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December 16, 2020

Mr. Andrew Wheeler, Administrator
Environmental Protection Agency
Office of the Administrator
Mail Code 1101A
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

Mr. David Ross, Assistant Administrator
Environmental Protection Agency
Office of Water
Mail Code 4101M
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

Re: Petition for Rulemaking to Set Water Quality Criteria & Produce a TMDL to
Protect the Ohio River from Nutrients

Dear Mr. Wheeler and Mr. Ross:

Enclosed please find a petition for rulemaking to set water quality criteria for nitrogen and phosphorus and establishment of a Total Maximum Daily Load (TMDL) for the Ohio River. We appreciate your attention to this matter, and respectfully request EPA's careful consideration and prompt response to this matter.

We are eager to meet with the appropriate EPA officials after the agency has had an opportunity to review our petition. Please feel free to contact me at 859-879-0020 or on my cell at 859-229-4033 with any questions or for additional information.

Sincerely,


W. Henry Graddy, IV

Enclosures

**BEFORE THE UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF WATER**

Petition for Rulemaking)
Under the Clean Water Act)
Numeric Water Quality Standards for)
Nitrogen and Phosphorus for the)
Ohio River and its Tributaries and for a)
TMDL for Nitrogen and)
Phosphorus for the Ohio River)

Sierra Club, including its Kentucky Chapter, Pennsylvania Chapter, West Virginia Chapter, Indiana Chapter, Illinois Chapter, Tennessee Chapter, Iowa Chapter, and Sierra Club Ohio, members of the Mississippi River Collaborative (MRC), including Healthy Gulf, Prairie Rivers Network and Tennessee Clean Water Network, Concerned Ohio River Residents, Hoosier Environmental Council, Ohio Environmental Council, Ohio River Foundation, Ohio Valley Environmental Coalition, Ohio River Waterkeeper, Valley Watch, West Virginia Rivers Coalition (collectively “Petitioners”) petition for Rulemaking under the Administrative Procedure Act, 5 U.S.C. § 553, and the Clean Water Act, 33 U.S. C. §1251 et seq., for Numeric Water Quality Standards for Nitrogen (N) and Phosphorus (P) for the Ohio River and its tributaries and for a Total Maximum Daily Load (TMDL) for N and P for the Ohio River.

The Ohio River and many of its tributaries have suffered from nutrient pollution-related eutrophication from manmade chemicals and human activities, posing a severe threat to human health and the environment. This eutrophication is chronic and is caused by and chronically caused mainly by N and P pollution. The last four years of U.S. EPA inactivity on this issue has allowed the situation to deteriorate further. The Ohio River Valley Sanitation Commission, the eight-state commission established in 1948 to address Ohio River water pollution problems, reported that P pollution in the Ohio River has worsened.¹

EPA-established numeric nutrient standards that would allow ready development of National Pollutant Discharge Elimination System (“NPDES”) permit limits on N and P discharges and proper calculation of total maximum daily loads (“TMDLs”) for the Ohio River and its tributaries, are badly needed.

Currently, none of the states in the Ohio River basin has numeric water quality standards for P in rivers or streams nor for N in any waters. Further, most of those states do not effectively limit N and P discharges in NPDES permits, from concentrated animal feeding operations (CAFOs) or from agricultural runoff, to protect the designated uses of their surface waters from nutrient pollution. As a result, the impairment of freshwater systems in the Ohio River Basin (like much

¹ Assessment of Ohio River Water Quality Conditions 2014-2018 (2020) available at <http://www.orsanco.org/publications/biennial-assessment-305b-report/>.

of the rest of the country) is largely uncontrolled. This is why the Ohio River basin has recently and repeatedly sustained toxic algal blooms fueled by nutrient pollution. These blooms that previously affected, at most, about ten river miles, now are affecting hundreds of river miles, with dire effects on recreation and the economy and potentially on drinking water supplies.

EPA has claimed in the past that states' narrative water quality standards are adequate to allow states to write NPDES permit limits and establish TMDLs for N and P. As a practical matter these claims are demonstrably untrue.² Most states are doing precious little to control N and P pollution; rather, they are allowing nutrient pollution to increase as evidenced by the increasing frequency, duration and extent of cyanobacteria and other nutrient pollution-related harmful algal blooms ("HABs").³ As long as EPA continues its hands-off approach, the nation's surface waters will continue to degrade.

