

***Gulf Hypoxia Science Meeting  
December 3, 1999  
Meeting Notes***

***Meeting Outcomes***

**To explore in a fact-based manner four scientific questions related to the causes of hypoxia:**

Question #1: What is the history of total nitrogen flux (and its constituent forms) from the Basin?  
(Presenter: Don Goolsby)

Question #2: What is the relative role of terrigenous carbon as a driver of hypoxia? (Presenters: Jon Pennock and Don Boesch).

Question #3: What is the relationship of nitrogen inputs (fertilizer, manure, atmospheric) to organic nitrogen soil inventories and nitrogen outputs?  
(Presenters: Mike Burkart and Don Goolsby).

Question #4: What effect does changes in freshwater flows to the Gulf have on stratification and hypoxia in the Gulf? (Presenter: Nancy Rabalais)

**To identify the areas of convergence (where there is general agreement among the scientific community) and identify the essence of disagreements, why the disagreements may be there and what it would take to resolve them.**

## Agenda

- 8:00 - 8:15 Participants introduce themselves and clarify meeting outcomes and expectations. “This meeting will be successful if...” Cindy Zook reviews meeting design and groundrules.
- 8:15 - 10:00 Presentation and discussion on Question #1: What is the history of total nitrogen flux (and its constituent forms) from the Basin?
- 10:00 - 10:15 BREAK
- 10:15 - 12:00 Presentation and discussion on Question #2: What is the relative role of terrigenous carbon as a driver of hypoxia?
- 12:00 - 12:15 Break (for working lunch).
- 12:15 - 2:00 Presentation and discussion on Question #3: What is the relationship of nitrogen inputs (fertilizer, manure, atmospheric) to organic nitrogen soil inventories and nitrogen outputs?
- 2:00 - 2:15 BREAK
- 2:15 - 4:00 Presentation and discussion on Question #4: What effect does changes in freshwater flows to the Gulf have on stratification and hypoxia in the Gulf?
- 4:00 - 4:30 Wrap up - Participants identify insights and observations from the day’s work and discuss next steps and follow-up.

## *Participant Expectations*

*This meeting will be successful/worthwhile if...*

1. **Joe S-B** - Hear resolution to some of the issues...potential actions.
2. **Jim** - Clarify agreement/disagreement and know what is needed in research.
3. **Doug** - Present problem in Gulf...source of problem.
4. **Victor** - Gain better understanding of causes...natural processes vs. man-induced processes.
5. **Tim** - Agreement on path for solution, shared responsibility and state-directed coordination.
6. **Nancy** - Put aside non-relevant issues and focus on key issues.
7. **Bob** - What are the real issues?
8. **John B** - Make the assessment process more transparent. We need greater role by states in solving problems.
9. **Bruce M** - Clear direction about how to inform farm community.
10. **Jim B** - What will be expected of agriculture?
11. **Mark A** - Understand the issues and reach consensus.
12. **Don G** - Resolution of issues.
13. **Mike B** - Curious about the controversies regarding sources.
14. **Dennis** - Get clarity.
15. **Jim L** - Really deal with the 4 questions. Have a focus on what scientific questions are critical and have process to move forward.
16. **Joe E** - Find out what we know and don't know.
17. **Don S** - Stay focused...be fact-based.
18. **Bill H** - Agree on importance of issue. Develop framework for better understanding of science basis.
19. **Jon P** - Stick to scientific issues so we can move forward to policy side.
20. **Don B** - Measurably move beyond questions about sources and move to solution.
21. **Len B** - Manage problem as a system vs. individual issues. Learn the latest about scientists' view.
22. **Jim P** - Common understanding of what carbon and nitrogen are doing down there.
23. **Don P** - Happy if we do all this! Focus on key scientific issues regarding causes.
24. **Tom P** - It's already successful because we have the right "brain power" in the room.

## ***Question #1***

***What is the history of total nitrogen flux (and its constituent forms) from the Basin?***

### ***Agreements***

1. DIN has increased.
2. Total nitrogen has increased.
3. Total nitrogen has increased due to increase in DIN.
4. The most significant increase in DIN concentration and flux occurred between 1963-1983.
5. There is no trend in DIN or total nitrogen flux since 1980; it's highly variable depending on discharge.
6. PON has declined since the 1950's.
7. Mississippi River trends mirror trends in other watersheds worldwide (increase in total nitrogen; stabilization in 1980's and 1990's).

### ***Follow Up Issues and Actions***

1. Include Don Goolsby's latest findings in IA.
2. Add confidence intervals to IA.

## ***Question #2***

***What is the relative role of terrigenous carbon as a driver of hypoxia?***

### ***Agreements***

1. The carbon that fuels hypoxia is produced over the shelf waters and sinks primarily in the spring. It is the source of most organic carbon that consumes oxygen in hypoxic zones. (Nancy's research).
2. River-derived nitrogen is the most important, manageable driver of increased organic carbon in the hypoxic zone.
3. Terrigenous carbon is a relatively small factor driving hypoxia (nitrogen-driven carbon production is approximately an order of magnitude greater).
4. Increased carbon production in the environment is consistent with similar systems worldwide.
5. This discussion is irrelevant unless we intend to control the amount of carbon.

