Final Meeting Summary

Fifth Meeting of the Mississippi River/Gulf of Mexico Watershed Nutrient Task Force

November 18, 1999
Holiday Inn O'Hare
Chicago, Illinois

The Mississippi River/Gulf of Mexico Watershed Nutrient Task Force (Task Force) met on November 18, 1999, in Chicago, Illinois. The meeting was chaired by Charles (Chuck) Fox, Assistant Administrator for Water, U.S. Environmental Protection Agency (EPA).

The objectives of the meeting were to discuss options for the Action Plan process, provide the Task Force and the public an update on the Integrated Assessment, discuss approaches for dealing with the baseline issue and environmental indicators, and share ideas for consultation on the Action Plan with all of the states, tribes, and stakeholders within the Mississippi River Basin.

MORNING

Opening Remarks

Chuck Fox opened the meeting by welcoming the participants and asking the Task Force members and the audience to introduce themselves. Mr. Fox reviewed the agenda and stated that the Task Force is now at the point of bridging the science results with the Action Plan. He recommended that this process be accomplished by consensus and reminded the Task Force to look at the issues holistically so that the solutions developed are fair and balanced.

Mr. Fox addressed a Task Force members' concern about the proposed schedule for delivering the Action Plan to Congress. He agreed that the schedule is ambitious, but noted that although some dates have been missed, he hopes to come to a general agreement about the direction of the Action Plan and some of the major issues. The projected schedule is to have a draft Action Plan available in the late spring and the final in early fall of next year.

Integrated Assessment

Don Pryor, National Oceanic and Atmospheric Administration (NOAA), reviewed the draft Integrated Assessment (IA) (copies of his presentation overheads will be included as Attachment 1). At the request of the Coordination Committee, his presentation focused on how public comment was dealt with in developing the IA. He noted that the IA does not provide recommendations but is intended to report the state of knowledge building on the six science assessment reports. Mr. Pryor reviewed the timeline for the IA, indicating that the public comment period closes on December 20, with the final IA being issued in March of 2000.

Mr. Pryor presented the list of questions used to integrate the six science reports and showed the components of the draft outline. He noted that the IA was not drafted until after public comments were received and reviewed. Changes made to the outline based on public comments received included: addition of an introduction to help clarify the nature of the IA; expansion of Section 2, which focuses on the causes of hypoxia, to include more detail on all potential causes; moving the section on effects to precede the section on approaches; and combination of the section on remaining uncertainties with the section on adaptive management.

Mr. Pryor informed the Task Force of a science meeting scheduled for December 3 to address some of the comments received on the IA. The participants will include scientists with expertise on hypoxia issues from government, academia, and the private sector. The scientists will explore three major questions: (1) what is the relative role of terrigenous carbon as a driver of hypoxia?; (2) what is the history of total nitrogen flux (and its constituent forms) from the basin?; and (3) what is the relationship of nitrogen inputs (fertilizer, manure, atmospheric, municipal wastewater) to organic nitrogen soil inventories and nitrogen inputs? The meeting is intended to identify areas of agreement and disagreement and to outline the approaches needed to resolve these issues.

Mr. Pryor then summarized each section of the draft IA. The areal extent of the hypoxic zone has been measured to be up to 8,000 mi^2 (larger than the size of the state of New Jersey) in the summer months. He explained that the section on causes received the most comments from the public and highlighted some of the comments received. Scientific evidence indicates that hypoxia in the Gulf is caused primarily by excess nutrients delivered to Gulf of Mexico waters from the Mississippi-Atchafalaya drainage basin, in combination with the stratification of Gulf of Mexico waters. Nitrogen is the only nutrient that has increased significantly in concentration and loads in the Mississippi River in recent decades. He explained that factors other than nitrogen inputs, such as carbon flux from the river or up-welling from deeper offshore water, might also affect the size of the hypoxic zone but are secondary factors. Mr. Pryor said there have been significant increases in nitrate levels in the basin from the 1970s to the present, with most of the increases occurring before 1980. He stated that the major inputs of nitrogen over time appear to be related to fertilizer use, and landscape changes in the drainage basin, and he reviewed the percentage contributions of point and nonpoint source inputs throughout the basin in terms of percent of nitrate and percent of total nitrogen. Mr. Pryor then reviewed the consequences of hypoxia in the Gulf in terms of both ecological and economic effects.

Mr. Pryor reviewed possible approaches to address hypoxia in the Gulf of Mexico which range from no additional actions to implementing nitrogen loading reductions by reducing nitrogen inputs through changing farm practices and reducing point source discharges, and increasing denitrification by creating and restoring wetland and riparian buffers and diverting rivers in coastal Louisiana. He stated that a decrease in nitrogen loading to the Gulf of Mexico of 20 to 30 percent would result in a 15 to 50 percent increase in dissolved oxygen, according to model predictions. Changing farm practices and reducing point source discharges produced the most significant results. Mr. Pryor acknowledged that one of the problems with the estimates of effects of changing farm practices (900 to 1,400 thousand metric tons/yr) is that the estimates are "edge of field" estimates rather than changes in loading in the mainstem of the river.

Finally, Mr. Pryor reviewed the framework for adaptive management, including the role of research, modeling and monitoring. He stated that in keeping with the intent to provide information rather than recommendations, there is no recommendation on how to coordinate the various activities among agencies and that this might be something for the Task Force to address.

Discussion Session

Task Force - Comments raised by Task Force members on the Integrated Assessment included the desire to add the issue of the Atachafalaya Basin diversions to the discussion at the December 3 science meeting; the need to be clear on presentation of nutrient loading inputs; concern over using "edge of field" estimates; caution against the appearance that the IA has already pre-selected the approach that will be taken to reduce nitrogen loadings; and the recognition that an environmental issue (hypoxia) has been clearly identified and there is a need to proceed with controls.

Chuck Fox agreed that clearly there are still some uncertainties with the science but he hopes there are some basic agreements on trends that will lead to some policy recommendations. He stated that there are

still other questions to answer on some of the interactions that occur and urged the science community to look at some of these interactions.

Public - Questions and comments raised by the public included concern about the appropriateness of the data used in the economic model; concern that the Task Force is still not willing to state that agricultural activities are responsible for most of the nitrogen inputs; a request to include scientist representatives from environmental groups at the December 3 science meeting; a request to clarify that the numbers that have been cited (e.g., 20 percent reduction in fertilizer use) are not recommendations; a recommendation that the solutions should be implemented on a state-by-state basis, not on a national level; and a request that the Task Force consider the amount of contribution from point sources (very small) and the additional controls needed to achieve further reductions (prohibitive).

AFTERNOON

Action Plan Discussion

The afternoon focused on discussion of the Action Plan, which is required by Congress to address the hypoxia problem in the Gulf of Mexico. The Action Plan is expected to be available in draft form by late spring of 2000 and to be finalized by early fall.

Jim Giattina, Gulf of Mexico Program

Mr. Giattina provided a summary of the win-win strategy developed last year (prior to passing of the Harmful Algal Bloom and Hypoxia Research Control Act) to possibly serve as a framework for the development of the Action Plan. The strategy emphasizes a national context to address the hypoxia problem and builds on water quality efforts under way. It includes the efforts of the Clean Water Act and the Farm Bill, as well as state efforts.

Mr. Giattina explained that the win-win strategy includes both long-term and short-term goals. The long-term goals are set for each of the 31 states within the basin as well as the Gulf of Mexico. Short-term goals have been identified to evaluate the compliance of point source controls, to ensure the implementation of best management practices, and to determine the amount of wetlands and riparian buffers that have been created or restored.

Mr. Giattina then reviewed the key roles and responsibilities of landowners, states and tribes, and federal agencies in the "win-win" strategy. The strategy also recommends various indicators (environmental, programmatic, and economic) to evaluate progress toward meeting the goals. Finally, he presented the range of options outlined in the strategy, from no additional action to further implementation of existing activities/programs such as nutrient standards, best management practices (BMPs), and Total Maximum Daily Loads (TMDLs).

Bruce Baker, Wisconsin Department of Natural Resources

Mr. Baker presented the results of the discussion from the Coordination Committee on its recommendation for the Action Plan. He stressed that prevention is always cheaper than remediation and the longer it takes to implement the restoration activities, the higher the cost. Mr. Baker stated that the Task Force should set other goals in addition to the goal of reducing nitrogen.

Framework. Mr. Baker proposed using the win-win strategy as a framework for developing the Action Plan, recognizing that adaptive management must be used for any solution selected. He stated that a timeframe for achieving the nitrogen reductions should be included in the Action Plan, as well as a date

for reevaluation of the goals. He also stressed that many water quality efforts are already under way for both nitrogen and phosphorus which should be recognized in the framework.

Principles. Mr. Baker recommended that the framework be flexible to allow states to determine the feasibility of meeting the goals and making adjustments. He stressed that it is important to state that these goals will not become regulations, will be implemented on a voluntary basis, and all interests (from the agricultural community to the municipalities) need to be involved in setting the goals.

Goals/targets. Mr. Baker stated that a quantitative goal should be an element of the Action Plan to motivate efforts and provide a basis for evaluating progress. He noted that there are several issues that need to be clear in considering what the goals should be:

1. Reductions in loadings to the Mississippi River/Gulf or use of fertilizer (Chuck Fox clarified that the percent reduction refers to loadings);

2. Reductions against what baseline (1990 was suggested);

3. There should be a consensus that the goal is feasible; and

4. There should be a process to revisit the goal as more is learned about hypoxia.

Mr. Baker stressed that any Action Plan would be successful only if assistance was given to the states in terms of funding and technical support.