EPA has the clear authority to act if the states fail to do so. In particular, EPA has clear authority to establish numeric water quality standards governing N and P pollution under Section 303(c) of the Clean Water Act (CWA), 33 U.S.C. §1313(c), and to establish TMDLs under Section 303(d), 33 U.S.C. §1313(d).

For the reasons set forth in greater detail below, Petitioners request under Section 4 of the Administrative Procedure Act, 5 U.S.C. § 553(e), that EPA use its powers under 303(c)(4)(B) and 303(d)(2) of the Clean Water Act, 33 U.S.C. §1313(c)(4)(B),(d)(2), to establish numeric standards and TMDLs that will serve to protect the designated uses of Ohio River waters for aquatic life, recreation, fish consumption and drinking water by controlling N and P pollution. EPA should adopt numeric water quality standards for N and P for all water bodies in all states in the Ohio River Basin for which numeric water quality standards controlling N and P pollution have not yet been established. At a minimum, EPA should establish protective water quality standards to control N and P pollution in the mainstem Ohio River.

Further, EPA should establish TMDLs for N and P for the Ohio River and for each Ohio River tributary that fails to meet the numeric standards that should be set by U.S. EPA.

Petitioners and/or their members commercially fish, swim, drink water, work with, recreationally fish, canoe, engage in nature study, collect water samples and otherwise use water bodies that clearly are negatively impacted by N and P pollution.

² United States Office of Inspector General (Aug. 26, 2009) [authors S. Barvenik, A. Chirigotis, D. Engelberg, L. Fuller, J. Hamann, and M. Reed] - *Evaluation Report: EPA Needs to Accelerate Adoption of Numeric Nutrient Water Quality Standards*. Report No. 09-P-0223. Available at: www.epa.gov/oig/reports/2009/20090826-09-P-0223.pdf.

³ Heisler, J., P. Glibert, J. Burkholder, D. Anderson, W. Cochlan, W. Dennison, C. Gobler, Q. Dortch, C. Heil, E. Humphries, A. Lewitus, R. Magnien, H. Marshall, D. Stockwell, and M. Suddleson (2008) Eutrophication and harmful algal blooms: A scientific consensus. *Harmful Algae* 8: 3-13; and Glibert, P.M. and J.M. Burkholder (2018) Causes of blooms, Chapter 1. In: *Harmful Algal Blooms and Their Management: A Compendium Desk Reference*, by S.E. Shumway, J.M. Burkholder, and S.L. Morton (eds.). Wiley, New York.

I. The Ohio River and its Tributaries and Waters Downstream of the Ohio are Impaired by Harmful Algal Blooms Caused by N and P Pollution

On September 16, 2019, the United States Environmental Protection Agency (“EPA”) published a Notice of Intent to Develop a Policy on the Determination of a Harmful Algae Bloom (HAB) and Hypoxia as an Event of National Significance in Freshwater Systems, at Federal Register. Vol. 84, No. 179, page 48610. That notice described the problem:

Harmful algal blooms (HABs) are caused by certain types of photosynthetic organisms that under certain conditions form large accumulations of algae that can adversely affect human health and the environment and can cause local economic losses. In freshwater, cyanobacteria are the major HABs-forming taxon. Cyanobacteria are microorganisms that can produce harmful cyanotoxins that, if ingested in sufficient amounts, can kill fish, shellfish, livestock, wildlife, and adversely impact human health. Algal blooms, both those that produce cyanotoxins and those that do not, can also harm aquatic environments by depleting oxygen needed to sustain freshwater aquatic life. HABs and other algal blooms can negatively impact drinking water systems, recreation, commercial and recreational fishing, property values and public health.

At the time of that EPA public notice, the Ohio River was in the early stages of what would become a 300-mile HAB that threatened public water supplies and caused the cancellation of recreational events on the Ohio River including the swimming portion of the Louisville Iron Man competition. Minutes of the Ohio River Valley Water Sanitation Commission (ORSANCO) Technical Committee meeting on February 12, 2020, state:

[The 2019 HAB event impacted about 300 miles of the Ohio River for over a month being first identified on September 11, 2019 by KY DOW at Russell, KY in the Greenup Pool. The bloom consisted of Microcystis sp. and produced toxin concentrations in excess of 5,000 ug/L. Recreation advisories were issued by Ohio, Kentucky, and Indiana in September. The final advisory was lifted on November 5, 2019.]⁴

