STATE OF MISSOURI

Mel Carnahan, Governor • Stephen M. Mahfood, Director

DEPARTMENT OF NATURAL RESOURCES

OFFICE OF THE DIRECTOR

P.O. Box 176 Jefferson City, MO 65102-0176

August 2, 1999

Gulf of Mexico Hypoxia Working Group
National Centers for Coastal Ocean Science
WS 13446 SSMC4
1305 East-West Highway
Silver Spring, MD 20910

Dear Members of the Gulf of Hypoxia Working Group:

On behalf of the State of Missouri, I submit comments on the six Gulf of Mexico Hypoxia Assessments. I request that these comments be available to the public. Additionally, I would request that our comments be addressed by the scientists who are tasked with the preparation of the Integrated Assessment.

While I commend the staff for the work performed on the six assessments, I have two primary concerns:

1) The breadth of the assessments could have and should have been greater taking advantage of additional credible scientific data that currently exists and was available to the investigators.

2) The time series relied on to determine the nature and extent of the nutrient flux to the Gulf should be lengthened. If this is not pursued with vigor, I fear there will be no end to an unsettled debate over the degree to which the hypoxia phenomena is a natural occurrence.

Finally, I suggest that the schedule for the preparation of an action plan containing policy recommendations be pushed back. Sufficient time should be allotted for issues in question to be resolved. I do not believe it was the intent of Congress to push the policy development in front of the science on which it should be based.

The state's detailed comment on each of the six scientific assessments are appended. I am grateful for the opportunity to comment. Thank you.

Sincerely,

DEPARTMENT OF NATURAL RESOURCES

Stephen Mahfood
Director

SM:jm

Attachment

c: Senator John McCain, Chairman of Senate Committee on Commerce, Science and Transportation
Senator Olympia J. Snowe, Chair, Subcommittee on Oceans and Fisheries
Mr. Neal F. Lane, Assistant to the President for Science and Technology
Mr. D. James Baker, Under Secretary for Oceans and Atmosphere, Department of Commerce
Ms. Rosina Bierbaum, Associate Director for Environment, Office of Science and Technology Policy
Mr. Chuck Fox, Chair Task Force on Hypoxia, Assistant Administrator for Water, U.S. Environmental Protection Agency

STATE OF MISSOURI
COMMENTS ON GULF OF MEXICO HYPOXIA ASSESSMENTS

Topic 1 – Characterization of Hypoxia: Distribution, Dynamics, and Causes

This report describes the seasonal, interannual, and long-term variation of hypoxia in the northern Gulf of Mexico, and its relationship to nutrient loadings. It also documents the relative roles of natural and human-induced factors in determining the size and duration of the hypoxic zone.

This report did not present a complete description of variations in Northern Gulf hypoxia, its relationship to nutrient loadings, and roles of natural and anthropogenic factors. Very limited data, spatially and temporally, as well as inadequate time to assimilate data from a variety of sources were the primary reasons provided for the incompleteness of this description of the Northern Gulf hypoxia phenomenon.

Since the Redfield ratio suggests that phosphorus, nitrogen, or silica may each be limiting factors at times, the feasibility of decreasing phosphorus should be further investigated. It was not apparent in the report if an analysis had been conducted to determine the overall contribution of point source discharges and the potential effects and costs associated with phosphorus reduction.

Substantial reductions in sediment delivery to the Gulf have resulted from the construction of dams on the Missouri, Ohio and upper Mississippi Rivers. The relationship of these sediment reductions to Gulf hypoxia has not been adequately addressed.

As the report itself indicates, much more data and time to analyze that data is necessary if we are to better understand hypoxia occurrences in the North Gulf waters to the extent that we can predict the benefits of various remedial actions. We concur and would like to assist with the effort.

Topic 2 – Ecological and Economic Consequences of Hypoxia

This report presents an evaluation of the ecological and economic consequences of nutrient loading, including impacts to Gulf of Mexico fisheries and the regional and national economy.

This report provides no evidence that the value of the Gulf fisheries have been adversely impacted by hypoxia so we question why the implementation recommendations are so drastic and time critical? We believe existing efforts are addressing the problems, so there is time for more research.

