2004
ATEEC Fellows Institute

Theme:
Surface Water Quality

Case Study:
Dead Zone: Hypoxia in the Gulf of Mexico

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The 2004 Fellows Institute explored the large area of the Gulf of Mexico called the "Dead Zone." Issues surrounded farm chemicals from the vast Mississippi River watershed, which empties into the Gulf.

Role Play
Introduction & Resource Materials

The Situation:

NOAA (National Oceanic and Atmospheric Administration) has convened a public meeting to discuss the Integrated Assessment of Hypoxia in the Northern Gulf of Mexico, along with the recommendations for future action contained in the report and in the action plan. The scientists/authors from the Committee on Environment and Natural Resources will serve as a panel of experts at the meeting. Representatives of various groups with a stake in the outcome have been invited to attend in order to present their perspectives and to ask questions of the CENR authors. The purpose of the meeting is for the report scientists/authors to address stakeholders' concerns; the meeting could lead to revisions of the "action plan."

NOAA Description of the Situation: Scientific investigations in the Gulf of Mexico have documented a large area of the Louisiana continental shelf with seasonally-depleted oxygen levels (< 2mg/l). Most aquatic species cannot survive at such low oxygen levels. The oxygen depletion, referred to as hypoxia, begins in late spring, reaches a maximum in midsummer, and disappears in the fall. After the Mississippi River flood of 1993, the spatial extent of this zone more than doubled in size, to over 18,000 km2, and has remained about that size each year through midsummer 1997. The hypoxic zone forms in the middle of the most important commercial and recreational fisheries in the coterminous United States and could threaten the economy of this region of the Gulf.

Nutrient over-enrichment from anthropogenic sources is one of the major stresses impacting coastal ecosystems. Generally, excess nutrients lead to increased algal production and increased availability of organic carbon within an ecosystem, a process known as eutrophication. There are multiple sources of excessive nutrients in watersheds, both point and non-point, and the transport and delivery of these nutrients is a complex process which is controlled by a range of factors. These include not only the chemistry, but also the ecology, hydrology, and geomorphology of the various portions of a watershed and that of the receiving system. Both the near-coastal hydrodynamics that generate water column stratification and the nutrients that fuel primary productivity contribute to the formation of hypoxic zones. Human

activities on land can add excess nutrients to coastal areas or compromise the ability of ecosystems to remove nutrients either from the landscape or from the waterways themselves.

Our Terminology for the Role Play:

- I. A. or Integrated Assessment report - meaning the government report titled Integrated Assessment of Hypoxia in the Northern Gulf of Mexico (provided in your binders)
- Authors - meaning scientists/authors on the Committee on Environment and Natural Resources
- Stakeholders - meaning respondents to the Integrated Assessment report - written comments from the stakeholders on the IA report are available online from http://www.nos.noaa.gov/products/pubs_hypox.html#pubcomm
- Action Plan* - meaning recommendations elicited from the Integrated Assessment report
- The action plan is available online www.epa.gov/msbasin/actionplan.htm

Resources:

- The participants' knowledge and research
- "Round Rivers" module. The 7-module ATEEC-MIT CD-ROM, *Technology and Environmental Decision Making*, may be ordered from http://www.ateec.org/ > Products > DVDs/CDRs.
- NOAA's report website (http://www.nos.noaa.gov/products/pubs_hypox.html), which publishes these materials:
    - "Integrated Assessment" report
    - The 6 hypoxia assessment reports produced by scientists from CENR (which provided foundation for the I.A. report), also referred to as scientific/technical reports"
    - Public letters of comment on the IA report by your "stakeholder" group

    (Note: Agencies sometimes change the address pathways for information like the Hypoxia report. If this link becomes obsolete, use a Web keyword search to find a new address: *NOAA gulf hypoxia integrated assessment report*.)

Goals:

- Read, research, and discuss within your assigned group to prepare for the meeting, so that you can accurately represent your stakeholders' backgrounds, data, and viewpoints.
- Within your group, agree on a spokesperson to provide a brief overview of your perspective (note that all 6 members of group 6 will serve as spokespeople). Each group should also produce a set of questions to be posed to the panel of experts.
- After the testimony has been provided, each group will provide recommendations for revisions to the action plan, as necessary.
- Reconvene all stakeholder groups and I.A. authors to achieve consensus on a list of components for a revised action plan.