This was not an isolated event. Up to nearly two-thirds (650 miles) of the Ohio River has been affected by highly toxic cyanobacteria outbreaks (“blooms”) within the past five years, from the Ohio/West Virginia border all the way down to Indiana.⁵

Indeed, analysis of dissolved oxygen data by Dr. JoAnn Burkholder makes clear that the Ohio River is subject to low dissolved oxygen levels and high algal activity every year. Dr. Burkholder’s analysis is contained in a letter to Albert Ettinger dated November 22, 2020, which is being sent with this petition. (see Exhibit B)

⁴ <http://www.orsanco.org/wp-content/uploads/2020/06/TECMinutesFeb20Final.pdf>

⁵ Graham, J.L., N.M. Dubrovsky, and S.M. Eberts (2016) Cyanobacterial Harmful Algal Blooms and U.S. Geological Survey Science Capabilities. U.S. Geological Survey Open-File Report 2016-1174, <http://dx.doi.org/10.3133/ofr20161174>; and Kentucky Health News (2019, Sept. 30) Algal bloom warning issued for Ohio River above Louisville. Available at: <https://ci.uky.edu/kentuckyhealthnews/2019/09/30/algal-bloom-warning-issued-for-ohio-river-above-louisville/>.

It is clear that Ohio River Tributaries are also impaired by N and P pollution. The Ohio EPA (2020) stated that “approximately 48% of Ohio’s watersheds are degraded by nutrient loading from P and N,” and that “conditions in Ohio’s surface waters have reached a critical situation” as evidenced by harmful algal blooms, issuance of public health warnings to avoid primary contact recreation, widespread nuisance growths of nutrient-stimulated aquatic vegetation, and increased water treatment costs (and even water treatment plant shutdowns) for safe public water supplies.⁶

Furthermore, scientists and EPA have known for decades that many marine and fresh surface waters of the U.S. are being harmed by nitrogen (N) and phosphorus (P) pollution. EPA has explained that excess levels of N and P are responsible for impairing the Gulf of Mexico and a substantial list of inland waters in nearly every state.⁷

Nutrient (N and P) pollution causes or contributes to low dissolved oxygen (DO) levels⁸ in violation of state standards across the nation⁹, and has numerous adverse effects on aquatic life and on the economic, aesthetic, and recreational value of our nation’s rivers, lakes, and streams. Adverse human health effects have also been traced to N and P pollution through direct stimulation of toxic cyanobacteria outbreaks.¹⁰

Excess N and P also leads to high levels of algae and total organic carbon in drinking water sources. Before affected water is suitable for drinking it must be treated, and cancer-causing trihalomethanes are produced as an unwanted side effect during the treatment process.¹¹ Cyanotoxins ingested by humans via contaminated water have been linked to human disease and death.¹²

Further, N and P pollution affects human health by stimulating the growth of cyanobacteria. As the National Research Council Committee on the Mississippi River and the Clean Water Act (“NRC”)¹³ explained:

Excess nutrients in lakes, ponds, slow-moving streams, and brackish areas in the upper ends of estuaries often lead to blooms of cyanobacteria (blue-green algae) that produce toxic substances. Exposure of humans to these toxic substances through contact,

⁶ <https://epa.ohio.gov/dsw/wqs/NutrientReduction>; see also the Ohio 305b report at https://epa.ohio.gov/Portals/35/tmdl/2020intreport/2020_Final_IR_CompleteReport_May2020.pdf?ver=2020-05-11-150221-420

⁷ Nutrient Criteria, Technical Guidance Manual, Rivers and Streams, EPA -822-B-00-002 (July 2000) (“Nutrient Criteria Guidance”).

⁸ Indeed, dissolved oxygen (DO) data collected in the Ohio River near Warsaw, Kentucky show clearly violations of DO standards and diel swings of DO levels that can be traced to nutrient pollution and algal activity. (Ex. A)

⁹ Burkholder, J.M. (2018) *A Synopsis on Developing Numeric Nutrient Criteria for Freshwaters*. Report for the Mississippi River Collaborative.

¹⁰ (“blooms” - Burkholder 2018 and references therein).

¹¹ Nutrient Criteria Guidance at 4-5.

¹² Chorus, I. and J. Bartram (eds.) (1999) *Toxic Cyanobacteria in Water – a Guide to Their Public Health Consequences, Monitoring and Management*. E & FN Spon for the World Health Organization, New York.