Charles Chisolm, Mississippi Department of Environmental Quality

Mr. Chisolm then proposed how the Task Force could move from the win-win strategy to the Action Plan. The Coordination Committee was in general agreement on using the win-win strategy as a framework. He stated that the strategy would have to be updated to reflect the state of the science. Mr. Chisolm outlined three key points: (1) adaptive management must be used for whatever goals are selected; (2) current water quality efforts need to be recognized (i.e., TMDLs, Stormwater Phase II, nutrient criteria, etc); and (3) the need for numerical goals—at this time there seems to be neither a sufficient basis nor a purpose to establishing numerical goals. He emphasized that the issue is not what goals will be selected, but what framework will be used.

Discussion Session

Task Force - The Task Force generally agreed with Mr. Baker's and Mr. Chisolm's comments. Comments from the Task Force members included the following recommendations: build flexibility into the Action Plan using a process of adaptive management; solicit the states as to what kind of technical assistance or funding is needed; define the terms being used (e.g., *flexibility*); establish indicators for each the goals (i.e., timber harvests, acres of conservation land, floodplain management, storm water) and correlate the goals with state program goals; ensure that the goals are feasible, acceptable, and supportable; identify the cost implications of implementing some of the goals; conduct additional monitoring (more stream gauging stations are needed throughout the basin) if adaptive management is going to be used; identify and coordinate among Agency programs in terms of scale as well as activities to determine how these efforts will work together; and expand restoration activities into the tributaries. With respect to Atchafalaya River diversions/MS River modifications, MG Anderson indicated that the Corps would be glad to examine the issues associated with the engineering modifications that have been made to the lower MS/ Atchafalaya system as they relate to the hypoxia problem. However, he also emphasized that human dimensions to the way the rivers were engineered also need to be taken into account.

Public - The public provided the following comments and recommendations: support of the idea to make the Action Plan voluntary; involve nongovernmental organizations that will be responsible for implementing the plan; incorporate existing conservation plans into the Action Plan; use the Action Plan as an opportunity to implement activities such as alternative cropping and floodplain silviculture; incorporate the issue of climate change into the plans; set a baseline that will allow current efforts to receive credit, but be careful not to create a divisive situation of groups that have already met the targets versus groups that have not; incorporate the work of nongovernmental organizations into the existing efforts identified; and include citizen-based organizations, preferably on the Task Force, to help shape the Action Plan.

Discussion on Stakeholder Participation in the Plan Development

Chuck Fox then asked the Task Force members how to best engage stakeholders and other interested parties in the process of developing the Action Plan. He reviewed the mechanisms currently being used by the Task Force: the meetings are open to the public, there is a web site highlighting key activities, and a mailing list of interested parties is used to send out relevant information.

He also stated that he sent out letters to the governors and tribal leaders in the basin states requesting their participation in defining the process to be used for the Action Plan. He asked them to designate a point of contact and has heard back from several of them.

Recommendations to increase stakeholder involvement included making presentations to national associations such as the Environmental Council of the States, National Governor's Association, and others.

Action Items:

- Glenda Humiston offered to make a presentation at the upcoming meeting of the Advisory Committee on Water Information to help build a case for acquiring new gauging stations.
- The Coordination Committee will provide information on cost implications for implementing various goals.
- The Coordination Committee will meet in the near future to continue the process of developing the Action Plan. The Task Force felt there was no need to establish a separate subcommittee. No specific meeting date was set.
- The next meeting will tentatively be in April, possibly April 19, 2000.

Integrated Assessment
-Process-

Sept, 1996	**CENR requested to review science**
Aug, 1997	**science review planning workshop**
Mar, 1998	**Assessment Plan approved**
May, 1999	**review of 6 reports completed**
Aug, 1999	**public comment on reports received**
Oct, 1999	**draft Integrated Assessment release**
Dec, 1999	**public comment on draft**
Mar, 2000	**transmit Integrated Assessment**

Integrated Assessment
-Outline-

DRAFT OUTLINE

Executive Summary

1. **Problem Statement**
2. **Causes**
3. **Consequences**
4. **Options**
5. **Direct and Indirect Effects**
6. **Strategy for Adaptive Management**
7. **Remaining Uncertainties**

Integrated Assessment - Integrating Questions

DRAFT INTEGRATING QUESTIONS FOR ASSESSMENT

1. What effects (environmental and economic) are likely for both the watershed and the Gulf of Mexico, over the next 10-20 years, if current activities are unchanged?

2. What effects (environmental and economic) are likely for both the watershed and the Gulf of Mexico, over the next 10-20 years, if nutrient loads to surface waters in the watershed are reduced by 20-30% and 50%?

3. What are the most cost-effective and practical reduction measures to achieve 20-30% and 50% reductions in nutrient loads to surface waters in the watershed? Describe the geographic variation of these measures. (This could be one approach for each target, or some alternatives for each target.)

4. What watershed, river, and Gulf efforts are needed to monitor the effectiveness of nutrient load reduction measures taken and to facilitate adaptation of those measures over time?

5. What are the most critical remaining uncertainties and what research is needed to reduce them?

Integrated Assessment
-Writing-

- **Outline/Integrating Questions**
- **Identify Extracts from 6 Reports**
- **Review Public Comment**
  - **-- reformulate outline?**
  - **-- change extracts?**
  - **-- get expert analysis**
- **Draft Integrated Assessment**
- **Review**
- **Release for Public Comments**

Integrated Assessment
-Outline-

REVISED OUTLINE

Executive Summary

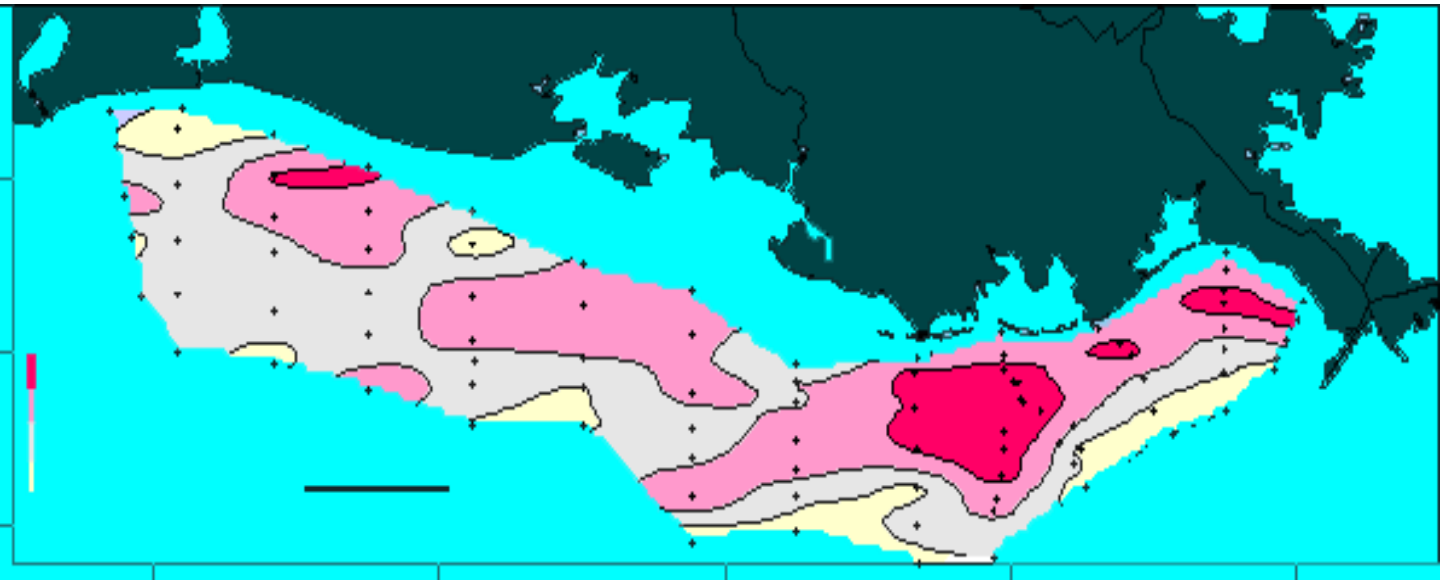
Introduction

1. **The Problem**
2. **Causes**
3. **Consequences**
4. **Effects**
5. **Approaches**
6. **Strategy for Adaptive Management; Action, Monitoring and Research**

