

Where do we go from here?

Dean W. Lemke, Iowa Department of Agriculture and Land Stewardship
Dennis P. McKenna, Illinois Department of Agriculture

The Upper Mississippi River Sub-Basin Hypoxia Nutrient Committee is very pleased to have been able to sponsor the Gulf Hypoxia and Local Water Quality Concerns workshop. We thank the workshop steering committee and each of the speakers and panelists who through their efforts and expertise contributed so much to the success of the workshop. The committee appreciates the financial contributions of our co-sponsors: Iowa State University, U.S. EPA Office of Wetlands, Oceans and Watersheds, EPA Regions 5 and 7 and the USDA Agricultural Research Service. We especially thank Dr. James Baker, Professor Emeritus of the Department of Agricultural and Biosystems Engineering at Iowa State University, for bringing together such a distinguished group of researchers to aid in identifying the most effective ways to reduce nutrient losses from agricultural land in the Corn Belt.

The Upper Mississippi River Sub-Basin Hypoxia Nutrient Committee includes the Illinois Department of Agriculture, the Iowa Department of Agriculture and Land Stewardship, the Minnesota Pollution Control Agency, the Missouri Department of Natural Resources and the Wisconsin Department of Natural Resources. Each of these agencies is represented on the Mississippi River/Gulf of Mexico Watershed Nutrient Task Force and the Coordinating Committee of the Task Force.

The workshop is a key component of a reassessment of the science underlying the Action Plan for Reducing, Mitigating, and Controlling Hypoxia in the Northern Gulf of Mexico that was adopted by the Mississippi River/Gulf of Mexico Watershed Nutrient Task Force in October 2000. In the Action Plan the Task Force adopted three Long-Term Goals:

- **Coastal Goal:** By the year 2015, subject to the availability of additional resources, reduce the 5-year running average areal extent of the Gulf of Mexico hypoxic zone to less than 5,000 square kilometers 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 nitrogen into the Gulf.
- **Within Basin Goal:** To restore and protect the waters of the 31 States and Tribal lands within the Mississippi/Atchafalaya River Basin through implementation of nutrient and sediment reduction actions to protect public health and aquatic life as well as reduce negative impacts of water pollution 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.

The Task Force also agreed on five principles:

1. Encourage actions that are voluntary, practical, and cost-effective;

2. Utilize existing programs, including existing State and Federal regulatory mechanisms;
3. Follow adaptive management;
4. Identify additional funding needs and sources during the annual Agency budget process; and,
5. Provide measurable outcomes as outlined below in the three goals and strategies.

Implementation of the *Action Plan for Reducing, Controlling, and Mitigating Hypoxia in the Northern Gulf of Mexico* will require a significant level of commitment from the federal agencies and state governments and increased awareness and action by hundreds of thousands of stakeholders. A key to achieving these commitments and actions is coordination and outreach by the sub-basin committees established by the states in response to Action Item #2 of the *Action Plan*.

2 States and Tribes in the Basin, in consultation with the Task Force, will establish sub-basin committees to coordinate implementation of the Action Plan by major sub-basins, including coordination among smaller watersheds, Tribes, and States in each of those sub-basins;

Clearly, the Task Force recognized that no single approach to nutrient reduction would be effective throughout the portions of 31 states that lie within the Mississippi River Basin. Rather, because the soils, hydrology, land use and cropping practices vary considerably across the Mississippi River Basin, it was left to the Sub-Basin Committees to develop the appropriate strategies for their portion of the Basin.

The *Action Plan* proposed ten short-term actions to achieve the long-term coastal, basin and quality of life goals. Six of those short-term actions items were assigned to the states through the sub-basin committees:

#5 States, Tribes, and Federal agencies within the Mississippi and Atchafalaya River Basin will expand the existing monitoring efforts within the Basin to provide both a coarse resolution assessment of the nutrient contribution of various sub-basins and a high resolution modeling technique in these smaller watersheds to identify additional management actions to help mitigate nitrogen losses to the Gulf, and nutrient loadings to local waters, based on the interim guidance established by the National Water Quality Monitoring Council;