The report only partially addresses the ecological and economic consequences of hypoxia. The discussion uses empirical observations on eutrophication without actual data. For example, the water quality relationship of the Gulf to the Baltic Sea in the 1950's, the Adriatic Sea of the

1970's, or the Black Sea of the 1980's is not fully described. These are very different water bodies yet the authors tie them together without any data to substantiate their similarities. Ties would just as easily be made to the Nile River delta, where a reduction in sediment and nutrients has devastated the fishery.

Using seven-year moving average for fishery stock population changes reduces the apparent impact that the 1993 flood of freshwater and nutrients had on the Gulf. This needs explanation. We agree that long-term monitoring is needed to measure dissolved oxygen at spatial and temporal scales. Oxygen data can then be better compared with fish catch data, with consideration of runoff anomalies.

A high priority for funding should be given to analyzing the large SEAMAP database mentioned in the report, to reduce some of the variability encountered and allow for more meaningful conclusions to be made.

Evaluation of the reports and references cited points out a critical lack of a basin-wide monitoring network of comprehensive data. We suggest USGS be charged and funded for this activity.

Hypoxia is a natural phenomenon in estuarine locations. It has been documented in the Gulf as "Jubilee" events since the 1700's. (Jubilee events were recorded when fish and shrimp moved close to shore, allowing for extremely easy, abundant harvesting.) These events are apparently contrary to the assessment statements that hypoxia in the Gulf is a recent phenomenon and the nutrient flux increase over the last 40 years are the reason for its occurrence.

There are also historic records of massive fish kills in the Gulf. Since these have not occurred in the last 50 years, it seems this would be anecdotal information that indicates that water quality has been getting better in the Gulf in the last 50 years, not worse, as the assessments conclude.

The high variability in the data quality and quantity makes it nearly impossible to derive any meaningful conclusions. (While the authors say as much, they need to emphasize this fact more.) The fact that conclusions were made and implementation mechanisms recommended is very disconcerting. The recommendations should be deleted from these reports.

Topic 3 – Flux and Sources of Nutrients in the Mississippi-Atchafalaya River Basin

This report identifies the sources of nutrients within the Mississippi Atchafalaya system and transport to the Gulf of Mexico with two distinct components. The first is to identify where, within the basin, the most significant nutrient additions to the surface water system occur. The second to estimate the relative importance of specific human activities in contributing to these loads.

This report identifies sources of nitrogen and human activities that have contributed to nitrogen loading. The report includes these as facts:

1) Nitrate is the most soluble and important form of nitrogen if commercial fertilizer is the major increasing nutrient factor.
2) Nitrate levels are three times higher than 30 years ago and come mostly from non point sources.

The report suggests that there have been improvements made in fertilizer technology that can help reduce nutrient loss by delaying nutrient mobilization. The way these formulations are used today and how these can help reduce nutrient loss should be the subject of future research.

We have specific concerns with the information presented about contributions from atmospheric deposition. We are concerned with the nitrogen balance table shown in Topic 3 with atmospheric (wet and dry) at 7.9%. At the Farm Bureau sponsored workshop From the Corn Belt to the Gulf Agriculture and Hypoxia in the Mississippi River Watershed of July 14-15, 1997, USGS' Dr. Richard Hooper claimed 25% of the Gulf's nutrients were from NOx. On page 72 of report six, literature cited estimated atmospheric deposition from 17% to 23%. These differences need to be explained and reconciled.

More information is needed to evaluate the significance of atmospheric contributions of stationary sources of NOx to deposition in the watershed. The airshed of the basin needs to be identified and EPA's NET database should be used for assessing point, area, and mobile sources.

The relative contribution of mobile area and biogenic sources of NOx need to be included in the integrated assessment.

The report identifies the degree of uncertainty and severe limitation on the authors efforts to accurately estimate NOx deposition using CASNET and NADP measurement approaches. This uncertainty needs to be reduced to be able to more accurately evaluate the costs of control verses the benefits to the Gulf. Comparisons of model predictions with observed data should be considered to produce more accurate estimates of the quantity and patterns of nitrogen loading to the Gulf from atmospheric sources.

We have seen data analysis from other scientists that suggests the nitrogen flux has declined since the 1950's, rather then increased as these reports suggest. Whether the flux is increasing or decreasing needs to be resolved before solutions and implementation mechanisms are recommended.