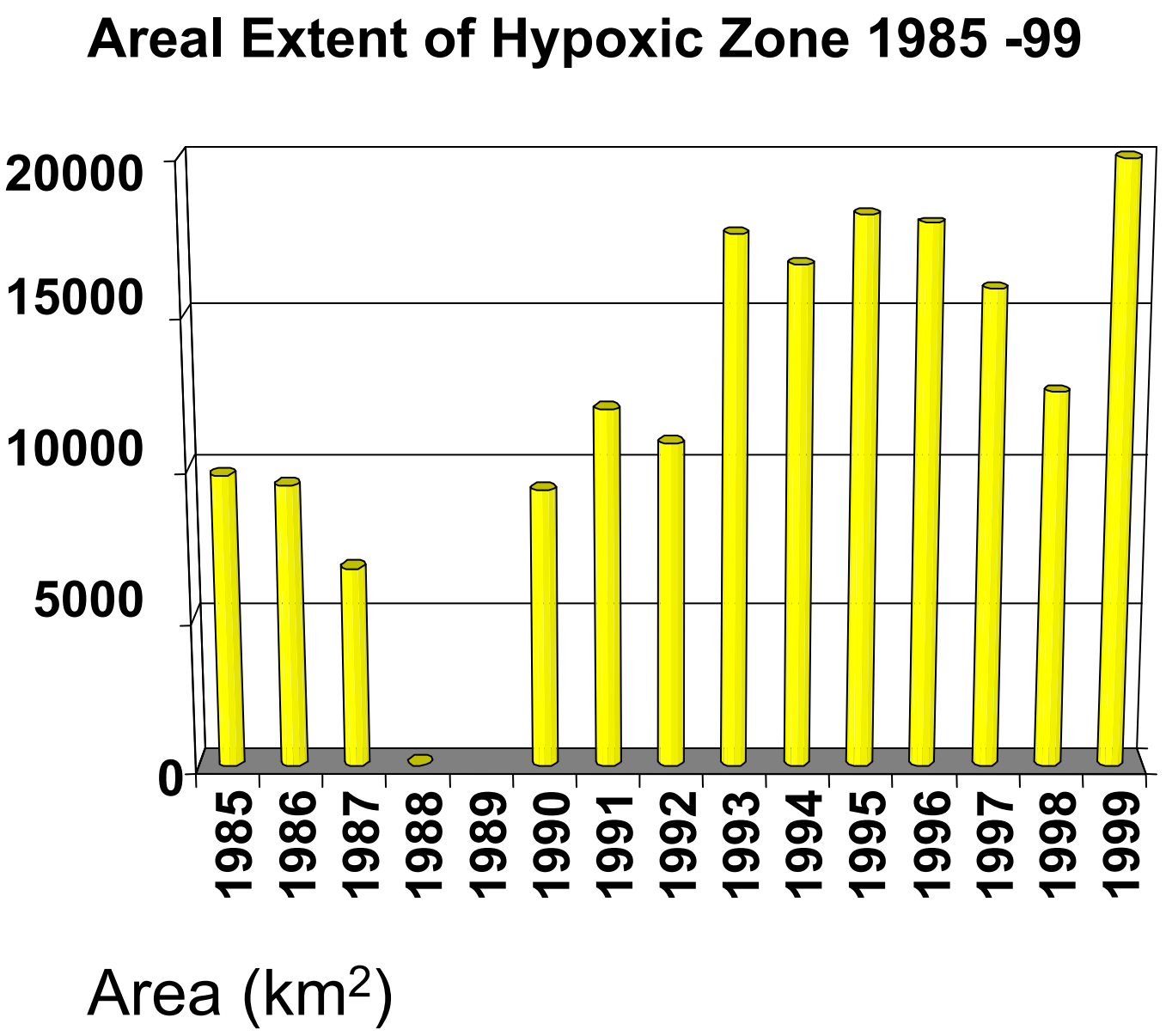
Integrated Assessment
-Causes-

IL: The importance of freshwater flux and stratification has been unduly discounted