#6 States, Tribes, and Federal agencies within the Mississippi and Atchafalaya River Basin, using available data and tools, local partnerships, and coordination through sub-basin committees, described in action #2, will develop strategies for nutrient reduction. These strategies will include setting reduction targets for nitrogen losses to surface waters, establishing a baseline of existing efforts for nutrient management, identifying opportunities to restore floodplain wetlands (including restoration of river inflows) along and adjacent to the Mississippi River, detailing needs for additional assistance to meet their goals, and promoting additional funding;

#8 Clean Water Act permitting authorities within the Mississippi and Atchafalaya River Basin will identify point source dischargers with significant discharges of nutrients and undertake steps to reduce those loadings, consistent with action #6;

#9 States and Tribes within the Mississippi and Atchafalaya River Basin, with support from Federal agencies, will increase assistance to landowners for voluntary actions to restore, enhance, or create wetlands and vegetative or forested buffers along rivers and streams within priority watersheds consistent with action #6;

#10 States and Tribes within the Mississippi and Atchafalaya River Basin, with support from Federal agencies, will increase assistance to agricultural producers, other landowners, and businesses for the voluntary implementation of best management practices (BMPs), which are effective in addressing loss of nitrogen to waterbodies, consistent with action #6;

The states, with information-sharing and coordination through the sub-basin committees, are the only entities capable of fulfilling the responsibilities outlined in the *Action Plan*. Several of the states have already initiated programs to reduce nutrient losses from both point and nonpoint sources. The states also have a great potential to leverage existing state and federal funds to provide assistance to agricultural producers and others for implementation of management practices to reduce nutrient losses. Many states in the basin have cost-share and incentive programs through their Departments of Agriculture and Natural Resources. State water quality agencies also have discretion in targeting Section 319 funds to better address nutrients.

The sub-basin committees through their state members are uniquely qualified to identify the key stakeholders who can influence opinion and support needed changes in practices and programs. Each of the state agencies and their counterpart water quality or agricultural department has established relationships with their constituents, whether agricultural producers or regulated entities such as wastewater facilities. These relationships are based on understanding and an often hard-earned trust. Because the legal, legislative and administrative framework varies among the states, it is critical that the existing state relationships with key stakeholders be maintained and supported in developing and implementing strategies to reduce nutrient loads to the Gulf of Mexico and to water bodies within the Basin.

Contingent upon adequate funding, the Upper Mississippi River Sub-Basin Hypoxia Nutrient Committee will continue to conduct and expand its activities in support of the *Action Plan for Reducing, Controlling, and Mitigating Hypoxia in the Northern Gulf of Mexico*. Specific tasks include:

- publication and distribution of the proceedings of the Gulf Hypoxia and Local Water Quality Concerns workshop;
- continued technical networking with research and Extension faculty at the five land grant universities;
- meetings of the Tier 2 stakeholders group which includes representatives of the land-grant universities, agricultural and environmental organizations, public water supplies and publicly owned treatment works, state water quality and agricultural agencies and federal agencies;

- compilation of spatial information on nutrient sources and sinks within the Upper Mississippi River sub-basin for use in developing a nutrient reduction strategy for the sub-basin;
- preparation and distribution of materials on nutrient issues and potential solutions identified in the September 2005 workshop for distribution to existing watershed groups, agencies and environmental and agricultural organizations;
- planning of a second conference to address technical, social and policy issues related to implementation of a nutrient-reduction strategy for the Upper Mississippi River Basin. Additional funding will be needed to support this conference.

The activities of the Upper Mississippi River Sub-Basin Hypoxia Nutrient Committee (UMRSHNC) are intended to achieve a near-term goal of a technically sound and economically viable nutrient reduction strategy for the Upper Mississippi River Sub-Basin and a long-term goal of reducing nutrient loadings to streams and lakes within the five states and to the Northern Gulf of Mexico which will, in turn, address the coastal, within Basin and quality of life goals of the *Action Plan*.

The formation of the UMRSHNC by the five states has addressed the Action Item #2 of the *Action Plan*. During the past year, the UMRSHNC has established a strong organizational framework and mission/vision statement, and has established the foundation for future accomplishments through forming a stakeholders group that includes representatives of key agricultural and environmental organizations, research universities, and municipal, state and federal agencies. An important component of the Committee's approach to reducing nutrient losses is outreach. We have identified three target audiences: the stakeholder group; local watershed planning groups; and local technical service providers including Extension, NRCS and soil and water conservation district staff and certified crop advisers. By working through the existing network, we can most effectively and efficiently influence the message that is delivered to producers about nutrient-caused impairments of local streams and lakes and of the Gulf of Mexico. The results of the September 2005 conference on management practice effectiveness will be re-packaged into short fact sheets and brochures to serve as a basis for educating these key leaders and technical advisers on nutrient issues and solutions.

