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U.S. Environmental Protection Agency
Office of Water/Office of Science and Technology
Health and Ecological Criteria Division (MC 4304 T)
Response to Region 4 White Paper
1200 Pennsylvania Ave., NW
Washington, DC 20460

We are submitting the following comments on the paper, "Evaluation of the Role of Nitrogen and Phosphorous in Causing or Contributing to Hypoxia in the Northern Gulf" (EPA Region 4), on behalf of organizations in the Mississippi Riverwise Partnership (MRP), a coalition of groups dedicated to improvement of water quality in the Mississippi River Basin, and reduction of the hypoxic zone in the Gulf of Mexico.

The public announcement or call for comments on the Region 4 paper invites "the public to provide scientific views on the Region 4 report."[1] Our comments deal primarily with concerns and questions about the process by which this paper and the peer review have come about. The announcement notes that this paper was released "to encourage discussion and pose questions for the reassessment of the Hypoxia Action Plan", and that the paper was released without external peer review, in contrast to the scientific literature that forms the basis for the CENR reports, the *Integrated Assessment*, and the *Action Plan*.

The unusual step of elevating an unpublished, unsigned paper to a prominent role in the *Action Plan* reassessment, in addition to including in the peer review two earlier versions of the paper not previously released officially by EPA, raises a number of questions. EPA notes in the public announcement that the August report and the earlier drafts "raised concerns within the Task Force and stakeholders throughout the basin." Those concerns stemmed at least in part from assertions by some interests of a flawed, if not corrupt process of science on the part of the agency and researchers who have been involved in work on the hypoxia issue. This view has been broadcast openly not only by interest groups such as the American Farm Bureau Federation[2], but also members of the Task Force[3].

These allegations deserved a forceful response by the agency. Including the earlier versions in the peer review provides at least the appearance of being a response to political pressure, rather than a standard process of scientific process of evaluation.

EPA states in its announcement that the earlier version of the paper "was found to lack the science and data necessary to conclusively support the findings as presented," but gives no explanation about what the paper's shortcomings were. Since both earlier versions (January and April 2004) are included in the peer review, the public needs a clear explanation of what their role in the review process is, especially if they differ from the August version in some central assertions. The shortcomings of the earlier versions, and the reasons that the August version was judged adequate for a public release, should also be clearly explained.

Some shortcomings are readily apparent from a review of the earlier versions. The January version states that "the Hypoxia Action Plan called for a 30% reduction of total nitrogen in the Mississippi River Basin," and this contention is repeated in the April version. The *Action Plan* actually states that "the best current science indicates that sub-basin strategies… should be aimed at achieving a 30% reduction (from the average discharges in the 1980-96 time frame) *in nitrogen discharges to the Gulf* [emphasis added] (on a 5-year running average) to be consistent with the [Plan's] Coastal Goal for reducing the areal extent of hypoxia in the Gulf" (p.21)[4]. This basic misunderstanding or misrepresentation of the *Action Plan's* aims can still be found among some segments of the public five years after the Plan's release, but it is disconcerting to see that it was also prevalent among Region 4's researchers and scientists.

The key contention of the August version of the paper is that "the available Gulf hypoxia data and related scientific literature support a modification of the original hypothesis that, for waters subjected to nitrogen and phosphorous loads significantly above historic background levels, there may be considerable benefit to reducing <u>both</u> nutrients in order to restore water quality" (p.ii), joined with a request to that the *Action Plan* Reassessment "consider the merits of reducing phosphorous loads as well."

While this is a reasonable request, it is not clear that reduction of both nutrients has been absent from the formation of hypoxia policy to this point. The *Action Plan* refers to "nutrients, such as nitrogen and phosphorous", and states that "most States in the Basin have significant river miles impaired by high nutrient concentrations, primarily phosphorous"(p.7). The Plan also states that "many of the actions proposed through this plan will also achieve basinwide improvements in surface-water quality by reducing phosphorous as well" (p.8).

