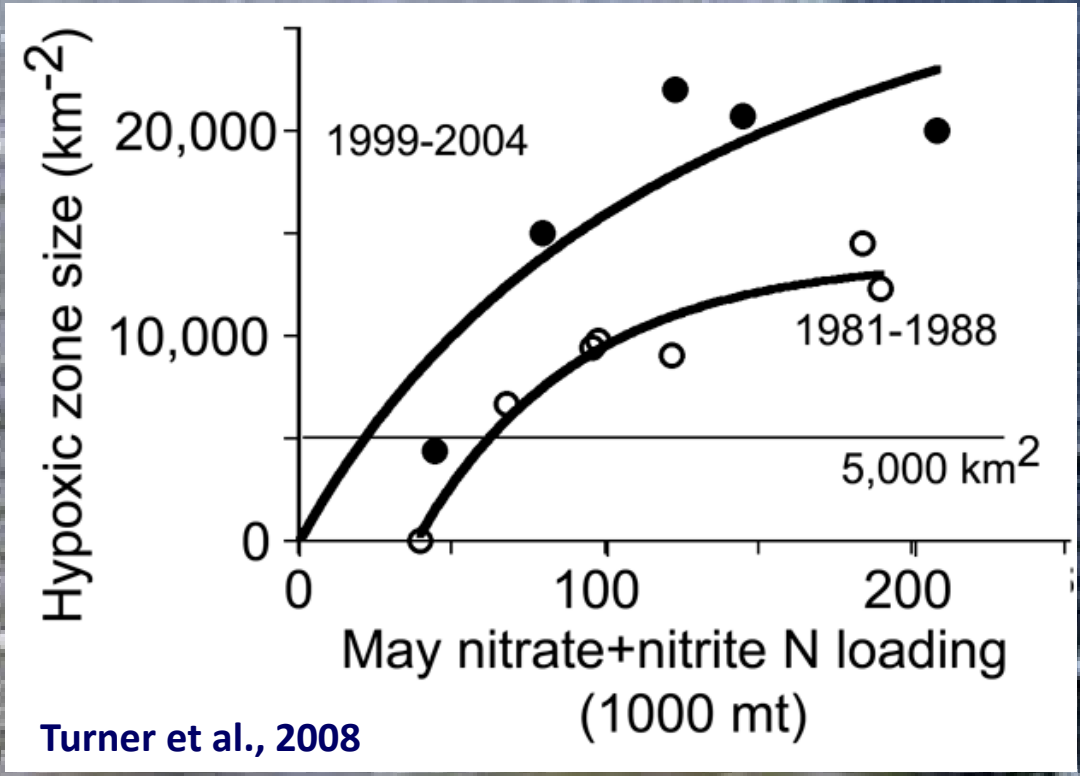
More Phytoplankton >>>

More Carbon Reaches the Bottom >>>

More Oxygen Consumed >>>

More Hypoxia

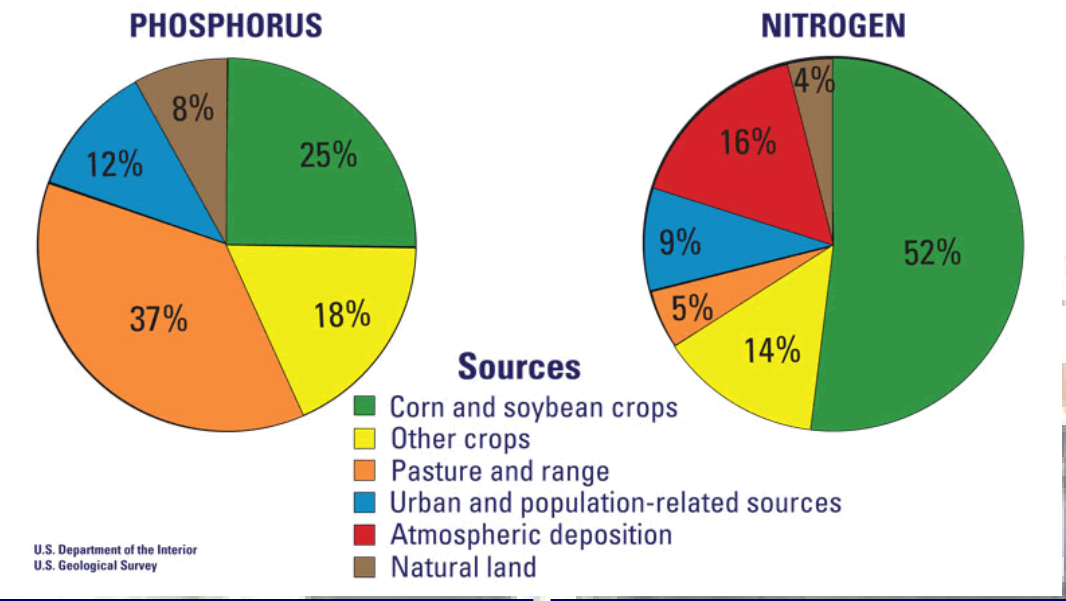
Verification from Paleoindicators