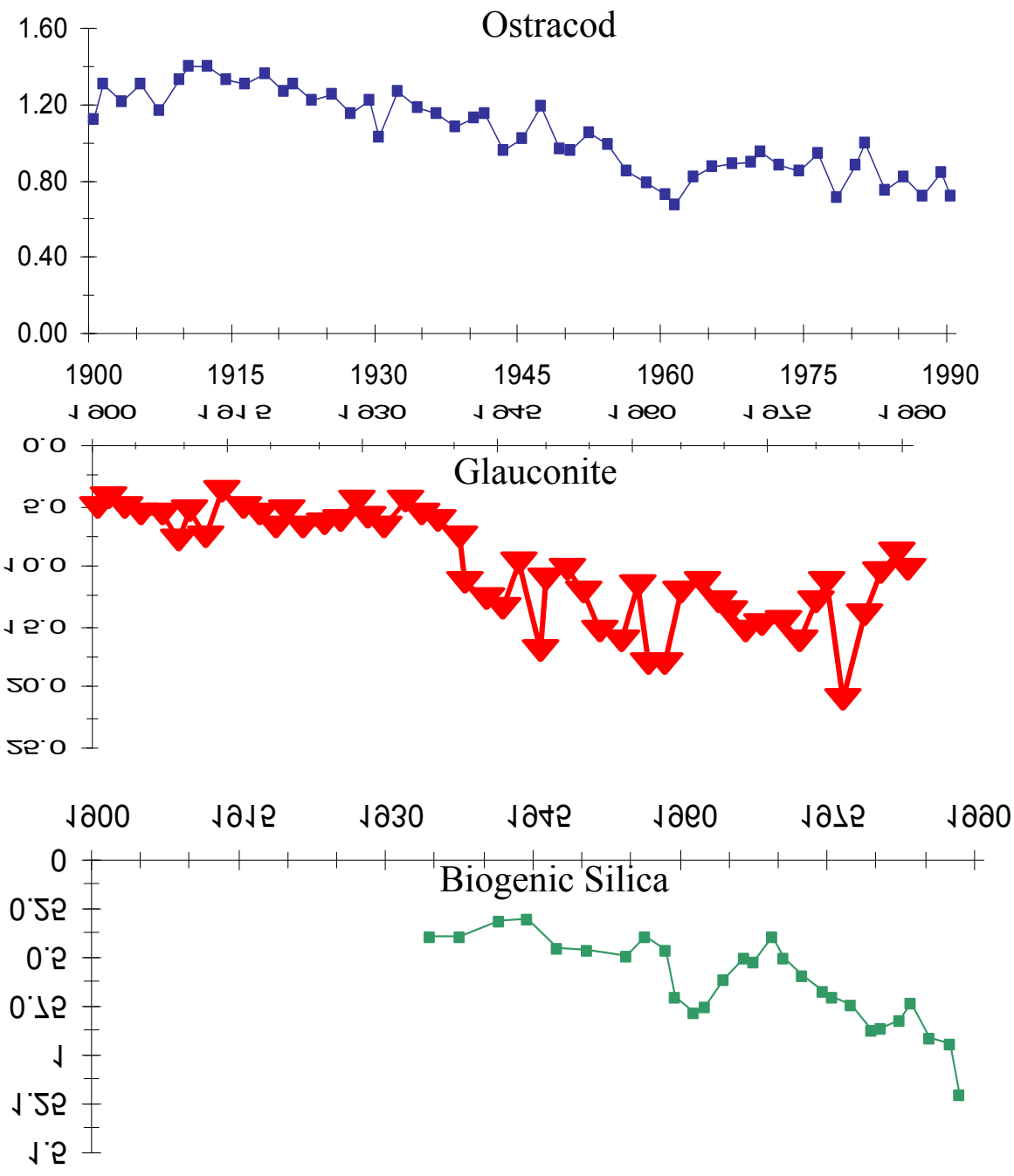
Integrated Assessment
-The Problem-



Integrated Assessment
-The Problem-



Integrated Assessment
-Causes-



Integrated Assessment
-Causes-

PRIMARY PRODUCTIVITY

IL: Primary productivity in the Gulf has decreased, not increased

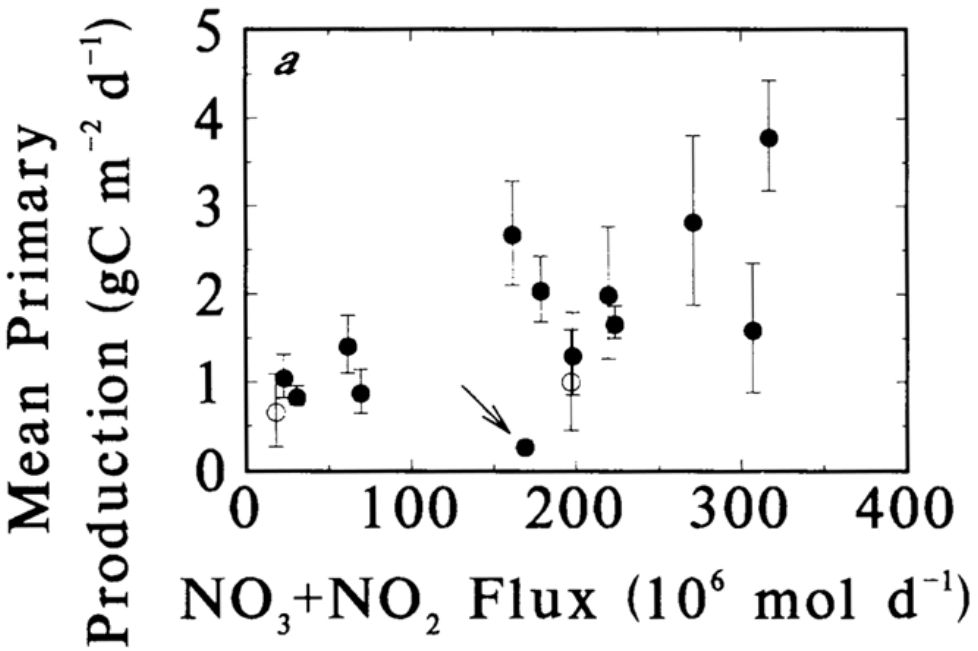
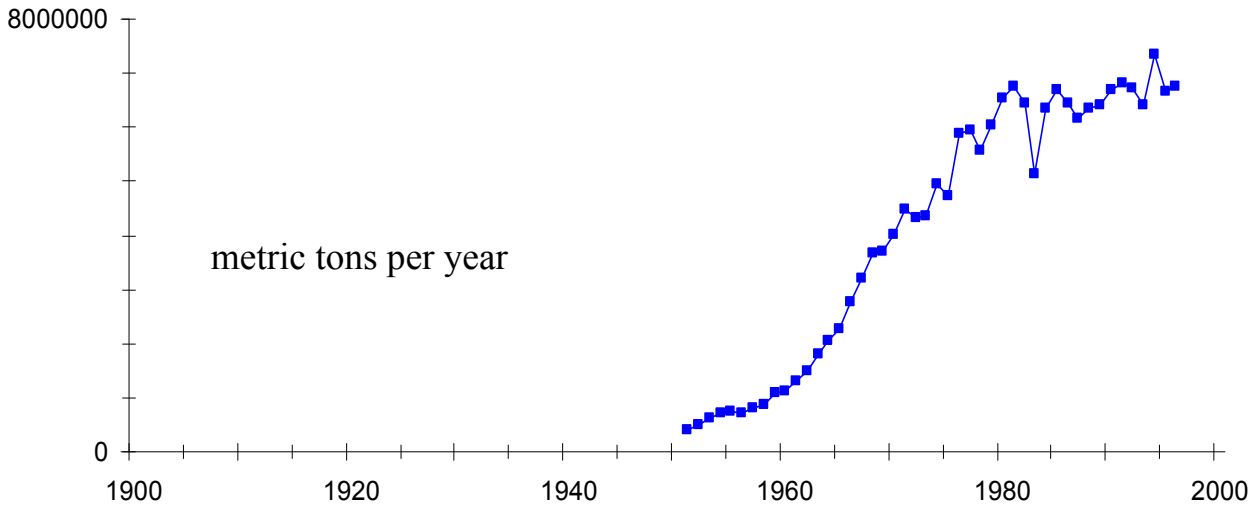


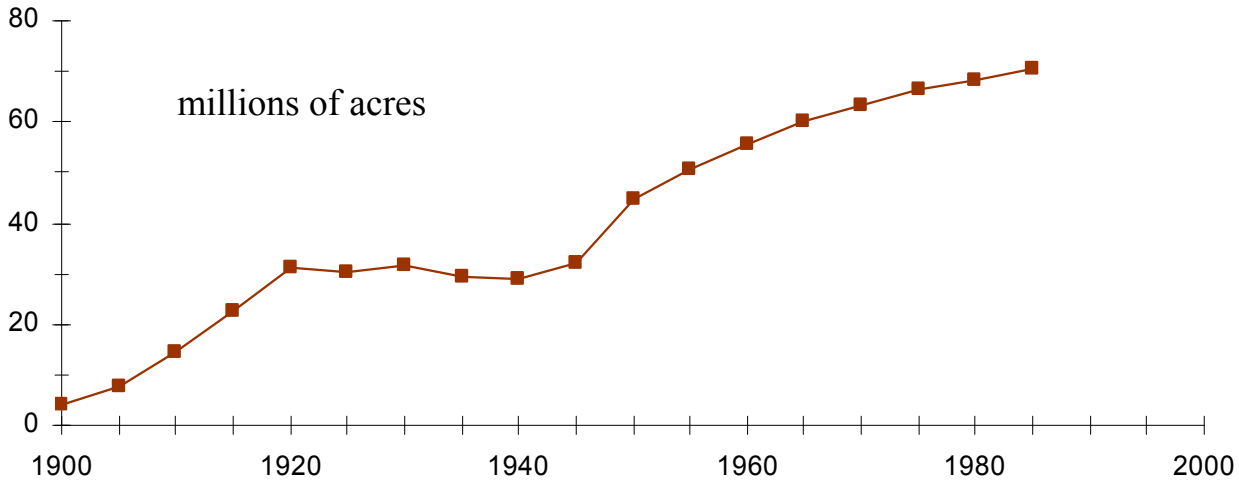
Figure 45. Relationship between mean primary production for the combined central and eastern regions of the Mississippi River bight and riverborne nitrate and nitrite flux, Historical primary production data from Thomas and Simmons (1960) are included in (a) and (b) for comparison (o). Error bars are ± 1 s.e. (From Lohrenz et al. 1997.)

Integrated Assessment
-Causes-

Estimated nitrogen fertilizer use in Mississippi River Basin



Estimated land drainage in Mississippi River basin states



Integrated Assessment
-Causes-

Oxygen stress in the northern Gulf of Mexico is caused primarily by excess nutrients delivered to Gulf waters from the Mississippi-Atchafalaya River drainage basin, in combination with stratification of Gulf waters.

Integrated Assessment
-Causes-

POTENTIALLY CONTRIBUTING FACTORS

- **Landscape changes in the drainage basin**
- **Organic loading from the Mississippi River**
- **Channelization of the delta and loss of coastal wetlands**
- **Intrusion of deeper offshore waters**
- **Short- or long-term climate changes**

Integrated Assessment
-Causes-

ORGANIC CARBON

IL: "The large flux of organic carbon has been unduly discounted."

Carey et al.:

Q: How does organic carbon transport in the river affect hypoxia in the Gulf?
A: -- large export of C, esp. in floods;
-- more sediment C is from terrestrial sources than previously thought;
-- insufficient information to assess ultimate sink for this material

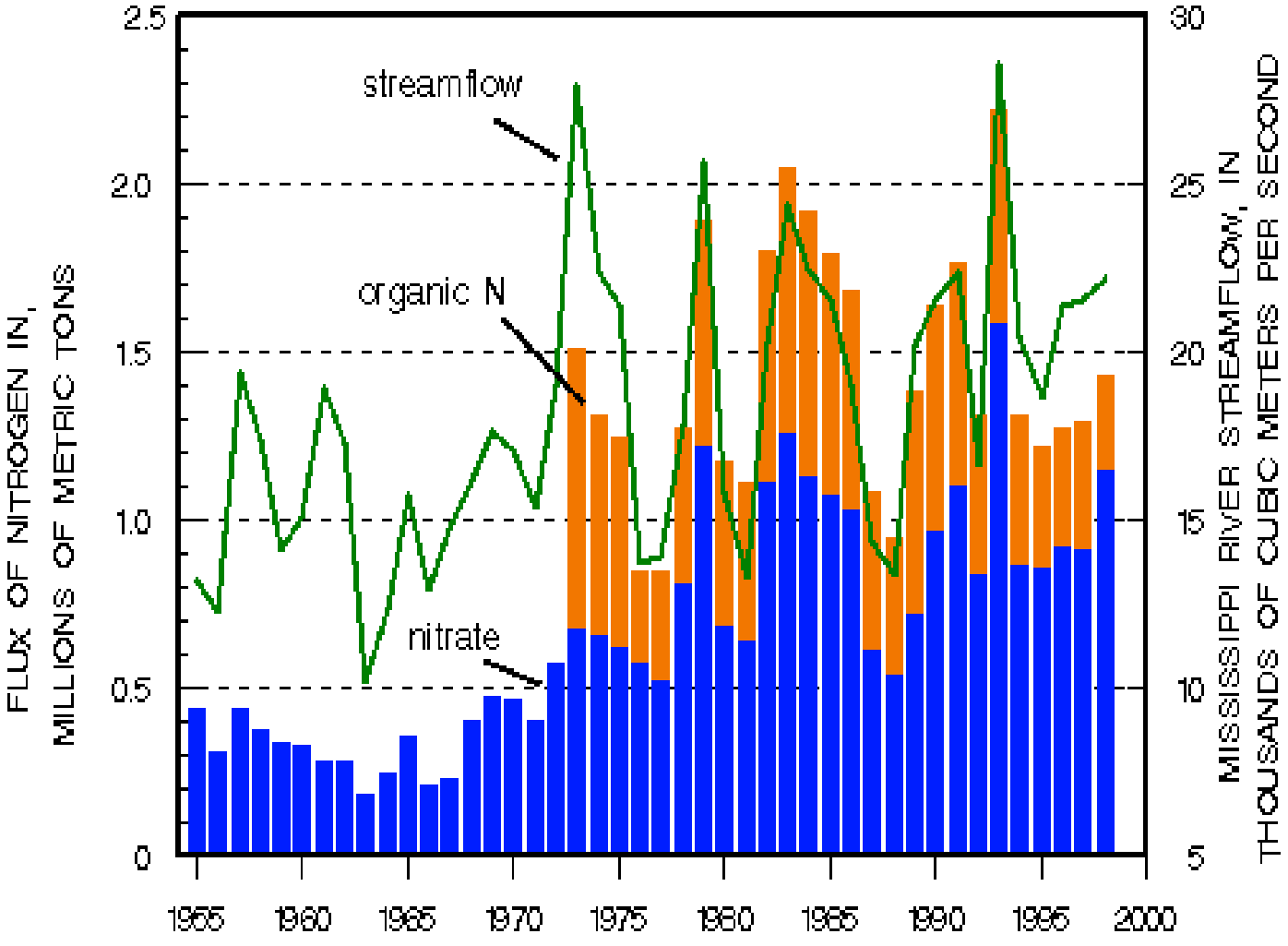
"even if only 10% of the total organic C flux could be metabolized within the bottom waters or at the sediment-water interface, this could account for a significant portion of O_2 loss"

Integrated Assessment
-Causes-

ORGANIC CARBON

- **Relatively small factor in O_2 depletion**
  - **-- max deposition into bottom layer of hypoxic zone is only 18% of labile C in river**
  - **-- nitrogen loading produces about 15 times greater O_2 depletion than C because of biological ratios and recycling**
- **Independent evidence that sediment C is largely marine in origin**

Integrated Assessment
-Causes-



Integrated Assessment
-Causes-

TOTAL NITROGEN

IL: A wealth of historical data demonstrates that nitrogen concentrations and/or fluxes of nitrogen in the Mississippi and Illinois Rivers have not discernably increased over those of a century ago.