We understand there is a 1950's study of the Gulf conducted by Scripps Institute of Oceanography that showed significantly more phytoplankton productivity than these assessments show for the 1990's. If this 1950's report is valid, and the 1990's data quoted in the assessments are valid, then the trend in productivity would be decreasing rather than increasing as the assessment indicates. A downward trend would indicate a reduction in nutrient flux to the Gulf. **The 1950's data did not support the assumption that the nutrient flux to the Gulf has increased over the past 40 years. This discrepancy needs to be addressed during development of the integrated assessment.**

Topic 4 – Effects of Reducing Nutrient Loads to Surface Waters Within the Mississippi River Basin and the Gulf of Mexico

This report estimates the effects of nutrient source reductions in the Mississippi-Atchafalaya Basin on water quality in these rivers and on primary productivity and hypoxia in the Gulf of Mexico. Modeling analyses were conducted to aid in identifying magnitudes of load reductions needed to effect a significant change in the extent and severity of hypoxia.

When estimating the effects nutrient source reductions would have on water quality in the Mississippi-Atchafalaya Basins, this report extrapolated site-specific case studies to the entire Mississippi watershed. The results found when analyzing measurable reductions of nutrient loads in small watersheds cannot be extrapolated to estimate changes in nutrient delivery to the Gulf because of variations of soil type, slope, participation, and other parameters. Some conclusions are drawn in the report that are based on data from a single year's worth of field studies. We believe better data and improved models are needed to be able to improve predictions of this nature.

At present, we do not have the information base to determine how site specific management practices will benefit water quality within the catchment, watershed, or basin.

The final plan should stress the need to create numeric standards for nutrients in waterways. In setting standards then, a monitoring network would need to be established. Data gathered through the monitoring network would help fill in some of the information gaps that currently exist. How these new standards may effect the nutrient flux needs to be factored into the integrated report.

In fact, we believe it will be necessary to acquire such monitoring information before the agricultural community will embrace nutrient reduction on their farms to benefit the Gulf fishery. In action last week, the Midwestern Association of State Departments of Agriculture agreed to conduct an inventory of best management practices used, reconstruct data of the past 100 years, draft an improved research plan and offer their assistance to the hypoxia research effort. We believe their efforts are sincere and pledge our assistance to their analysis.

Topic 5 – Reducing Nutrient Loads, Especially Nitrate-Nitrogen, to Surface Water, Groundwater, and the Gulf of Mexico

The main focus of this report was to identify and evaluate methods to reduce nutrient loads to surface water, ground water, and the Gulf of Mexico. The analysis was not restricted to only reduction of sources. It also included means to reduce loads by allowing the system to better accommodate those sources through processes such as modified hydraulic transport and internal cycling routes.

The report failed to address the impact of organic nitrogen flux on hypoxia in the Gulf of Mexico. Organic nitrogen constitutes approximately 40% of the total nitrogen in the Mississippi River, yet a thorough analysis of methods to reduce nitrogen loading was not provided.

The effects of coastal wetland loss on hypoxia needs to be addressed. Louisiana has already lost over 1 million acres of wetlands in the last 10 years and continues to lose considerable acreage annually. This wetland loss results in the reintroduction of nutrients to the Gulf. The loss of thousands of areas of coastal wetlands each year can have a significant impact on the Gulf, but that impact was not evaluated in this report.

The impacts the water control structure have on the Atchafalya River and the levees and pumps protecting New Orleans have on the loss of wetlands needs to be evaluated. Little analysis is included about the impacts the operation and maintenance of these structures have on wetlands, even though these structures are mentioned in the report as contributing factors to the loss of wetlands. We would like to see additional evaluation about modifying the operations and maintenance of these structures and the potential benefit to the Gulf in the integrated report.

While the various wetland proposals make some sense, the idea of having small wetlands at the outlets of tile drainfields needs to be tested before being implemented on a large scale. Diverting floodwaters to backwaters of the Mississippi River Delta and coastal wetlands needs to be evaluated further; if wetland improvements are not linked, upstream improvements may be negated if the Delta area is not simultaneously addressed.

Changes in land use (urbanization, increased timber harvest using questionable timber harvesting practices, etc.) undoubtedly contribute to the overall nutrient loading in the system. The effects that land use changes, other than agricultural, have upon the overall problem were not adequately addressed.

Recent information concerning the contribution from large concentrated animal feeding operations to the atmosphere indicate a larger contribution than previously thought. This new information needs to be incorporated into the integrated report discussion of atmospheric deposition.

The report needs to make stronger statements promoting incentives to alter farming practices. Missouri has made great progress in reducing erosion problems by providing state financial assistance. We believe similar financial incentives programs can have a similar impact for nutrients.