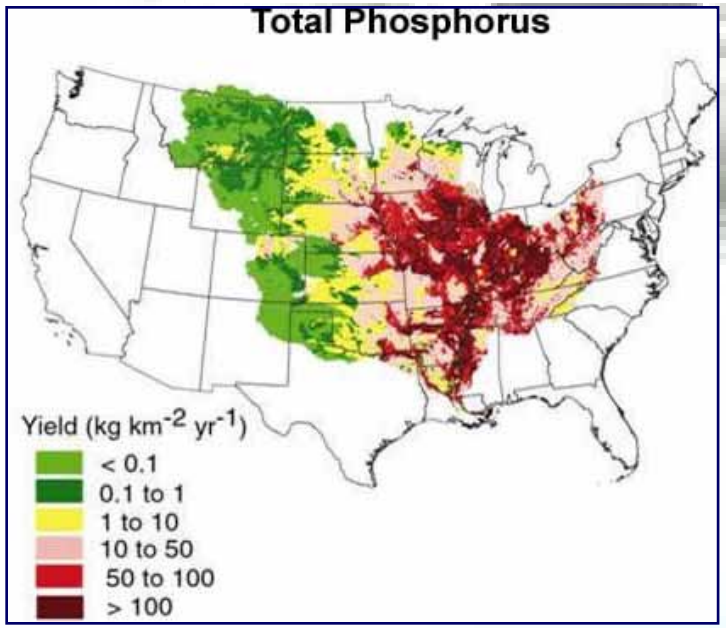


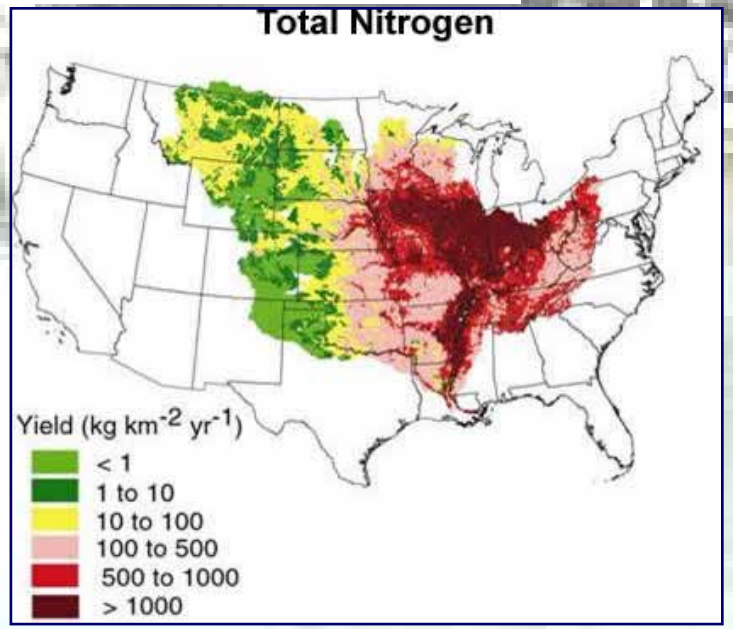
Turner et al., 2008

Photo: N. Rabalais, LUMCON

Nutrients Delivered to GoMx

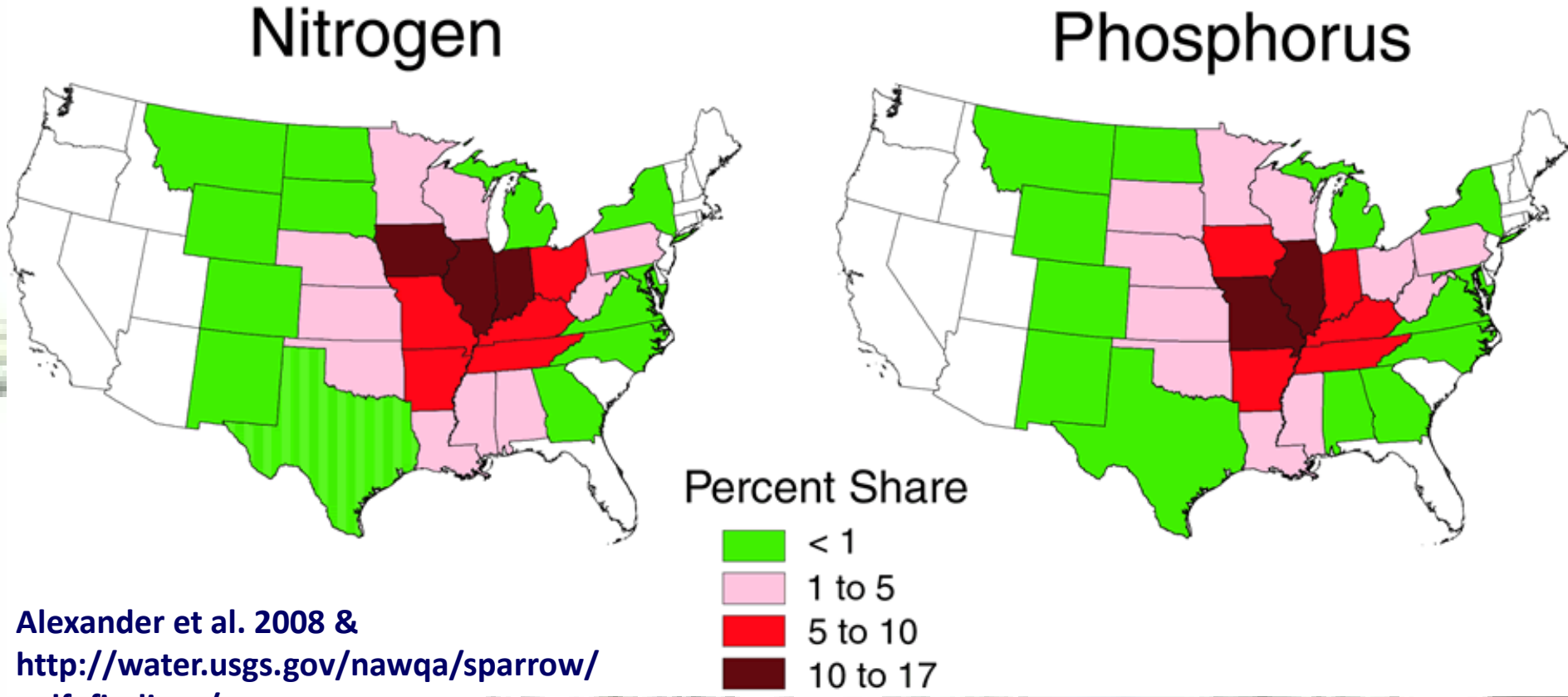






Alexander et al. 2008 & http://water.usgs.gov/nawqa/sparrow/gulf_findings/

State Shares



Alexander et al. 2008 &
http://water.usgs.gov/nawqa/sparrow/gulf_findings/

Times-Picayune
New Orleans, LA

"The Nutrient Nine"

Friday, February 01, 2008

Reduce Nitrogen (1000 MT/yr)