St Francisville

	nitrate (#3, tbl 3-4) (mg/l)	est. total N (4x nitrate) (mg/l)	meas. Total N (#3, tbl. 3.1) (mg/l)
1905-06	0.56	2.24 (2.8)	--
1955-65	0.65	2.60 (3.25)	--
1980-96	1.45	5.80 (--)	2.26

Integrated Assessment
-Causes-

TOTAL NITROGEN

IL: A wealth of historical data demonstrates that nitrogen concentrations and/or fluxes of nitrogen in the Mississippi and Illinois Rivers have not discernably increased over those of a century ago.

Location	ammonium-N	Total org N	NO2+NO3-N	total N
Lower Illinois River				
Grafton 1897-1902	0.31	1.09	1.29	2.69
Valley City 1980-96	0.15	1.22	4.12	5.49
Mississippi River (below Illinois R. & above Missouri R)				
1899-1900	0.13	1.18	0.46	1.77
1980-96	0.12	1.29	2.78	4.19
Missouri River				
Ft Belfontaine 1899-1900	0.07	1.83	0.50	2.40
Hermann 1980-96	0.05	1.00	1.23	2.28

Integrated Assessment
-Causes-

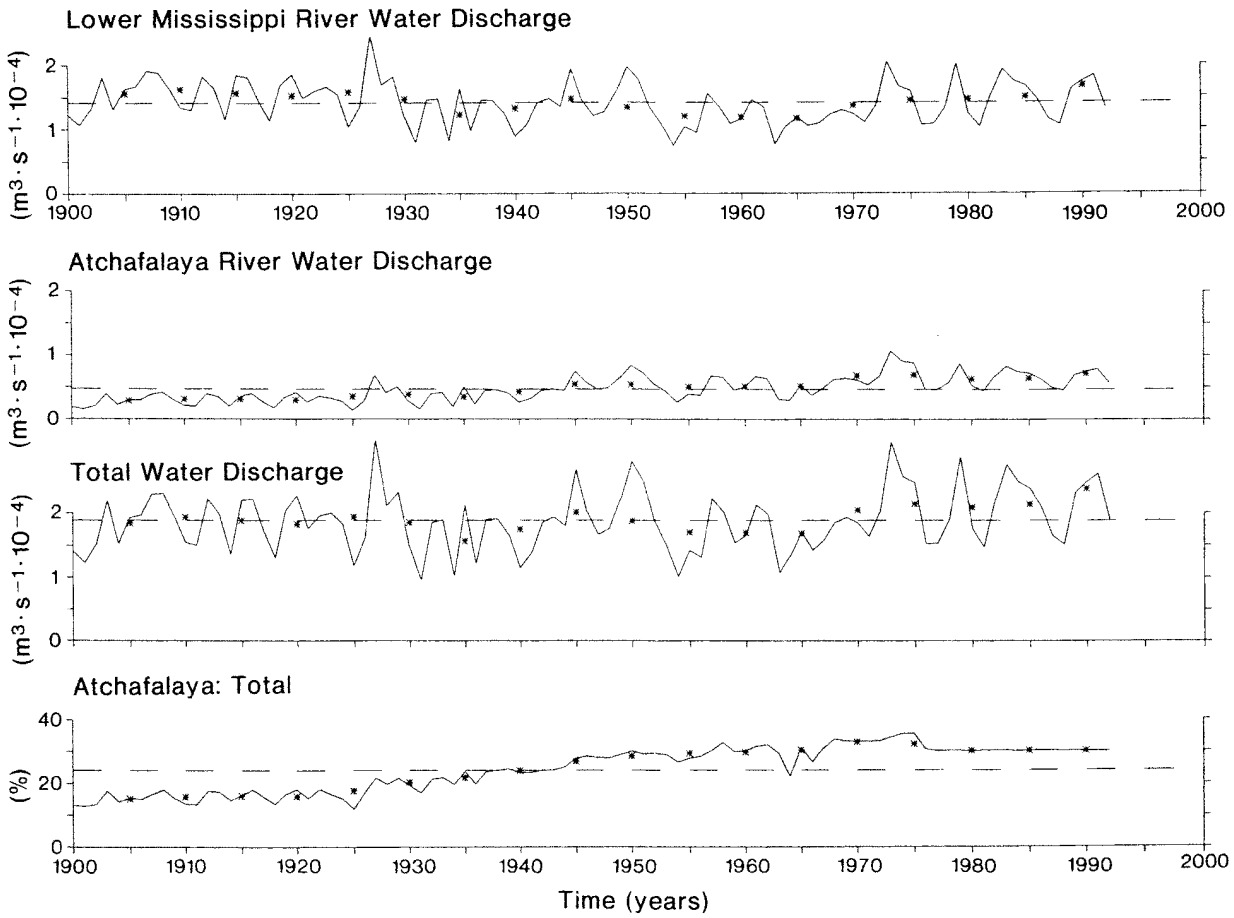


Figure 32. The 92-yr annual average water discharge time-series data for the lower Mississippi River, Atchafalaya River and combined flow. The lower panel shows the flow ratio for the same time period; Atchafalaya River to total flow. *s are centered, decadal running-mean-averaged values (last values are partially extrapolated). Dashed horizontal lines are 92-yr average values. The Atchafalaya River to total flow has been strictly regulated at ~30% since 1977. (From Bratkovich et al. 1994.)

Integrated Assessment
-Causes-

SCIENCE MEETING

- **Explore three scientific questions related to causes of hypoxia**

    1. **What is the relative role of terrigenous carbon as a driver of hypoxia?**
    2. **What it the history of total nitrogen flux (and its constituent forms) from the Basin?**
    3. **What is the relationship of nitrogen inputs (fertilizer, atmospheric, municipal waste water) to organic nitrogen soil inventories and nitrogen outputs?**

- **Identify areas of agreement, the essence of disagreements, why the disagreements may be there and what it would take to resolve them**