Focus:

A wide variety of topics are covered in the I.A. report and the stakeholders' responses. In order to provide a sense of focus to the role play, we have selected 4 main points, outlined below. Each stakeholder group will focus their preparation on addressing these themes from the stakeholders' points of view:

- Farming practices are already changing; additional regulations are not necessary
- Local watershed approach preferable to federal regulations
- The "system" is not completely understood (nutrients may not be the cause)
- No negative economic consequences of hypoxia in the Gulf of Mexico have been demonstrated

Six Role Play Groups:

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Group 1: State Governments in Upper Mississippi River Basin

Stakeholder Information for Participants:
Your group represents the position of state governments in Iowa, Illinois, Wisconsin, and Missouri. Although many of the reports were issued from the office of the Governor, the responses came as a consensus from the government of each state, including representatives from the Department of Natural Resources and the Department of Agriculture.

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Group 2: Agricultural Trade/Professional Organizations

Stakeholder Information for Participants:
Your group represents these professional organizations: American Farm Bureau; The Fertilizer Institute; Potash and Phosphate Institute. These organizations produce, sell, and utilize nutrients for row crops and livestock operations in the United States.

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Group 3: Small Farms Special Interest Groups

Stakeholder Information for Participants:
Your group represents these special interest groups: farmers and advocates in the Missouri Corn Growers Association; Center for Global Food Issues. Your constituents tend to have smaller, family owned and operated farms.

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Group 4: Mississippi River & Gulf Activist Groups

Stakeholder Information for Participants:
Your group represents these environmental activist groups: the Mississippi Riverwise Partnership and the Gulf Restoration Network.

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Group 5: Other Agricultural Science/Technology Groups

Stakeholder Information for Participants:
Your group represents scientists/technologists in these groups: Missouri DNR; USDA; LSU Agricultural Center

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Group 6: Authors of the Integrated Assessment Report on Gulf Hypoxia

Stakeholder Information for Participants:
Your group represents authors/scientists who are highly respected in their fields and were selected as the lead authors for the 6 technical reports on which the Integrated Assessment is based.

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Additional Resources:

General

- ATEEC-MIT. "Round Rivers Module" *Technology & Environmental Decisionmaking*, CD-ROM (May be ordered from ATEEC Web site: http://www.ateec.org/ > Products > DVDs and CD-ROMs)
- Globe Program (Multi-lingual Site) http://www.globe.gov/globe_flash.html
- U.S. Environmental Protection Agency http://www.epa.gov

Activities

- Globe Program - Measurement Protocols (multi-lingual site) http://www.globe.gov/fsl/html/aboutglobe.cgi?intro&lang=en&nav=1
- Environmental Inquiry at Cornell - Authentic Scientific Research for High School Students http://ei.cornell.edu/

Data

- National Water Quality Assessment Program; links to water related data for almost all 50 states http://water.usgs.gov/nawqa/

Ecological Footprinting

- Resource flow and mass balance accounting, greenhouse gas (carbon) reporting, ecological footprint analysis http://www.bestfootforward.com
- Ecological Footprint Calculator http://www.bestfootforward.com/footprintlife.htm

Interactive Models of Natural Systems

- Comprehensive List of Models in "Round Rivers" module of ATEEC-MIT CD-ROM, p. 32

Lab and Testing Equipment Providers

- Vernier Software and Technology http://www.vernier.com/
- HOBO Data Loggers and Other Products http://www.onsetcomp.com/index.html
- Carolina Biological Supply http://www.carolina.com/
- LaMotte Testing Equipment http://www.lamotte.com/
- Hach Testing Equipment http://www.hach.com/

Laws & Regulations

- ATEEC-MIT. "Regulations Bank." *Technology & Environmental Decisionmaking*, CD-ROM
- Training on Clean Water Act - EPA Watershed Academy http://www.epa.gov/watertrain/cwa/

Lecture Notes

- EPA Watershed Academy on the Web http://www.epa.gov/watertrain/
- OpenCourseWare at MIT http://ocw.mit.edu/index.html

Multilingual

- Globe Program (multi-lingual site) http://www.globe.gov/globe_flash.html
- USGS - Water Cycle in Over 30 Languages http://ga.water.usgs.gov/edu/watercycle.html

News

- Global Water News Watch http://www.sahra.arizona.edu/newswatch/index.html

Surface Water Educational Sites - Multi-Resource

- Water on the Web http://wow.nrri.umn.edu/wow/
- Water Site at U.S. Geological Survey http://water.usgs.gov/
- USGS Overview of Water Quality in Streams and Aquifers 1991-2001 http://water.usgs.gov/pubs/circ/2004/1265/pdf/circular1265.pdf
- Direct pdf link - Source Page: Overview of Selected Findings http://infotrek.er.usgs.gov/pubs/
- USGS Water Science for Schools http://ga.water.usgs.gov/edu/
- Water Site at Environmental Literacy Council http://www.enviroliteracy.org/category.php/14.html
- For-profit (?) water research site with current news and organization links http://www.waterwebster.com/reference_frameset.htm

Testing Programs

- Great North American Secchi Dip-In http://dipin.kent.edu/
- Iowater http://www.iowater.net/