Scientific Curiosity
Hypothesis Testing

Management Needs
Known OR Unknown

Directed Research Programs

Implement Management Strategy

Improved Management Plan

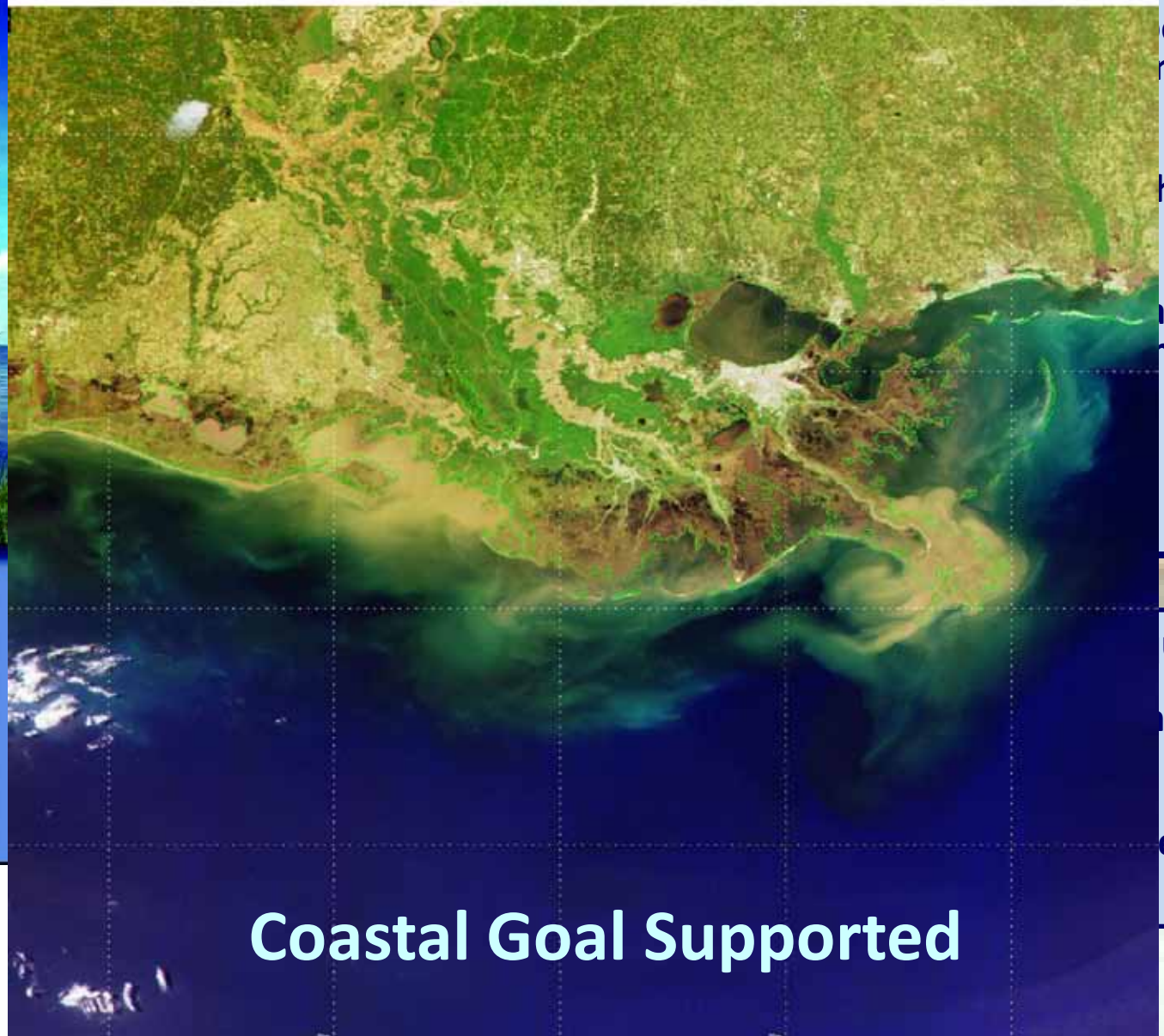
Monitor System Response

Data Interpretation, Model Analysis & Improvement

N. Rabalais, LUMCON

Hypoxia in the Northern Gulf of

An Update by the EPA Science Advisory Board



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Coastal Goal Supported

Hypoxia in the Northern Gulf of

An Update by the EPA Science Advisory Board

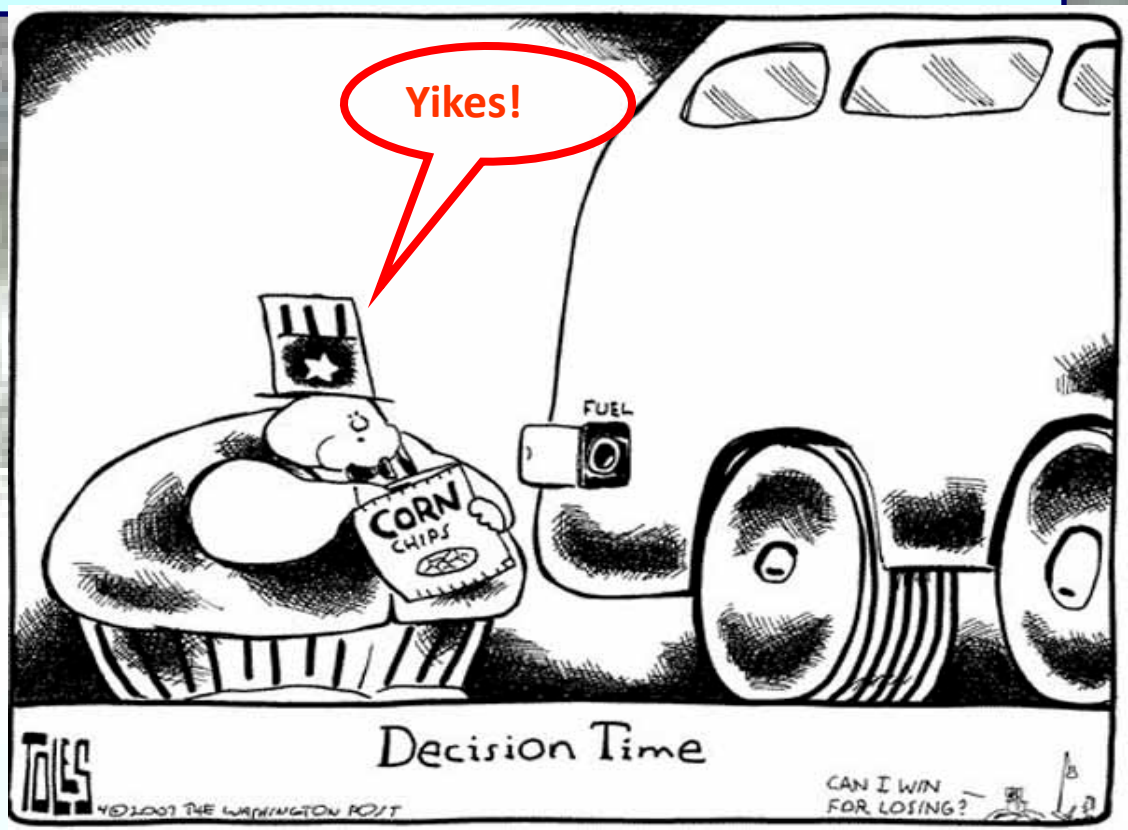
Supports and Strengthens the Science

- **N loading drives timing and extent of hypoxia**
- **P loads significant in watershed and Gulf of Mexico**
- **HAP recommends dual N & P reduction strategy**

Coastal Goal Supported

? ? ? ? ? HOW ? ? ? ? ?

- **Upper MSR and Ohio-TN sub-basins account for the 84% nitrate-N and 64% total P flux to Gulf**
- **Tile-drained, corn-soybean landscapes very N leaky**
- ***The HAP recommends* targeting the tile-drained Corn Belt region of the MARB for N and P reductions in both surface and sub-surface waters.**