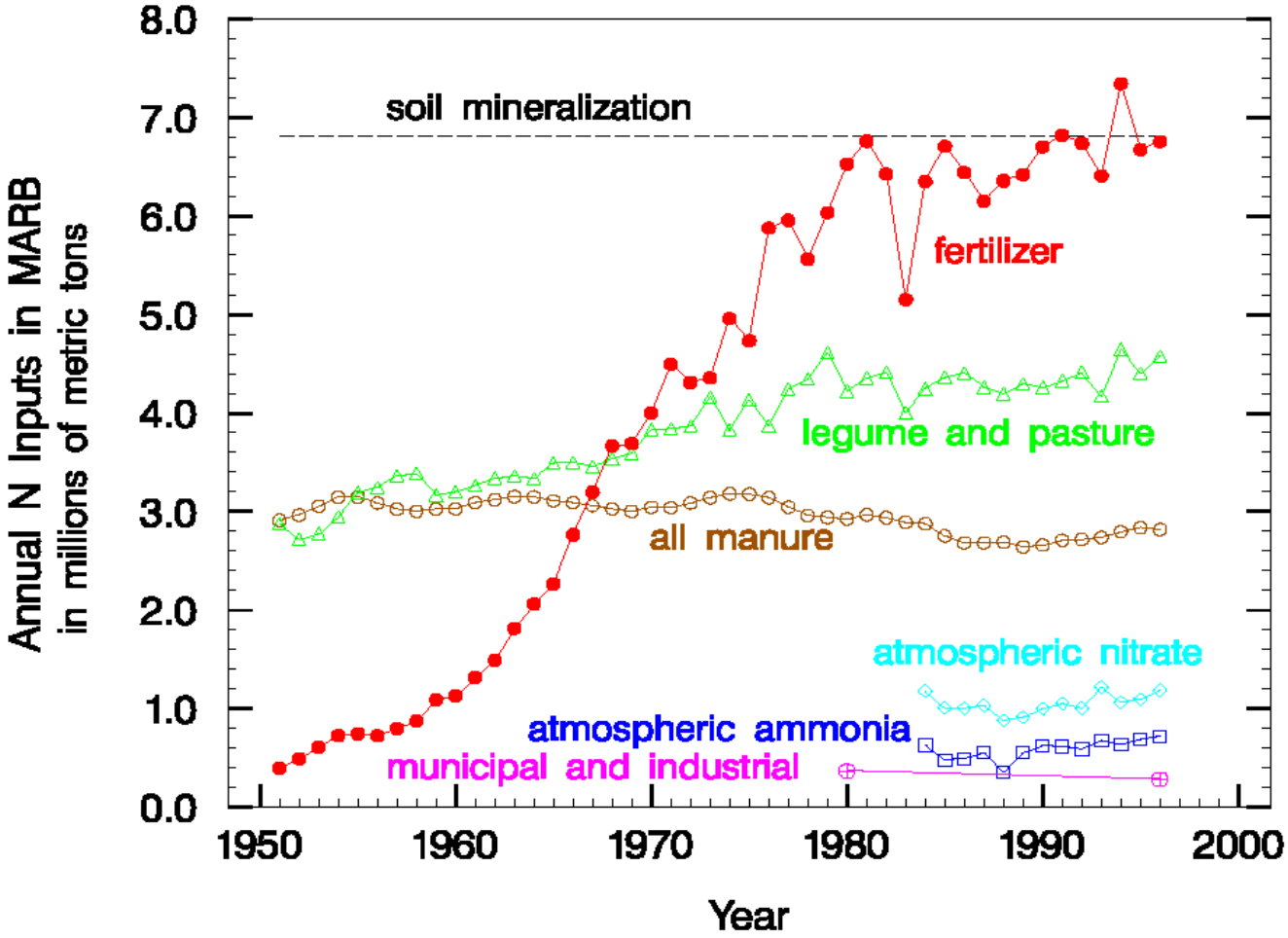
Integrated Assessment
-Causes-

SCIENCE MEETING

Jim Baker, Iowas State
Vic Bierman, Limno-Tech
Don Boesch, Univ. of Maryland
Mike Burkart, USDA NSTL
Anne Carey, Ohio State
John Downing, Iowa State
Joe Engeln, Missouri DNR
Jim Giattina, Gulf of Mexico Proigram
Don Goolsby, USGS
Bob Howarth, Cornell
Paul Kendiger, Ag Retailers Assn
Doug Knauer, WI DNR .
Don Parrish, Am. Farm Bureau
Jonathan Pennock, U. Alabama, Dauphin Island Sea Lab
Don Pryor, NOAA
Tom Pullen, USACOE Vicksburg
Jim Porterfield, Am. Farm Bureau
Nancy Rabalais, LUMCON
Don Scavia, NOAA
Joe Schubauer-Berigan, EPA NCEA
Tim Strickland, USDA CSREES
Derek Winstanley, Illinois Water Survey