Collaboration/Partnerships: To carry out the responsibilities of the Action Plan for the Upper Mississippi subbasin, a two-part strategy has been developed by the UMRSHNC. One is to facilitate and encourage technical networking between research/extension personnel of the five land grant universities, other research institutions, and technical agencies. The goal of the technical networking is to strengthen the knowledge base and technical exchange between the five states on practices and programs necessary to feasibly reduce nutrient transport to streams and rivers in a manner which is economically viable.

The second part of the strategy is to establish a broad-based input forum which can facilitate two-way communications between and within the primary stakeholder interests of the subbasin. This goal of this forum, the Stakeholder Advisory Group, is to obtain input, network between, and formulate recommendations from the varied interests of the stakeholders of the five states. The primary role of the group is to focus on issues relating to Gulf hypoxia, but secondarily the

group will consider local water quality concerns as they relate to Gulf hypoxia. Specific details of the roles and function of the Stakeholder Advisory Group are:

- Serve as the primary stakeholder input group for the Upper Mississippi River states concerning issues relating to the Gulf of Mexico hypoxic zone
- Obtain inputs from broad stakeholder interests on issues relating to hypoxia and the actions of the Upper Mississippi River states to reduce nutrient contributions to the Gulf
- Communicate issues of concern and recommendations back to the various stakeholder interests and organizations within the Upper Mississippi River states
- Develop recommended positions on issues of concern for consideration by the UMRSHNC governing body and the Task Force
- Represent stakeholder/agency's constituent area and interest in discussions and development of recommended positions
- Provide leadership to communicate issues of concern and recommended positions back to constituent area or agency

STAKEHOLDER ADVISORY GROUP MEMBERS

Five State Agencies – Agriculture, Conservation or Environmental Protection

- Illinois Environmental Protection Agency
- Iowa Department of Natural Resources
- Minnesota Department of Natural Resources
- Missouri Department of Agriculture
- Wisconsin Department of Agriculture, Trade and Consumer Protection

Five Land Grant Universities – Research/Extension

- University of Illinois
- Iowa State University
- University of Minnesota
- University of Missouri
- University of Wisconsin

Five Agricultural Stakeholder Organizations

- Illinois Fertilizer and Chemical Association
- Iowa Farm Bureau Federation
- Minnesota Soybean Association
- Missouri Corn Growers Association
- Professional Dairy Producers of Wisconsin

Five Environmental, Consumer and City Utility Organizations

- Prairie Rivers Network
- Metropolitan Water Reclamation District of Greater Chicago (Illinois)
- Cedar Rapids (Iowa) Water Department
- The Nature Conservancy
- Audubon Upper Mississippi River Campaign

Five Federal Agencies

- USDA Natural Resources Conservation Service
- USDA Agricultural Research Service
- U.S. Geological Survey
- U.S. EPA Region V (ad hoc)
- U.S. EPA Region VII (ad hoc)

Reassessment of the Hypoxia Action Plan

The following discussion is based upon materials provided by the U.S. Environmental Protection Agency to members of the Mississippi River/Gulf of Mexico Watershed Nutrient Task Force.

The *Action Plan for Reducing, Mitigating, and Controlling Hypoxia in the Northern Gulf of Mexico* included an action item to assess the nutrient reductions achieved and the response of the hypoxic zone, water quality throughout the Basin and economic and social effects. The reassessment includes a series of actions that will develop the information necessary for the Task Force to review the 2001 Action Plan and make revisions as necessary. It will be completed over the next two years. These actions include reassessment of the primary causes of Gulf hypoxia and management approaches to address these causes. The reassessment will result in the following outcomes, in order to produce a revised Action Plan:

