THE CONTINUING HYPOXIA SAGA

K.A. Kelling[1/]

Since 1996, agriculturalists have increasingly become familiar with Gulf of Mexico hypoxia and the potential impacts that this phenomena may have on Midwestern agriculture. Between 1993 and 1999, the zone of seasonally low oxygen (< 2 mg/L) in the northern Gulf of Mexico has been estimated to be larger than 4,000 square miles. In 1999, it was 8,000 square miles, but in the summer of 2000 dropped to 1700 square miles (see Fig. 1). The hypoxic zone is a result of complicated interactions involving excessive nutrients, primarily nitrogen, carried to the Gulf by the Mississippi and Atchafalaya Rivers; physical changes in the basin, such as channelization and loss of natural wetlands and vegetation along the banks as well as wetland conversions throughout the basin; and the stratification in the waters of the northern Gulf caused by the interaction of fresh river water and the saltwater of the Gulf. In the near shore Gulf, excessive algal growth results in a decrease in dissolved oxygen in the bottom water, and the corresponding loss of aquatic habitat. Mobile organisms leave the hypoxic zone and those that cannot leave, die or are weakened depending on how low the oxygen level gets and for how long. In the Gulf, fish, shrimp, crabs, zooplankton, and other important fish prey are significantly less abundant in bottom waters in areas that experience bottom waters hypoxia.

As estimated by USGS, most of the nutrients entering the Gulf come from sewage treatment and industrial wastewater treatment plant discharges and from storm water runoff from city streets and farms. Estimates are that 90% of the nitrate load to the Gulf comes from nonpoint sources, with about 56% of the load entering the Mississippi River from above the Ohio River. The Ohio basis adds 34%; the USGS specifically identified high nitrogen loads coming from basins in Iowa, Illinois, Indiana, southern Minnesota, and Ohio.

Hypoxia Task Force Goals

On 11 October 2000, the EPA on behalf of the Mississippi River/Gulf of Mexico Watershed Nutrient Task Force formally adopted three goals:

> **Coastal Goal**—By the year 2015, subject to the availability of additional resources, reduce the 5-year running average area extent of the Gulf of Mexico hypoxia to less than 5,000 square kilometers (1930 square miles) through implementation of specific, practical, and cost effective voluntary actions by all states, tribes, and all categories of sources and removals within the Mississippi/Atchafalaya River Basin to reduce the annual discharge of nutrients into the Gulf.

[1/] Professor and Extension Soil Scientist, University of Wisconsin-Madison.

Figure 1. Size of the Gulf of Mexico hypoxic zone, 1985 to 2000. (Adapted from N. Rabalais, personal communication).

Within Basin Goal —To restore and protect the waters of the 31 states and tribal lands within the Mississippi/Atchafalaya Basins through implementation of nutrient and sediment reduction actions to protect public health and aquatic life as well as reduce negative impacts on the Gulf of Mexico.

Quality of Life Goal —To improve the communities and economic conditions across the Mississippi/Atchafalaya River Basin, in particular the agriculture, fisheries, and recreation sectors, through improved public and private land management and a cooperative, incentive based approach.

Task Force Action Plant

The Mississippi River/Gulf of Mexico Watershed Nutrient Task Force at its 11 October 2000 meeting also proposed the following short-term major actions and time frames to achieve the long-term goals outlined above.

1) Establish sub-basin coordinating committees (Summer, 2001);
2) Develop sub-basin strategies for nutrient loss reductions (Fall, 2001);
3) Identify and remediate point source dischargers (Fall 2001);
4) Increase voluntary wetland and buffer establishment (Spring, 2002);
5) Increase voluntary best management practices implementation (Fall, 2002);
6) Increase hypoxia research (Fall, 2001);
7) Expand hypoxia monitoring programs (Spring, 2002);
8) Expand basin monitoring and evaluation of management effectiveness (Spring, 2002);
9) Evaluate modification of COE projects (Fall, 2003);
10) Implement actions that achieve 300% reduction in N losses (Fall, 2005);
11) Assess reductions achieved (Fall, 2005).

Suggested Approaches for Reducing Hypoxia

It is recognized that there are no simple solutions that will reduce hypoxia in the Gulf. An optimal approach would take advantage of the full range of possible actions to reduce nutrient loads and increase

nitrogen retention and denitrification and accomplishes this in a cost-effective manner. While reduction of nitrogen is the principal focus, many of the actions needed to reduce nitrogen loads will complement and enhance existing efforts to restore water quality throughout the basin. Actions that can achieve these goals as published by the Hypoxia Task Force include:

> Encouraging nonpoint source pollutant reductions under the Clean Water Act, the Farm Bill, and State cost-sharing programs;
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> Implementation of the Environmental Quality Incentives Program (EQIP) to assist grain and livestock producers in reducing excessive nutrients movement to water resources;
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> Implementation of the Conservation Reserve Program, Wetlands Reserve Program, Corps of Engineers Environmental Restoration Programs, and Agricultural Extension Education Programs to promote restoration and enhancement of natural systems for nitrogen retention and denitrification;
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> Increasing emphasis on nutrient management through State and Tribal efforts to implement watershed-based approaches to water quality management, including monitoring and assessing waters, adoption of water quality standards, including nutrient criteria, developing total maximum daily loads (TMDLs), and implementing point source controls through the National Pollutant Discharge Elimination System (NPDES);
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> Promoting public-private partnerships to restore buffers;
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> Implementation of Louisiana's Coastal Nonpoint Pollution Control Programs under the Coastal Zone Act Reauthorization Act in the lower Mississippi and Atchafalaya Rivers;
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> Supporting actions by non-water quality state and tribal agencies, private landowners, the agricultural and other industries to reduce nitrogen loadings to the basin; and
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> Providing voluntary incentives for nitrogen reductions from point and nonpoint sources.

Wisconsin Not Immune

These recommendations have very broad sweeping implications for much of agriculture and should not be swept aside or dismissed. It appears that the action plan calling for a 30% reduction in nitrogen losses through more careful crediting of legumes and manure, adherence to realistic yield goals, and improvements in other nitrogen management techniques may be difficult to achieve through voluntary action. While these techniques are all recommended and utilize available technologies, it is unclear as to how quickly they are or will be adopted without regulation.

In some cases, these regulations are already taking shape in the form of nutrient management planning and the rewrite of the Department of Natural Resources nonpoint rules. Wisconsin farmers need to understand what is in these proposed rules and provide their views. Hypoxia is being measured in the Gulf of Mexico, but it may significantly affect what Wisconsin farmers may do on their land.

NOTE: Significant sections of this paper are taken or paraphrased from the EPA report published in the Federal Register, Volume 65, no. 133/Tuesday, 11 July 2000/Notices.