¹³ National Research Council Committee on the Mississippi River and the Clean Water Act, *Mississippi River Water Quality and the Clean Water Act: Progress, Challenges and Opportunities*, 44-45, 74 (2008), <http://nap.edu/catalog/12051.html> (NRC Report).

inhalation of water spray, or oral ingestion can cause debilitating illness and even death. Recreational activities such as swimming and water skiing can result in exposure to contaminated water, as can being on the water in recreational or commercial fishing. Little is known about the transfer of cyanobacterial toxins into the food web, but recent studies indicate that there may be both environmental effects and human health concerns.¹⁴

The excessive loading of nutrients to rivers, lakes, and streams results in excessive plant and algal growth that can be directly attributed to substantial economic damages or increased mitigation expenses associated with anthropogenic nutrient pollution. These economic impacts include:

- **Tourism and recreation.** *Studies from Ohio, Florida, Texas, and Washington (NRC Section III.A.1) provide quantitative estimates of declining restaurant sales, increased lakeside business closures, decreased tourism-associated spending in local areas, and other negative economic impacts of algal blooms. For example, a persistent algal bloom in an Ohio lake caused \$37 million to \$47 million in lost local tourism revenue over two years.*
- **Commercial fishing.** *Several studies (NRC Section II.A.2) document the negative impacts of algal blooms to commercial fisheries throughout coastal areas of the United States, including reduced harvests, fishery closures, and increased processing costs associated with elevated shellfish poisoning risks. For example, a harmful algal bloom (HAB) outbreak on the Maine coast prompted shellfish bed closures, leading to losses of \$2.5 million in soft shell clam harvests and \$460,000 in mussel harvests.*
- **Property values.** *Elevated nutrient levels, low dissolved oxygen levels, and decreased water clarity can depress the property values of waterfront and nearby homes. Studies in the New England, Mid-Atlantic, Midwest, and Southeast regions (NRC Section III.A.3) have demonstrated these impacts using hedonic analyses that measure the impact of water clarity or direct water quality metrics such as pollutant concentrations on property sales price. In New England, for example, a 1-meter difference in water clarity is associated with property value changes up to \$61,000 and in Minnesota, property values changed up to \$85,000.*
- **Human health.** *Algal blooms can cause a variety of adverse health effects (in humans and animals) through direct contact with skin during recreation, consumption through drinking water, or consumption of contaminated shellfish, which can result in neurotoxic shellfish poisoning and other effects. For example, a study from Florida (Section III.A.4) documented increased emergency room visit costs in Sarasota County for respiratory illnesses resulting from algal blooms. During high algal bloom years, these visits can cost the county more than \$130,000.*

¹⁴ As was explained in the NRC Report: The EPA is authorized to step in and address water quality problems that may exist because of limited state action in setting and enforcing water quality standards related to the Clean Water Act provisions. Indeed, the EPA has the statutory duty to do so. NRC Report at 137.

• **Drinking water treatment costs.** Excess nutrients in source water for drinking water treatment plants can result in increased costs associated with treatments for health risks and foul taste and odor. For example, a study in Ohio (Section III.B.1) documents expenditures of more than \$13 million in two years to treat drinking water from a lake affected by algal blooms.

• **Mitigation.** Nutrients that enter waterbodies can accumulate in bottom sediments, acting as sources of loadings to the water column. In-lake mitigation measures such as aeration, alum treatments, biomanipulation, dredging, herbicide treatments, and hypolimnetic withdrawals may be necessary to address the resultant algal blooms. Several studies (NRC Section III.B.2) have documented these measures and the costs associated with them for individual waterbodies. These costs range from \$11,000 for a single year of barley straw treatment to more than \$28 million in capital and \$1.4 million in annual operations and maintenance for long term dredging and alum treatment. (NRC ES-2-3)

• **Restoration.** There are substantial costs associated with restoring impaired waterbodies, such as developing total maximum daily loads (TMDLs), watershed plans, and nutrient trading and offset programs (Section III.B.3). For example, there are several trading and offset programs that have been developed specifically to assist in nutrient reductions. One developed for the Great Miami River Watershed in Ohio for nitrogen and phosphorus had estimated costs of more than \$2.4 million across 3 years.¹⁵