Scientific Curiosity
Hypothesis Testing

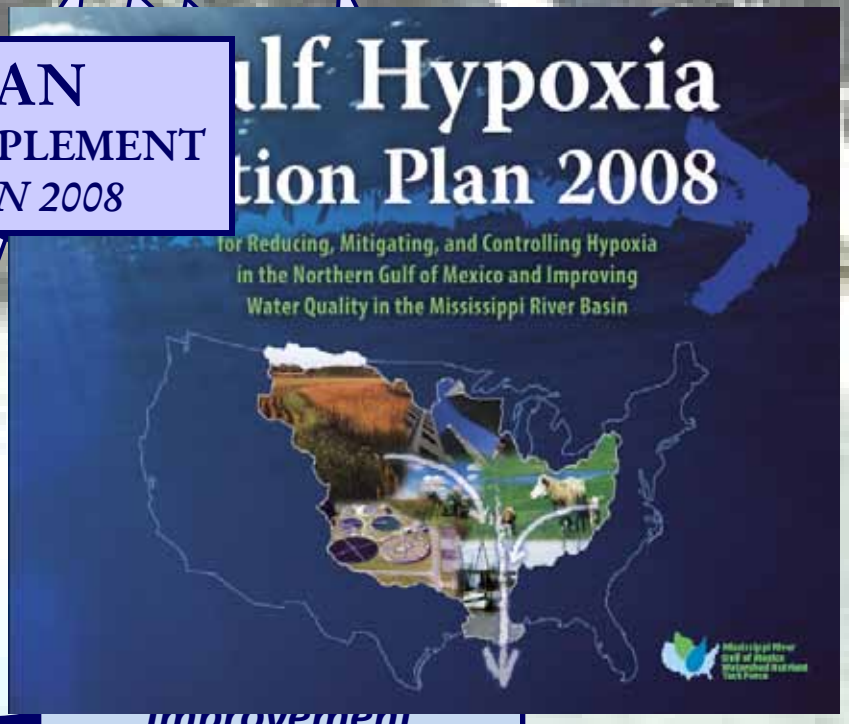
Management Needs
Known OR Unknown

Directed Research Programs

FY 2009 OPERATING PLAN
A COMPILATION OF ACTIONS TO IMPLEMENT
THE *GULF HYPOXIA ACTION PLAN 2008*

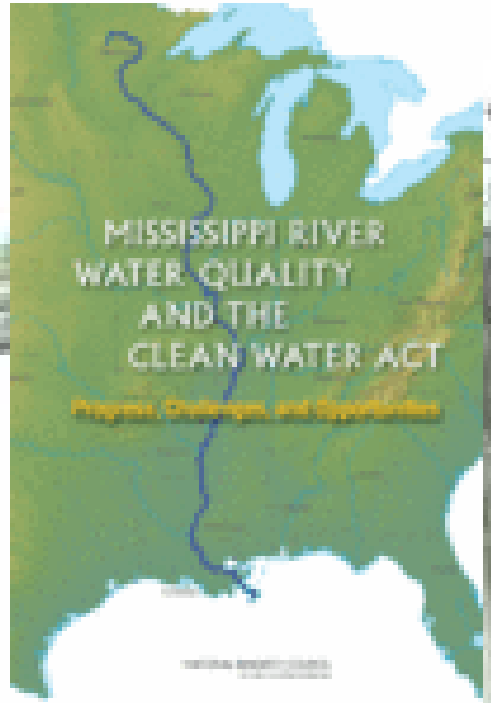
Implement Management Strategy

Monitor System Response



Improvement

National Research Council 2008



The Mississippi River is an 'orphan' from a water quality monitoring and assessment perspective.

EPA has failed to use its Clean Water Act authorities to provide adequate interstate coordination and oversight of state water quality activities.

EPA should develop water quality criteria for nutrients in the Mississippi River and in the northern Gulf of Mexico.

EPA should ensure that states establish water quality standards and TMDLs such that they protect water quality.

EPA should develop a federal TMDL, or its functional equivalent, for the Mississippi River and the northern Gulf of Mexico.

National Research Council 2009

Nutrient Control Actions for Improving Water Quality in the Mississippi River Basin and Northern Gulf of Mexico

TARGET ACTIONS IN PRIORITY WATERSHEDS

EPA and the U.S. Dept. of Agriculture should direct conservation programs and other nutrient management resources to priority Mississippi River basin watersheds with higher levels of nutrient loadings.

A NUTRIENT CONTROL IMPLEMENTATION INITIATIVE (NCII)

Implement and test a network of nutrient control pilot projects. Should identify a select group of Mississippi River basin priority watersheds for initial actions.