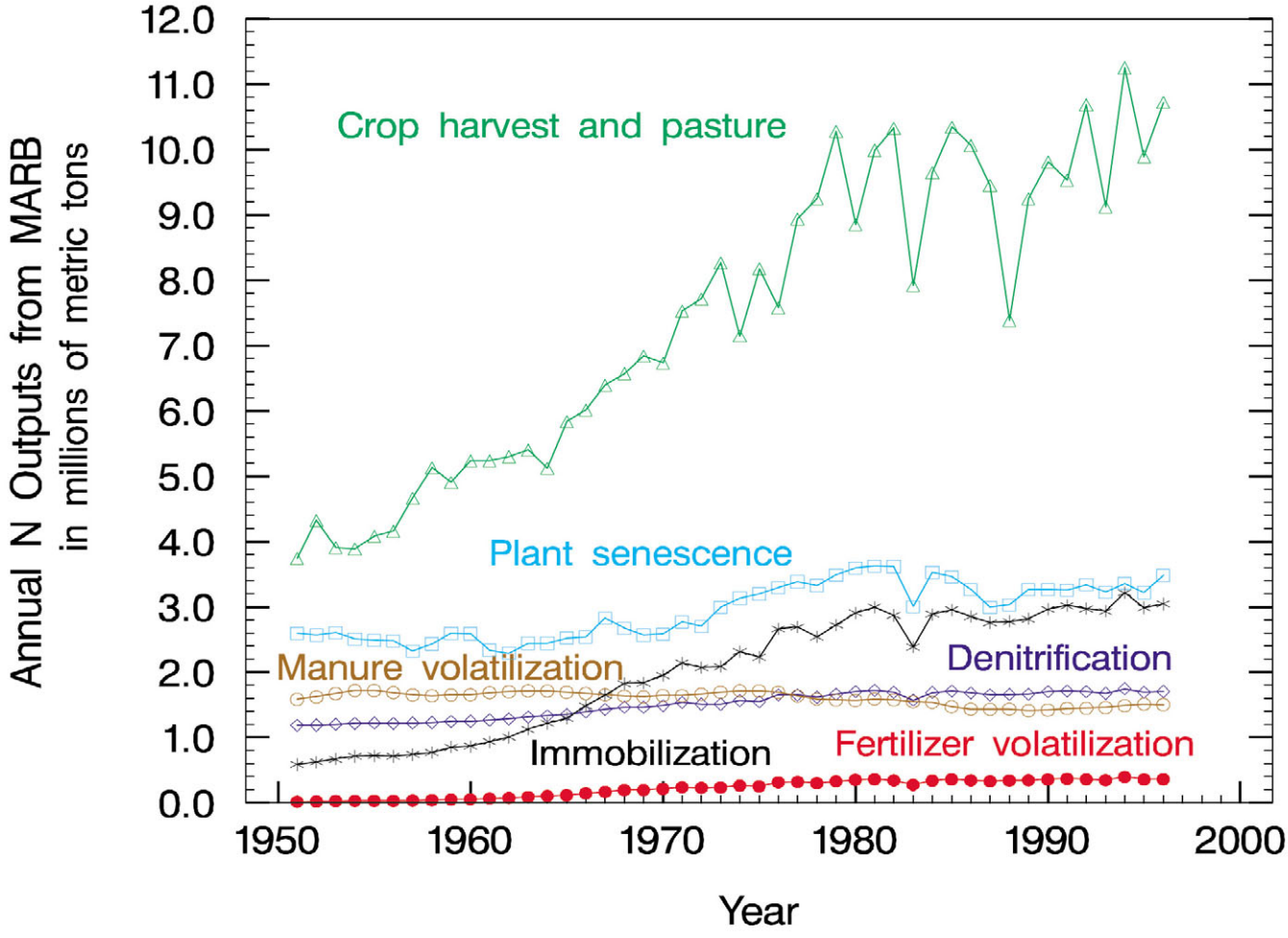
Integrated Assessment
-Causes-

ANNUAL NITROGEN INPUTS



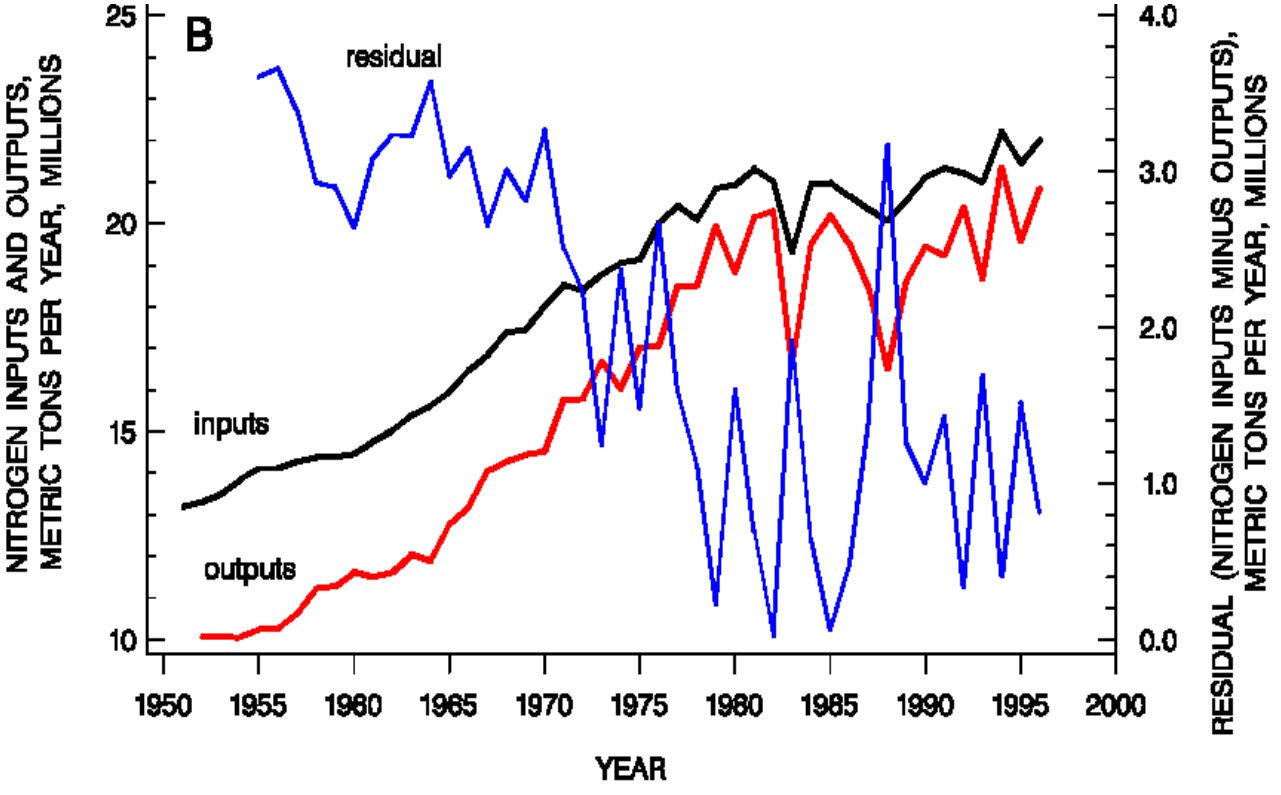
Integrated Assessment
-Causes-

ANNUAL NITROGEN OUTPUTS



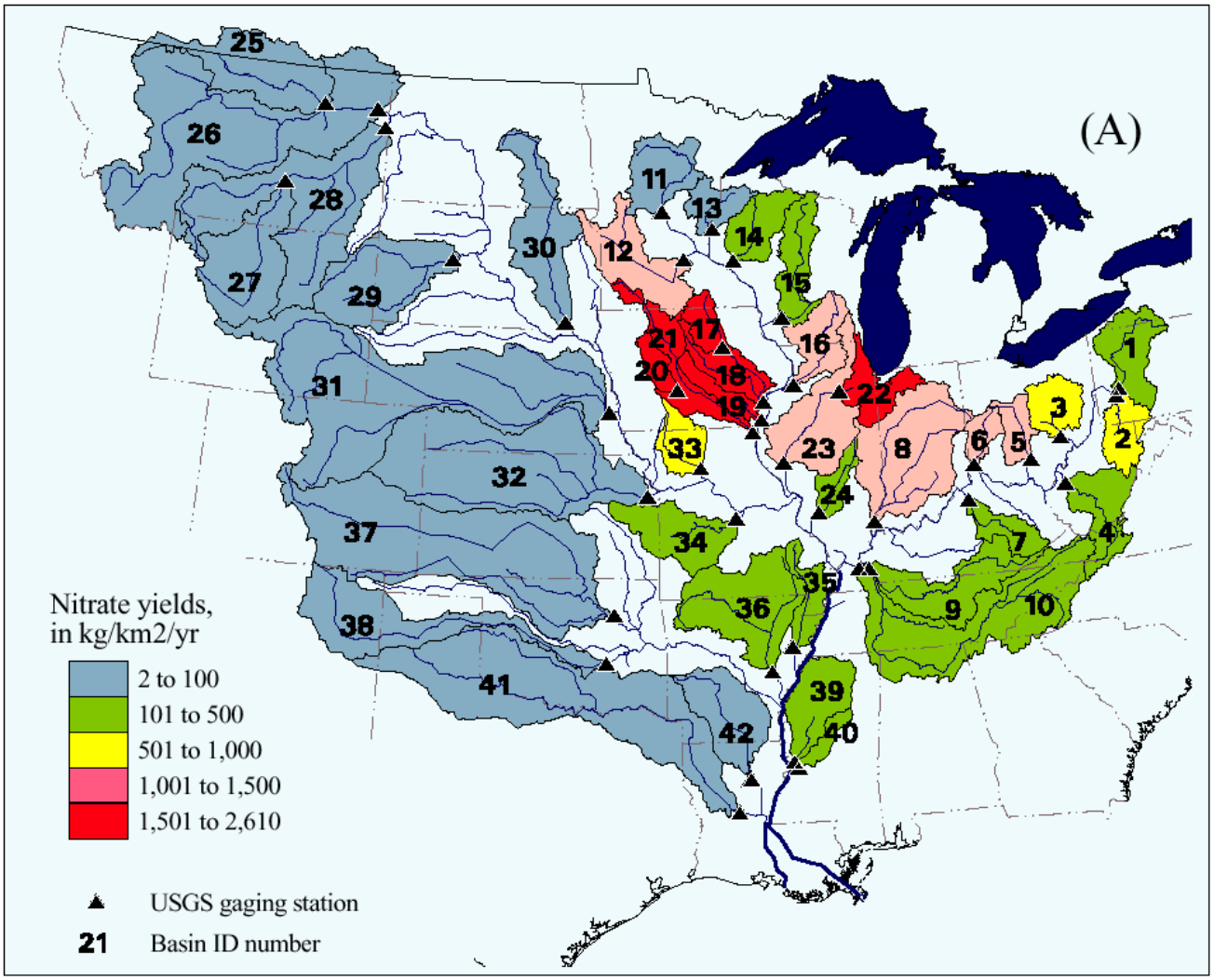
Integrated Assessment
-Causes-

ANNUAL NITROGEN INPUTS, OUTPUTS AND RESIDUALS



Integrated Assessment
-Causes-

AVERAGE ANNUAL NITRATE YIELDS FOR 42 BASINS WITHIN THE MARB



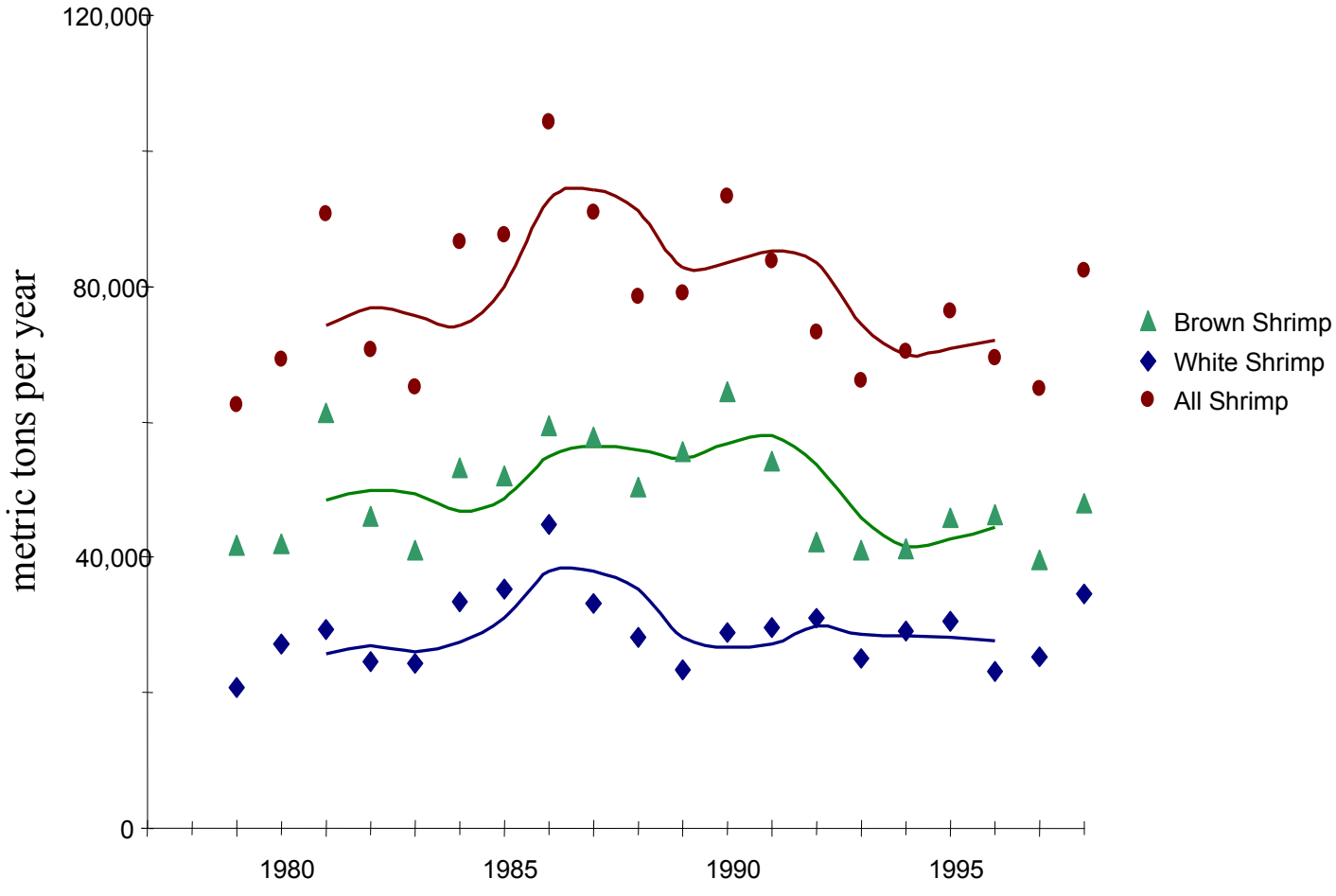
Integrated Assessment
-Causes-

Estimated Contributions of Nitrogen Input Sources to the Total Nitrogen and Nitrate Nitrogen Yield of the MARB and Flux to the Gulf of Mexico