### ***Follow Up Issues and Actions***

1. Role of terrigenous carbon is not widely understood. Use Don Boesch's paper (edited) to more adequately explain the role of terrigenous carbon.

## ***Question #3***

***What is the relationship of nitrogen inputs (fertilizer, manure, atmospheric) to organic nitrogen soil inventories and nitrogen outputs?***

### **Agreements**

1. Worldwide, 20% of net human inputs get exported in rivers. The Mississippi follows this pattern.
2. At the basin level, these are the sources of total nitrogen delivered to the Gulf:
  - Agriculture – 65%
  - Municipal and Industrial – 11%
  - Other – 24%These results are consistent with Sparrow and Scope analyses.
3. There is tremendous variability of nitrogen loads and forms at the field level based on:
  - Farming systems/management practices
  - Climate
  - Hydrology
  - Soil and other physical characteristics.
4. It is hazardous to scale from basin level to field level and vice versa.

### **Follow Up Issues and Actions**

1. Find better ways of scaling.
2. Find better ways to deal with various agriculture sources of nitrogen (manure, legumes, etc).
3. Find better ways to relate different land uses (forest, agriculture, etc.) to nitrogen loads in streams.
4. Assure IA includes research needs.

## ***Question #4***

***What effect does changes in freshwater flows to the Gulf have on stratification and hypoxia in the Gulf?***

### ***Agreements***

1. You have to have both nutrient loading and stratification for Hypoxia.
2. There have been modest changes in total flow as well as the Atchafalaya River diversion. These changes affect both nutrient loading and stratification.
3. We do not have data on the changes in stratification caused by the modest changes in total flow and the Atchafalaya River diversion.
4. Compared to modest changes in flow, there have been 2x-3x changes in nutrient loading since 1900.
5. If we choose to manage hypoxia by changing the flows within the Mississippi River Basin (such as the distribution of flow between the two main distributaries), there will be multiple consequences, not all of which are known. Therefore, we need to improve the scientific basis of decision-making regarding river flow and engineering to meet multiple objectives.

### ***Follow Up Issues and Actions***

1. We need to integrate hypoxia into discussions on changes to river management throughout the Basin.

## *Next Steps for IA*

1. Draft IA out for public comment - closes December 20<sup>th</sup>.
2. Working Group - Review and address public comments by January 31, 2000.
3. Review within CENR agencies by end of February 2000.
4. Deliver IA to Task Force, President and Congress by March 2000.



# *Gulf Hypoxia Science Meeting*

## *December 3, 1999*

### *Session Evaluations Summary*

*No. of Submissions:* (13)

**1. Please indicate on the scale below your overall rating of the meeting and your reason for the rating.**

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1	2 (1)	3 (1)	4 (4)	5 (7)
<i>Highly Dissatisfied</i>				<i>Highly Satisfied</i>

**Why? Comments:**

1. Came to agreements! Cindy did an excellent job bringing focus on points on agreement.
2. We achieved the major objective of the meeting.
3. Great discussion and great facilitation.
4. Excellent job of facilitating meeting and delivering meeting summary in a timely manner.
5. Free exchange of information led rather quickly to consensus. Diversity of interests and backgrounds was excellent. We got rid of the red herrings.
6. Discussed to resolution the items on the agenda. Verbal agreement at least by those who agreed. I suspect silence by some was disagreement.
7. No real accomplishments were made. We had all this from the first 6 reports.
8. Little new value added to integrated assessment process. Most of time spent on old issues and red herrings. Much of discussion driven by special interests and not motivated by real scientific issues.
9. Meeting was well run and the facilitator kept things well focused.
- 10-13. No comments.

**2. The highlight and most significant part of the meeting for me was:**

1. Good interaction and focus on critical questions and good facilitation.

2. Coming to common understanding and agreement.
3. Here was less dissension and more consensus than I expected. We seemed to have settled 2 or 3 major points of contention. Also, high level of technical expertise and good group of participants.
4. The open discussion and the relatively strong consensus on agreements.
5. Hard to say.
6. Making meaningful progress toward the goals in an efficient and collegial manner.
7. Discussion on questions 1 and 2.
8. Hearing agriculture interests be frank about their activities, what they were affecting. Good synthetic thought by Cindy.
9. Reaching consensus/agreement on the questions.
10. Pretty well stayed on the data issues.
- 11-13. No comments.

3. ***If I could have changed anything about the meeting it would have been:***

1. To broaden the group to include a greater diversity of the user group.
2. Have more of the skeptics included in the group.
3. Linking supporting documentation to recommendations.
4. The group was tired by question #3 and very tired by question #4. Not sure what could have been done.
5. Fewer listeners and more scientists or managers with real data to share and discuss.
6. To address relevant topics. To actually have crafted a response to the IA.
7. Development of questions better focused on major criticisms of CENR reports and IA draft.
8. Increased attendance by people who had disagreements with reports 1-6.
- 9-13. No comments.

**4. *Other Comments?***

1. Very well facilitated meeting.
2. I thought your mechanism of asking "Okay, so what data or information do you have to bring to bear to that comment?" was very effective. (i.e., Put up or shut up).
3. Great facilitation!
4. Meeting itself was well structured and well facilitated. Facilitator had energy and worked hard to ensure productive outcomes.
5. Great job in running the meeting!
- 6-13. No comments.

## *Final Participant List*

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