Researchers at Iowa State University looked at U.S. Environmental Protection Agency data on N and P levels in bodies of water throughout the country. The researchers calculated the money lost due to N and P pollution by looking at factors like decreasing lakefront property values, the cost of treating drinking water and the revenue lost when fewer people take part in recreational activities like fishing or boating. They further found that freshwater pollution by P and N costs government agencies, drinking water facilities, and individual Americans at least \$4.3 billion annually. Of that, they calculated that \$44 million a year is spent just protecting aquatic species from nutrient pollution.¹⁶

The cost of treating drinking water with elevated nitrate levels is high. Many public water supply systems must either invest in treatment technologies that remove nitrates from their water sources or blend water from multiple sources to ensure nitrate concentrations in their drinking water are within acceptable levels. “Since 2000, five public water supply systems in Iowa have invested at least \$1.8 million (2015 dollars) in nitrate-removal equipment. Small public water supply systems, those serving less than 500 people, in areas with high nitrates face difficult choices. Nitrate reduction equipment in those communities is typically too costly to justify, and smaller communities often do not have multiple water sources for blending.”¹⁷

¹⁵ Id.

¹⁶ Chuan Tang, Gabriel E. Lade, David Keiser, Catherine Kling, Yongjie Ji, and Yau-Huo Shr *The Costs and Benefits of Nutrient Reduction Programs*, Agriculture Policy Review, Iowa State University Office of Science and Technology https://www.card.iastate.edu/ag_policy_review/article/?a=88

¹⁷ https://www.card.iastate.edu/ag_policy_review/article/?a=88

Excess nutrients in source water for drinking water treatment plants can result in a number of potential health risks and increased treatment costs. For example, algal blooms can result in taste and odor issues that often require treatment plants to add granular or powdered activated carbon. Wendy Drake and Tom Davenport of EPA (2011)¹⁸ indicate that some municipalities are purchasing equipment to monitor for and treat the toxins associated with HABs.

Excess algae also produce precursors to carcinogenic and toxic disinfection byproducts.¹⁹ These byproducts form when disinfectants used in water treatment plants (e.g., chlorine) react with natural organic matter, such as decaying vegetation or algae. The EPA regulates these disinfection byproducts due to their harmful effects on human health. Hence, increased concentrations could result in increased treatment costs for removal.²⁰

Further, harmful algal blooms caused by N and P pollution lead to increased toxicity of arsenic and other pollutants in water bodies.²¹

Lastly, high levels of nitrates in source water are a concern because nitrates have been linked to health effects such as cancer and methemoglobinemia, a condition involving a decrease in the ability of red blood cells to carry oxygen, also known as blue baby syndrome.²² Higher pollutant concentrations of nutrients and algae in the source water result in higher treatment costs for municipalities and their residents due to the additional treatment needed to remove the pollutants.²³

In short, N and P pollution in the Ohio River Basin is causing severe environmental, health and economic effects. The need for effective action is clear.

II. CONTRARY TO THE EXPECTATIONS AND PAST REPRESENTATIONS OF EPA, THE STATES ARE NOT TAKING NECESSARY ACTION TO CONTROL N AND P POLLUTION.

The Ozark Chapter of the Sierra Club petitioned EPA in 2003 requesting, in part, that EPA publish numeric criteria for nutrients. In its June 25, 2004 decision denying the petition, EPA detailed its evaluation of this specific request as follows:

- 1) EPA first looked at whether states in the petition area had adopted numeric N or P criteria to protect designated uses;

¹⁸ <https://dnr.mo.gov/env/wpp/rules/rir/docs/davenport-drake-2011.pdf>

¹⁹ <https://www.epa.gov/nutrientpollution/effects-human-health>

²⁰ <https://awwa.onlinelibrary.wiley.com/doi/abs/10.5942/jawwa.2013.105.0034>

²¹ Tang, Zhang, Sun and Pan, Impact of Eutrophication on Arsenic Cycling in Freshwaters, <https://www.sciencedirect.com/science/article/pii/S0043135418309758>

²² <https://www.ewg.org/research/nitrate-us-tap-water-may-cause-more-12500-cancers-year/>
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3068045/>

²³ <https://www.epa.gov/sites/production/files/2015-04/documents/nutrient-economics-report-2015.pdf>

- 2) EPA next looked to see if petition states had adopted narrative criteria applicable to nutrients and whether there were accompanying procedures to derive numeric criteria; and
- 3) EPA identified the status of petition states' efforts to adopt numeric criteria.²⁴

EPA found that the states were poised to adopt numeric nutrient criteria and that these controls applied to intrastate tributaries would lead to needed near-term reductions in nutrient loadings to the Mississippi River and Gulf of Mexico. EPA further found that, in the interim, states' narrative criteria served to establish nitrogen and phosphorus limits in NPDES permits, allow effective listing of water bodies as nutrient-impaired on section 303(d) lists, and facilitate development of TMDLs to restore those waters.²⁵ These findings proved to be wildly inaccurate.