Topic 6 – Evaluation of Economic Costs and Benefits of Methods for Reducing Nutrient Loads to the Gulf of Mexico

In addition to evaluating the social and economic costs and benefits of the methods identified in topic 5 for reducing nutrient loads, this analysis included an assessment of various incentive

programs and any anticipated fiscal benefits generated locally for those attempting to reduce sources.

This report makes extensive use of assumptions without proof. It is not a creditable reference for determining the least cost methods of reducing nutrient inputs to streams. The report does not examine cost per unit of nutrient removed by buffers or wetlands and seems to conclude that there should be a wetland below every cornfield. This report also includes alarming statements such as:

1) "Little data has been collected that allow economic impacts of hypoxia to be estimated."
2) "Little systematic data has been collected that would allow the identification of the economic effects of hypoxia."
3) "Farmers may believe their right to farm gives them a right to pollute."

Such statements make the job of addressing non-point source pollution more difficult.

The report states that "fertilizer restrictions are more cost-effective means of reducing nitrogen losses than strategies based only on wetland restoration or buffers." This conclusion does not take into account many other economic benefits that would be associated with the restoration of wetlands including flood control, reduction in sediment load, and restoration of wildlife habitat. Wetlands can reduce the severity of floods, which over the long run would have tremendous economic benefits. Any cost-benefit analysis of wetland restoration needs to consider all the benefits, not just those directly related to nutrient reduction in the Gulf of Mexico.

The report states that "administration, monitoring, verification, and enforcement costs have not been included" in the cost-benefit analysis discussion of alternative solutions. This is a significant shortcoming of the report as these costs may be considerable depending upon the specific solutions chosen. These costs should be included in the final plan that is to be submitted to Congress.

The report acknowledges limitations on the implementation of recommendations on the questionable extent of return (measurable reductions in nutrient loading) and the difficulty in terms of least cost economies. Instead, benefits that accrue locally for on-site improvements are analyzed. We agree that local people solving local problems is the best way to address non-point source issues.

Missouri has long been cognizant of agricultural non-point source pollution. Missouri's economy is built on a strong agricultural foundation that generated $5.6 billion dollars in agricultural production during 1996 with a wide variety of crops and livestock.

In order to deal with soil and water conservation problems, including those identified in these assessments, Missouri voters passed a one-tenth of one percent Parks and Soils Sales Tax in 1984, which funds the Soil and Water Conservation Program (SWCP), a part of the Missouri Department of Natural Resources (DNR). Prior to passage of the tax, Missouri had the second worst erosion rate

in the nation. Tremendous progress has been made in soil and water conservation in Missouri during the past fifteen years. Missouri has reduced erosion on its agricultural land by almost half from 1982 to 1992 – more improvement than any other state (see attachment A). Working mainly in conjunction with the USDA's Natural Resources Conservation Service (NRCS) and local soil and water conservation districts, the DNR has provided a multitude of financial incentives to landowners since 1984 in order to promote improved land management practices on agricultural land. In addition to the standard NRCS practices, Missouri offers incentives through several custom practices that promote the reductions in nitrate loss delineated in the hypoxia reports (particularly the "Report of Task Force #4").

Historically, program efforts have focused only on combating soil erosion, which degrades water quality as sediment laden with agricultural chemicals clogs streams, rivers, and lakes. Much progress has been made in these efforts through regular cost-share, and loan interest share programs, as well as through the 200 Special Area Land Treatment (SALT) or larger EARTH projects initiated since 1986. SALT and EARTH projects are locally led and watershed based. Working through soil and water conservation districts, landowners that farm in a targeted watershed can take advantage of extra financial resources available through the program (see attachment B).

The newest type of SALT project, the AgNPS SALTs, expand the focus of the traditional SALTs to include emphasis on the reduction of all forms of agricultural non-point source (AgNPS) water pollution. Objectives of these watershed projects embrace many of the recommendations proposed in Topic 6. They include, but are not limited to, reducing pesticide and nutrient runoff from cropland, improving pasture management, reducing sedimentation from agricultural land, improving animal waste management, protecting and enhancing riparian corridors, and raising awareness of agricultural non-point source water pollution issues. Twelve AgNPS SALTs are currently being piloted across Missouri, and our District Commission intends to approve at least thirty more projects over the next four years (see attachment C).