- A Peer Review of the August 2004, Region 4 White Paper on the role of nitrogen and phosphorus in causing Gulf Hypoxia
- A bibliography of all references pertinent to the science of Gulf hypoxia
- A summary of available information on implementation of federal and state management programs and activities
- An inventory of existing point sources throughout the Mississippi River Basin
- A public science symposium on the causes of Gulf hypoxia to feed into the Expert Science Panel report.
- An Expert Science Panel report that describes the best scientific understanding of the causes, sources, and controlling processes of the formation, extent and duration of hypoxia in the northern Gulf of Mexico
- At least two sub-basin workshops on management science
- A synthesis of management recommendations and options revisions to the Action Plan (which may include additional expert or peer review)
- Public participation and opportunities for comment and review

Peer Review of the August 2004, Region 4 White Paper on Causes of Hypoxia

EPA scientists in Region 4 (Atlanta) conducted a review of data and information regarding hypoxia in the northern Gulf of Mexico. This Region 4 staff assessment concluded that phosphorus, rather than nitrogen, may be the limiting nutrient controlling Gulf hypoxia. An unauthorized draft of the report was released in January of 2004. This report, because of its controversial conclusion regarding the role of phosphorus in Gulf hypoxia, caused a significant

amount of concern among stakeholders. After considerable internal review by Region 4 EPA scientists, the Region released a significantly revised version of the draft report for a broader internal EPA review in April 2004. The report was revised based on the broader EPA review and released to the Hypoxia Task Force in August 2004, as an informational document with the specific purpose of encouraging discussion and posing questions for the reassessment of the *Action Plan*. The draft report, "Evaluation of the Role of Nitrogen and Phosphorus in Causing or Contributing to Hypoxia in the Northern Gulf, August, 2004," had not at that time been subjected to external peer review.

The August report, and the earlier drafts that were not prepared for release but were widely circulated outside EPA, raised concerns among Task Force members and stakeholders throughout the Mississippi Basin. In response, the Task Force requested an expedited scientific peer review of the August 2004 draft report to be coordinated by the Monitoring, Modeling and Research Workgroup (MMR) of the Task Force. Concerns were raised at the September 1, 2004 public meeting of the Task Force that earlier versions of the report (January and April drafts) should also be included in the review. Thus, the Task Force decided to include the two draft versions of the report, along with the August 2004 Report, in the peer review request.

The External Peer Review of the Draft Region 4 report, "Evaluation of the Role of Nitrogen and Phosphorus in Causing or Contributing to Hypoxia in the Northern Gulf, August, 2004," provided considerable insight regarding the various processes involved in hypoxia formation in the northern Gulf of Mexico. The peer review raised substantial questions and issues regarding the role and significance of these processes in producing hypoxia. EPA believes the discussion of these processes has produced a valuable dialogue regarding the issues needing consideration in future reassessment.

EPA concluded that further refinement, completion, and formal publication of the Draft Region 4 report would not contribute significantly to the resolution of identified issues or to the reassessment of the *Action Plan* and that the reassessment process provides a greater opportunity for continuing dialogue on the issues identified through the paper and the peer review. The results of the peer review are available at http://www.epa.gov/msbasin/taskforce/peer_review.htm.

Updates of Federal Data, Bibliography, Federal and State Programs, and Source Inventory

Two sub-committees of the Coordinating Committee will provide information for the reassessment as follows:

The Science Reassessment Team (SRT) -- will develop a bibliography of all references pertinent to the science of Gulf hypoxia. The bibliography will include references cited in the initial CENR science assessment conducted from 1998-2001. It will be supplemented by a request to all Task Force participating agencies for references that may have been omitted from the initial science assessment and any new research published since 1998. The Monitoring, Modeling, and Research Workgroup (led by USGS and NOAA), which

developed the MMR Strategy for the Task Force, will coordinate this team, with appropriate leadership and participation from states and other federal agencies.

The Management Action Reassessment Team (MART) – will develop two reports, collating information on point sources and available programs. The first report will present an inventory of point source location and loadings throughout the Mississippi River Basin. EPA is compiling this information from available federal data. The second report will update information on implementation of federal and state management activities to address the cause of hypoxia. The MART will compile information on management activities from all Task Force members, particularly USDA, ACOE and states. EPA and USDA Coordinating Committee members will coordinate this team with appropriate leadership and participation from states and other federal agencies.