In 2008, Mississippi River Collaborative and Sierra Club petitioned EPA to take significant steps in the development of numeric nutrient criteria and to develop a TMDL for the Mississippi River.²⁶ Mississippi River Collaborative and Sierra Club recognized then that these were not easy steps to take, but they would help set the necessary framework to achieve the Mississippi River/Gulf of Mexico Hypoxia Task Force's (HTF) goals.

The MRC and Sierra Club petition was denied, and the subsequent legal action under the Administrative Procedure Act to require further consideration of the petition ultimately failed. However, the District Court in *Gulf Restoration Network v. Jackson*, (224 E. Supp. 3d 470 E.D. La. 2016) made clear that EPA did not have unlimited discretion to do little or nothing itself while encouraging states to act. The District Court wrote:

*EPA's assessment that the best approach at this time is to continue in its comprehensive strategy of bringing the States along without the use of federal rule making is subject to the highly deferential and limited review that the Fifth Circuit described in its opinion. Presumably, there is a point in time at which the agency will have abused its great discretion by refusing to concede that the current approach — albeit the one of first choice under the CWA — is simply not going to work. But for now, Plaintiffs have not demonstrated that EPA's assessment was arbitrary, capricious, or contrary to law.*²⁷

Much of the basis for EPA's denial of the petition and the court's decision to uphold EPA's denial was set forth in a memo by Acting Assistant Administrator Nancy Stoner in 2011, entitled "Working in Partnership with States to Address Phosphorus and Nitrogen Pollution through Use of a Framework for State Nutrient Reductions."²⁸ This "Stoner Memo" outlines eight elements for a "state framework for managing nitrogen and phosphorus pollution:"

²⁴ <https://archive.epa.gov/water/archive/web/html/sierraclub.html>

²⁵ Id.

²⁶ This 2008 petition, which regrettably need not be amended to take into account effective actions by states along the Ohio River, is being submitted with this petition.

²⁷ *Gulf Restoration Network v. Jackson*, 224 F. Supp. 3d 470, 477

²⁸ https://www.epa.gov/sites/production/files/documents/memo_nitrogen_framework.pdf

- 1) Prioritize watersheds on a statewide basis for N and P loading reductions,
- 2) Set watershed load reduction goals based upon best available information,
- 3) Ensure effectiveness of point source permits in targeted/priority sub-watersheds,
- 4) In partnership with federal and state agricultural partners, NGOs, private sector partners, landowners, and other stakeholders, develop watershed-scale plans that target the most effective practices where they are needed most,
- 5) Identify how the State will use state, county and local government tools to assure N and P reductions from developed communities not covered by the Municipal Separate Storm Sewer Systems (MS4) program, including an evaluation of minimum criteria for septic systems, use of low impact development/ green infrastructure approaches, and/or limits on phosphorus in detergents and lawn fertilizers,
- 6) Include accountability verification measures,
- 7) Provide annual public reporting of implementation activities and biannual reporting of load reductions and environmental impacts associated with each management activity in targeted watersheds, and
- 8) Develop a work plan and schedule for numeric criteria development.

While some of the above elements were incorporated into some state Nutrient Reduction Strategies, other elements are glaringly absent from state efforts. At least while posturing for the courts, U.S. EPA has stated that it expected states to develop numeric standards, use their existing narrative standards to incorporate numeric limits into NPDES permits under 40 CFR 122.44(d) and use numeric standards to write TMDLs that would control nutrient pollution and harmful algal blooms. While some isolated positive steps have been taken, basically all of the claims U.S. EPA made about how the states would solve the problem have been disproven over the last four years.

A. States Are Not Moving Ahead on Numeric Standards.

As to numeric nutrient criteria development, EPA in the Stoner Memo stated that establishing numeric N and P criteria for at least one class of waters by 2014-16 would be a reasonable start. Four years later, the Ohio River states have failed to make this start. Further, specific load reduction goals have not been set. As detailed below, the states in the Ohio River basin have broadly failed to implement the steps that were the basis of EPA's denial of the 2008 petition and of the court decisions to uphold, for the time being, EPA's inaction.