ESTABLISH A MISSISSIPPI RIVER BASIN WATER QUALITY CENTER

NUTRIENT LOADING CAPS

EPA, USDA and basin states set nutrient load reduction goals, target, adopt an allocation that balances equity and cost-effectiveness considerations

MONITOR THE EFFECTIVENESS IN WATERSHED & GULF OF MEXICO

The Future

Climate Change

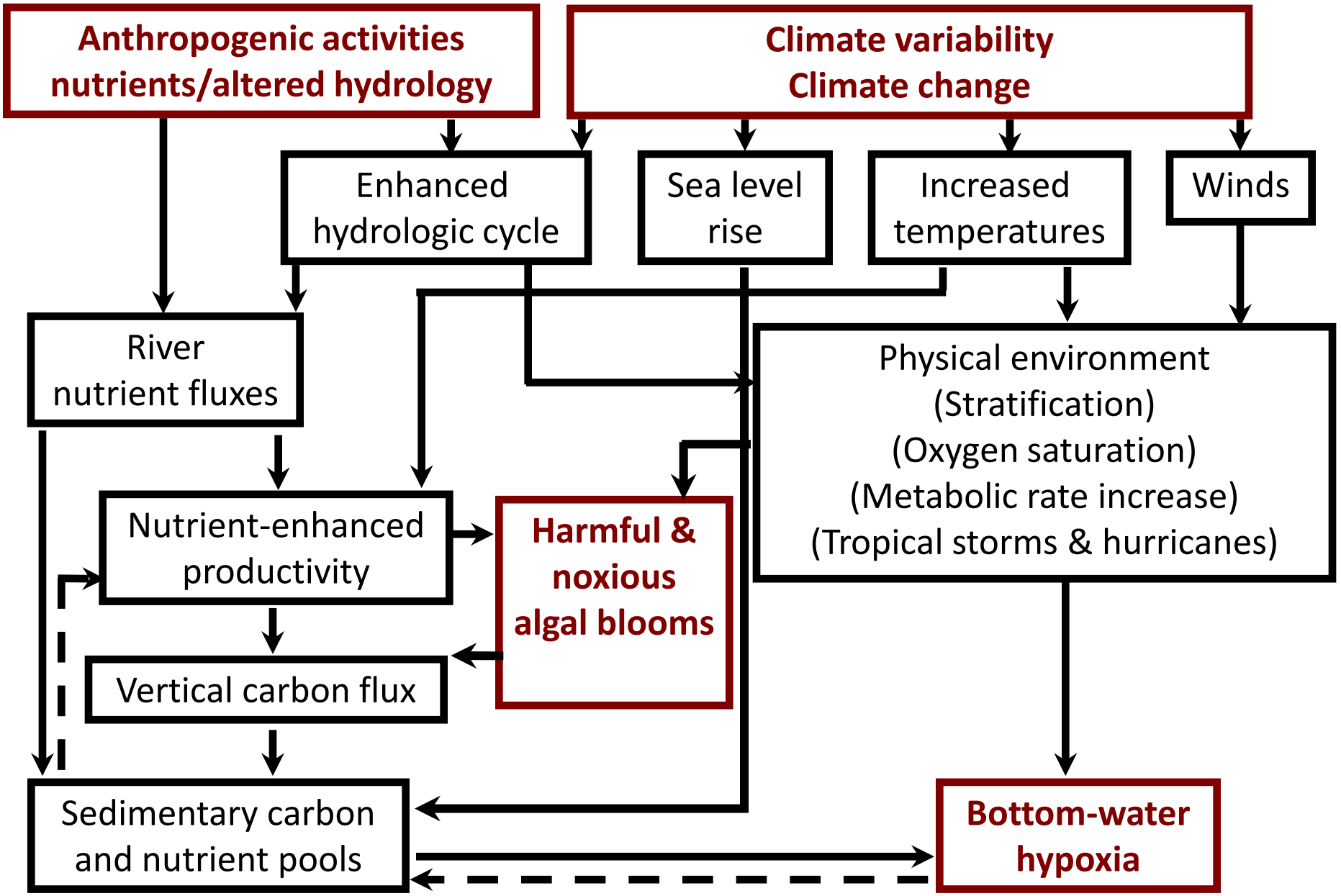
Biofuels

Increased Population

Increased Agribusiness

Increased Atmospheric Deposition

Affected Processes



Rabalais et al. 2009

“Thanks”
to all contributors and funding agencies

http://www.gulfhypoxia.net