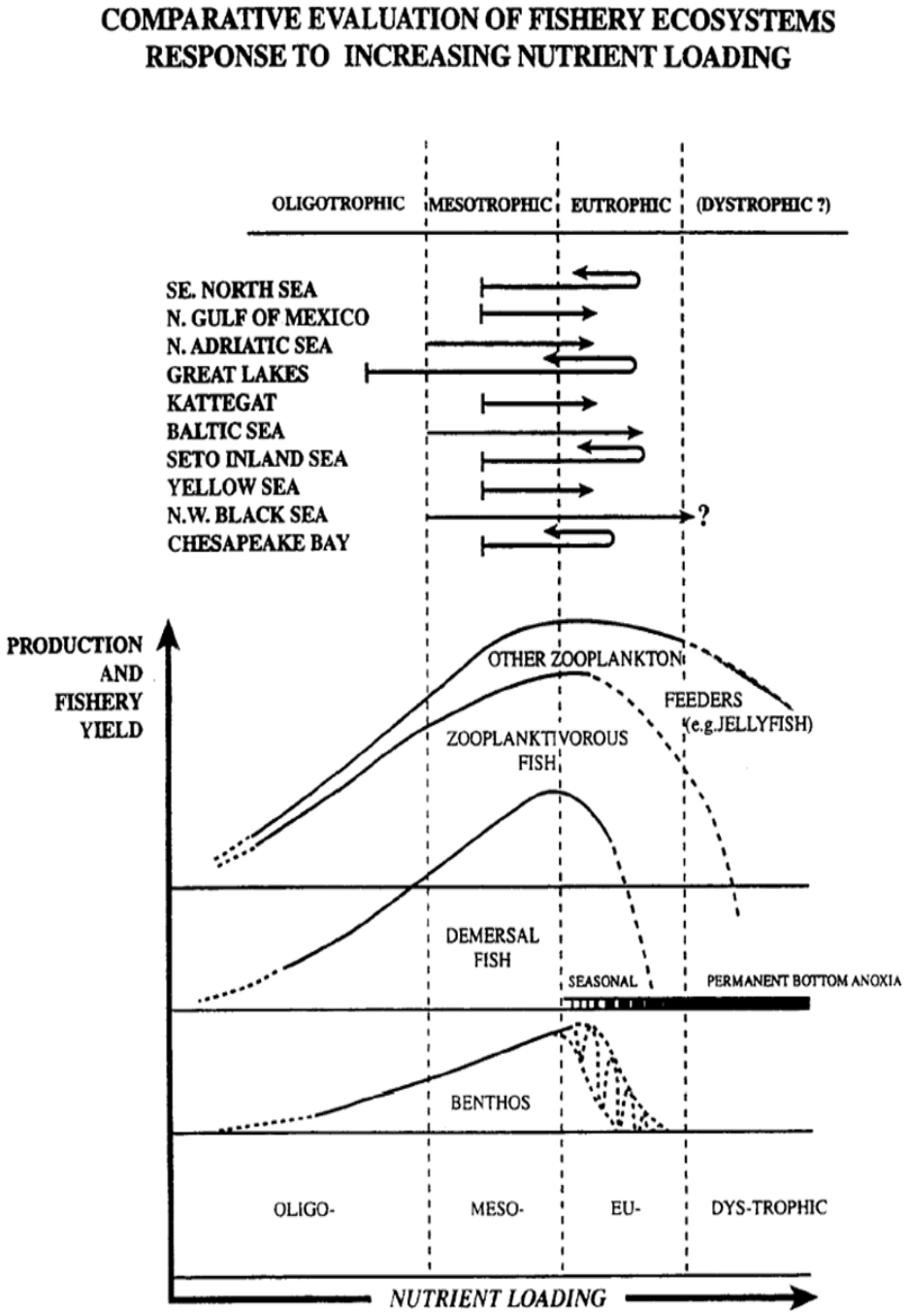
Source of Nitrogen Transported to the Gulf	Percent of Nitrate	Percent of Total Nitrogen
NON-POINT SOURCES		
Fertilizer and mineralized soil nitrogen	58	50
Animal manure	16	15
Atmospheric deposition and unmeasured inputs	16	24
POINT SOURCES		
Municipal and industrial point sources	9	11

Integrated Assessment
-Consequences-

TRENDS IN SHRIMP YIELD



Integrated Assessment
-Effects-



Integrated Assessment
-Effects-

POTENTIAL FUTURES

	Gulf	Basin
Current Activities Unchanged	?	continue impairments
Loading Reduced	+DO	+water quality +drinking water +habitat

Integrated Assessment
-Approaches-

Potential Approaches to Reducing Nitrogen Inputs

Approach	Potential Nitrogen Reduction (Thousands of metric tons/yr)
1. Changing Farm Practices	
Nitrogen management (reduction in "insurance" rates of N fertilizer application, improved manure management, crediting of nonfertilizer nitrogen)	900 - 1,400
Alternative cropping systems (Perennial crops in lieu of corn and soybeans on 10% of acreage)	500
Decrease feedlot runoff by 20%	500
2. Reduction in Point Sources	
Tertiary treatment of domestic wastewater	20

Integrated Assessment
-Approaches-

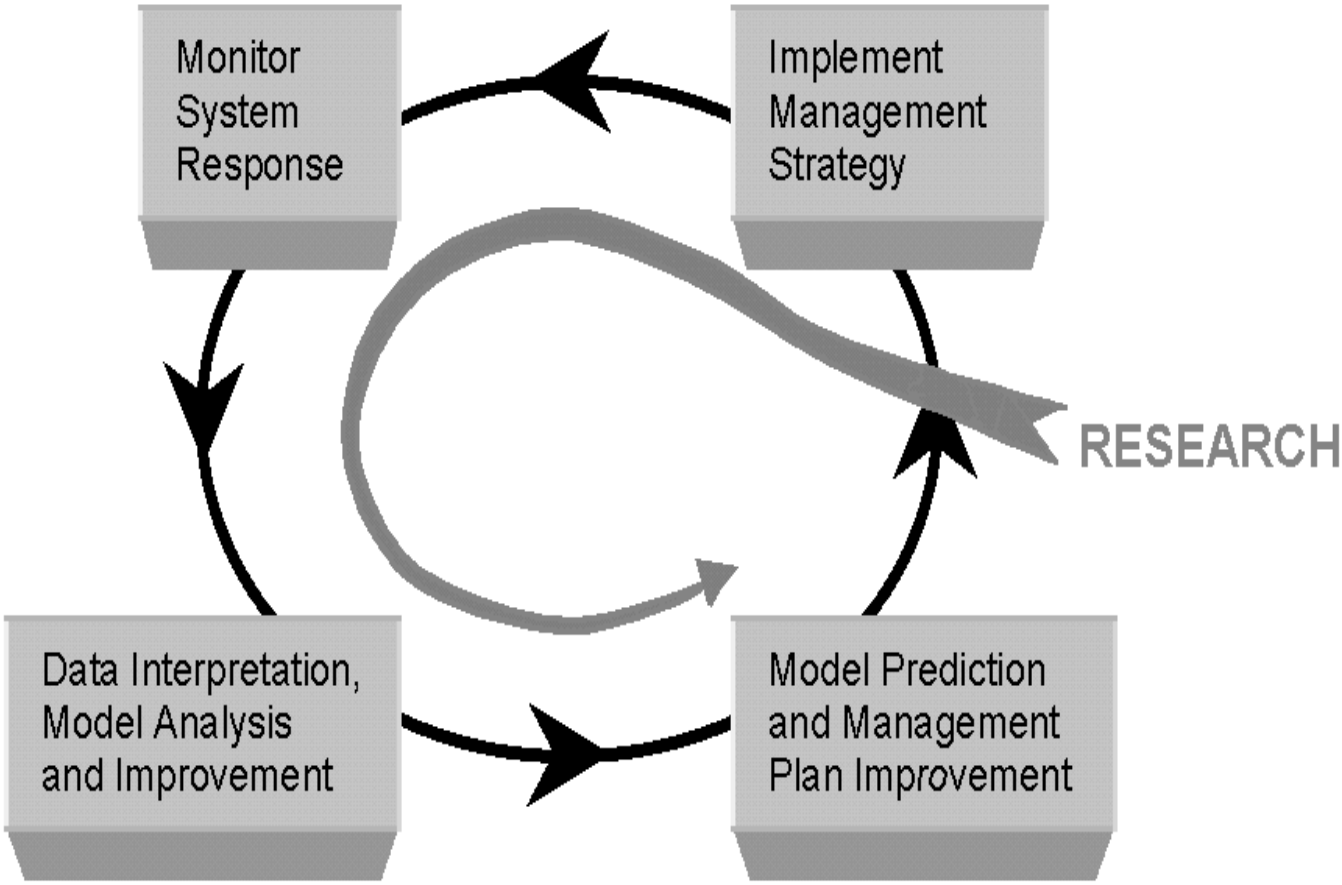
Potential Approaches to Increasing Denitrification

Approach	Potential Nitrogen Reduction (Thousands of metric tons/yr)
1. Creating and Restoring Wetlands (Create and restore 5 to 13 million acres of new wetlands)	300 - 800
2. Creating and Restoring Riparian Buffers (Restore 19 to 48 million acres of riparian bottomland hardwood forest)	300 - 800
3. Diverting Rivers in Coastal Louisiana	50 - 100

Integrated Assessment
-Approaches-

Scenario	N-loss Reduction (Thousand metric tons/yr)	Unit Cost ($/kg N-loss)	Net Cost ($/kg N-loss)
edge-of-field N-loss reductions			
20%	941	0.88	0.80
30%	1,412	1.90	1.80
40%	1,882	3.37	3.25
50%	2,352	5.20	5.08
60%	2,822	7.48	7.37
fertilizer reductions:			
20%	503	0.69	0.67
45%	1,027	2.85	2.81
500% fertilizer tax	1,027	14.54	14.50
wetlands: 1M acres	67	6.06	- 2.19
5M acres	350	8.90	1.00
10M acres	713	10.57	2.81
18M acres	1,300	11.93	4.27
riparian buffers (19M acres)	692	26.03	
river diversions to coastal wetlands	75	~6	
tertiary treatment/waste water	20	~40	

Integrated Assessment
-Adaptive Management-



Adaptive Management Framework