Symposium on the Causes of Gulf Hypoxia

To support the work of the Expert Science Panel, the Task Force will convene a symposium on the causes of Gulf hypoxia, including examination of the factors that contribute to the timing, duration and extent of the hypoxic zone. This public symposium will serve as a kick-off of the reassessment process for all the interested stakeholders and provide an opportunity to present the most recent research on causes of Gulf hypoxia. This workshop, which is tentatively scheduled for April 2006, will be coordinated with the Expert Science Panel and serve to provide current information for their analysis.

Expert Science Panel Report on the Cause of Gulf Hypoxia

The purpose of this action is to develop an updated, independent assessment of the causes of Gulf hypoxia and recommend whether the most recent body of scientific evidence supports or suggests revisions to the assessment that formed the basis of the 2001 Action Plan. After review of several options, the Task Force agreed that an expert panel be chartered through EPA's Science Advisory Board (SAB) to review available scientific information and provide a report that synthesizes the current state of knowledge of the causes of Gulf hypoxia. The expert panel will develop a report that answers the following general question:

Using the Integrated Science Assessment (CENR, 2000), the six supporting reports, and other scientific contributions, what is the current scientific understanding of the causes, controlling processes and sources of formation, extent and duration of hypoxia in the northern Gulf of Mexico?

Description of SAB Process The Task Force selected the SAB because of the opportunities for public access, timeliness and cost. All SAB panel meetings and deliberations are open to the public in accordance with Federal Advisory Committee Act and EPA administrative policies for advisory committee management. The SAB will hold at least two meetings, one for initial discussion of their charge and the second for deliberations on their findings, both of which will be open to the public. As described in the SAB charter, all advice and recommendations developed by the SAB are provided directly to the EPA Administrator.

As part of the process to develop the Gulf hypoxia report, the SAB will select a chair and seek public input on panel members. The Task Force, as well as other members of the public, will be able to make recommendations for panel members. The SAB will develop a short list of potential names that will be announced for additional public review and from that list, a panel will be selected. How the panel would proceed is ultimately dependent on the chair and final make up of the Committee.

Under the SAB's charter, the Assistant Administrator of the official sponsoring Program Office (Ben Grumbles for the Office of Water), will act as the Task Force representative to the SAB. Charge negotiations and any communication, including the submission of questions pertaining to draft reports, will have to be communicated by Ben Grumbles to the DFO and the Chair of the panel. However, the Task Force, as well as any other interested parties at any time may submit additional information for the panel to consider. Upon completion, the draft report will be released for public comment.

Sub-Basin Workshops on Management Science and Policy

The Task Force will support and participate in a minimum of two workshops hosted by the major sub-basin committees in the Upper Mississippi and the Lower Mississippi. These workshops will provide opportunities for researchers and program managers to discuss management science and activities relevant to each of the sub-basins and recommend actions to reduce the causes of Gulf hypoxia within the context of the broader goals of the 2001 Action Plan. Each workshop will produce a report on the major discussions and recommendations from the workshop. While additional workshops may be needed as the reassessment proceeds, at a minimum, two workshops are being held:

Upper Mississippi Sub-Basin Workshop This workshop is gathering together available knowledge to assess tools and possible solutions to agricultural nutrient losses to water resources. The workshop will inform implementation agencies and policymakers on the science of nutrient loss reduction, and thereby lay the groundwork for future planning, policy and programs. The Upper Mississippi Sub-Basin committee is considering holding a second conference after completion of the Expert Science Panel Report on the Cause of Gulf Hypoxia, to more specifically address upper basin implementation programs needed to address the goals of the Action Plan.

Lower Mississippi Sub-Basin Workshop This workshop will be hosted by the Lower Mississippi Sub-basin Committee to address management issues in the lower Mississippi and Atchafalaya Basins from the Mississippi and Ohio Rivers confluence to the Gulf of Mexico. The focus will be on agricultural and point sources as well as hydrologic modifications and freshwater wetlands.

Management Recommendations Synthesis and Revisions to the Action Plan

The Coordinating Committee will evaluate and synthesize the recommendations for management from the SAB review, the workshops and the public comments into a set of recommendations

and options for the entire basin. This synthesis will form the basis of the recommendation to the Task Force.

Public Review and Comment

The public will provide comment and input to the formation of the Expert Science Panel as well as to their report development. The public will participate in the sub-basin workshops. The draft Action Plan revision will be made available for public review and comment at the conclusion of the activities described above.