The second of the Environmental Indicators of the *Action Plan* (p.27) states:

> Seasonal/annual average nitrogen and phosphorous concentrations and mass loadings are reduced at key river and tributary stations. Measurement stations should represent watershed scales ranging from the local scales at which specific management actions are tested to the scale of the Mississippi and Atchafalaya River Basin as it discharges into the Gulf.

The Programmatic Indicators (p.28) include:

> Reduction in discharges of nitrogen and phosphorous for municipalities.
>
> Estimated/monitored reductions in nitrogen and phosphorous (or surrogate Indicators) for industrial point sources.

The *Action Plan* does emphasize nitrogen for several reasons, among them the fact that substantial actions were already being taken by states upriver to reduce phosphorous loads, and a strong body of literature exists substantiating the key role that nitrogen plays in the formation of Gulf hypoxia. This literature, which has continued past the creation of the *Action Plan*, is cited in the CENR reports and the Integrated Assessment, as well as journal articles published subsequent to those.

The August paper asserts that "the more traditional and perhaps informative comparison of the nutrient composition in the lower MARB would be the DIN:DIP ratio [dissolved inorganic nitrate and phosphorous]."(p.1) But several recent articles not cited by the Region 4 paper conclude that the total forms of nitrogen and phosphorous, rather than the dissolved forms, should be used to determine whether a system is N or P limited. These articles also suggest that the inorganic ratios should not be used to define phytoplankton growth limitation in marine waters, especially when TN:TP values are available.

Dodds (2003) has criticized the use of inorganic nitrogen and phosphorous as an inadequate substitute for measurements of total nitrogen (TN) and total phosphorous (TP) when applying Redfield ratios to determine trophic conditions and nutrient deficiencies.[5] Guilford and Hecky (2000) reviewed the basis for using the inorganic or total N:P ratios to measure nutrient limitation in freshwater and marine ecosystems, and concluded that the TN:TP ratio was the most effective ratio to determine whether nitrogen or phosphorous limited phytoplankton growth. They demonstrated that a TN:TP ratio of 20:1 (which is close to the ratio in the Mississippi River) was indicative of a nitrogen, not phosphorous, limited system. A TN:TP ratio of >50:1, far above that of the Mississippi River system, would indicate a phosphorous limitation.[6]

It is clear that the literature review behind the Region 4 paper was far from complete. Had the paper been subjected to a standard publishing review (which would have required an author's signature), these issues could have been clarified by independent reviewers before it was released to the public. We hope that the peer review undertaken by EPA will adequately address these issues, but are concerned that the way in which this paper has been handled by the agency not opens the door to politicizing a scientific process.

Sincerely,

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[1] "EPA Seeks Scientific and Public Input on the Region 4 Report…," (www.epa.gov/msbasin/region4report.htm).

[2] "Report shifts blame for Gulf hypoxia," American Farm Bureau Federation, *Voice of Agriculture Newsroom*, September 6, 2004 (www.fb.org/news/fbn/04/09_06/html/report.html). This article states erroneously that the "latest EPA report" was "peer reviewed" as of September 2004.

[3] "Nitrogen or Phosphorous? Update on hypoxia in the Gulf of Mexico", Dean Lemke, Iowa Department of Agriculture & Land Stewardship, *2005 Agriculture & Environment Conference, March 8, 2005,* (www.aep.iastate.edu/water/2005/workshops/ A7-lemke.html). This talk refers to the EPA Region 4 "white papers", reflecting how the unreleased versions are being grouped with the August paper to convey the impression of consistent conclusions across all three.

[4] *Action Plan for Reducing, Mitigating, and Controlling Hypoxia in the Northern Gulf of Mexico,* Mississippi River/Gulf of Mexico Watershed Nutrient Task Force, January 2001.

[5] "Misuse of inorganic N and soluble reactive P concentrations to indicate nutrient status of surface water," Dodds, W.K., *Journal of the North American Benthological Society* 22, 2003, 171-181.

[6] "Total nitrogen, total phosphorous, and nutrient limitation in lakes and oceans: Is there a common relationship?", Guilford, S.J., Hecky, R.E., *Limnology and Oceanography* 45, 2000, 1213-1223.