Implementation

We hope that the results of this workshop have made a significant contribution in describing the effectiveness and cost effectiveness of the various management practices currently available to agriculture to reduce nutrient losses. However, even with the best set of tools, we face an extremely challenging task in getting the right practices on the ground in the right places.

Nutrient impairment of surface and ground waters in the Corn Belt is largely due to a complex set of factors involving landscape and land use changes (which affect ground cover, need for additional nutrient inputs, and hydrology). The current Corn Belt landscape, now dominated by annual row-crop and local concentrations of intensive livestock production systems, will require improved management of fertilizer inputs and manure utilization practices to minimize nutrient losses from those systems. Off-site practices, and possibly some cropping system changes, will likely also be needed to reach water quality goals. The potential and limitations of improving both in-field and off-site management practices/systems need to be assessed in order to efficiently plan for future actions. Improvements in current management systems do need to be made, and new, innovative technologies designed and tested. Because of the economic and social consequences of returning lands to their prior condition, society will need to decide how far to go in promoting land use changes (e.g., growing less row-crops and/or having longer rotations including sod-based crops) and landscape modifications (e.g., creating more wetlands and buffer strips, and possibly redesigning drainage systems).

There are about 100 million acres of cultivated cropland in the Corn Belt states and with limited state and federal resources for technical assistance and cost-sharing and an agricultural economy buffeted by high input costs and low commodity prices, accurate targeting will be critical to achieving water quality improvements. Because phosphorus is typically the limiting nutrient in freshwater systems and nitrogen is the primary limit on algal growth in the Gulf, state and local agencies face a difficult choice in designing programs to meet multiple, if not conflicting, goals. Accurate targeting to achieve reductions in agricultural nonpoint sources is further complicated because potential pollutants from agriculture may have different chemistries and, consequently, different pathways to water bodies. For example, nitrate is a soluble, non-reactive chemical and is readily leached through soils, while phosphorus is slightly soluble and reactive in soils and the highest concentrations are in the upper soil layers.

In most of the Corn Belt, nitrate concentrations in streams and reservoirs are much higher in those areas underlain by flat, black, tile-drained soils and sandy soils. Phosphorus loads

attributable to agricultural nonpoint sources are highest in areas with high runoff or erosion rates. In addition, different management practices are often necessary to reduce nitrate and phosphorus movement to surface water: nitrate BMPs modify infiltration, leaching and soil water content; phosphorus BMPs modify surface runoff and erosion. In some instances, practices to reduce nitrate leaching and movement to surface waters may increase losses of phosphorus.

The costs, whether in incentive payments for changes to management practices or for constructed management practices, are relatively constant for an acre of land treated. However, loadings of sediment and nutrients vary greatly across the Corn Belt and within individual states, within counties or small watersheds, and even from differing areas of fields. The most cost-effective strategies to achieve pollutant reduction will require targeting of the delivery and implementation of improved management practices.

Targeting must include the right practice in the right area. For example, educational and incentive programs to encourage changes in nitrogen management practices will be most fruitful if they are targeted to tile-drained areas and erosion control practices are likely to be most efficient if they are targeted to fields contributing high sediment loads.

Variable payment rates in financial incentive programs may also play a part in an effective strategy for pollutant reduction. A higher cost-share rate for installation of erosion control practices on a sloping field immediately adjacent to a stream, for example, may be the most cost-effective way to reduce losses of sediment and particulate phosphorus.

We must get the right practice in the right area at the right rate to make a difference. Government programs based primarily, or sometimes solely, on a first-come first-served approach or a dominant goal of spending the allocated funds are relatively easy to implement, but will not get the job done.

Choices will need to be made among the competing demands for reductions, changes and improvements and we must design programs to most cost-effectively address the agreed-upon goals. While many of the management practices discussed in this workshop have secondary benefits in reducing sediment, sequestering carbon and providing wildlife habitat, not all of these environmental benefits can be primary goals along with nutrient reduction to water resources.

References

Mississippi River/Gulf of Mexico Watershed Nutrient Task Force. 2001. Action Plan for Reducing, Mitigating, and Controlling Hypoxia in the Northern Gulf of Mexico. Washington, DC.