The Clean Water Act requires criteria to "protect" beneficial uses, Section 303(c), not just to react to damage. In addition, water quality criteria must protect the "most sensitive use." 40

CFR 131.11(a) Further, each “State shall take into consideration the water quality standards of downstream waters and shall ensure that its water quality standards provide for the attainment and maintenance of the water quality standards of downstream waters.” 40 CFR 131.10(b). None of the Ohio Basin states have come close to adopting such standards.

Although it has been over twenty years since the launch of the EPA National Nutrient Strategy,²⁹ Ohio River mainstem states are still wholly dependent on general narrative criteria to protect designated uses for flowing waters in their jurisdiction. As shown in EPA's 2020 "progress" report, Illinois and West Virginia have numeric criteria for P in some lakes, but no state in the basin has numeric criteria for P in rivers or streams or N in any water bodies.³⁰ Lacking meaningful EPA action, this state of affairs is likely to continue for many years. Mainstem states have not met deadlines promised in their Nutrient Criteria Development Plans and some have stated that they are waiting for EPA to act.

Pennsylvania

Pennsylvania has not adopted any numeric nutrient criteria, promulgated regulatory water quality standards regarding cyanotoxins associated with HABs or implemented any advisory levels that are applicable within the Ohio River Basin.³¹ The state cites the complexity of the response of stream biological communities to nutrient enrichment for its failure to promulgate numeric nutrient criteria.³² Several watersheds in the Ohio River Basin have been identified as having the “most consistent degradations” in terms of nitrogen and phosphorus.³³ Nutrient pollution remains one of the leading causes of impairment for Pennsylvania’s streams and lakes.³⁴

Pennsylvania’s Nutrient Criteria Development Plan, which includes a strategy for criteria development with a detailed schedule ending with criteria adoption, was agreed upon by EPA Region 3 in June 2002, with nutrient criteria to have been adopted by the state in 2009.³⁵ However, eight years later, at ORSANCO’s October 3, 2017 Technical Committee meeting, Pennsylvania Department of Environmental Protection (PADEP) reported the state was (finally) preparing to move forward with its water quality standards proposed rulemaking. Pennsylvania’s major proposals only included adoption of revised ammonia criteria for aquatic life, and no numeric criteria for N and P.³⁶ In July 2020, Pennsylvania finalized the adoption of a revised ammonia criteria to be consistent with EPA’s recommended Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater 2013, as part of the state’s Triennial Review of

²⁹ <https://www.epa.gov/sites/production/files/2018-10/documents/nutrient-strategy-1998.pdf>

³⁰ <https://www.epa.gov/nutrient-policy-data/state-progress-toward-developing-numeric-nutrient-water-quality-criteria#tbl>

³¹ The Pennsylvania 2018 305b report shows that almost 30% of the state’s lakes are hypereutrophic with another 46% being eutrophic. https://www.depgis.state.pa.us/2018_integrated_report/index.html

³² Eutrophication Cause Determination Protocol: Technical Report (2018)

³³ 2018 Trend Analysis for Pa Surface Waters,

https://www.depgis.state.pa.us/2018_integrated_report/pdfs/PADEPTrendsReport_SRBC.pdf

³⁴ The Pennsylvania 2020 305b report shows that nutrients are the cause of aquatic life impairment for 2,639 miles of streams and 23,725 acres of publicly owned lakes, and the cause of water supply impairment for 30 miles of streams and 623 acres of publicly owned lakes. https://www.depgis.state.pa.us/2020_Integrated_Report/

³⁵ Nutrient Criteria Development in Pennsylvania (February 2007)

https://www.state.nj.us/drbc/library/documents/mac02202007/brown_padep.pdf

³⁶ At page 9, <http://www.orsanco.org/wp-content/uploads/2016/08/TECMinutesOct17.pdf>

Water Quality Standards.³⁷ Pennsylvania’s Triennial Review did not include water quality standards for N and P.

West Virginia

As explained in the 2016 West Virginia Nutrient Criteria Development Plan (2016 W. Va. Plan),³⁸ West Virginia has adopted numeric total phosphorus (TP) standards to protect certain recreational lakes of 40 ug/L and 30 ug/L respectively for warm water lakes and cool water lakes. (2016W.Va. Plan p. 1) It does not appear that there has been further progress.

Regarding standards to protect the Ohio River and other downstream water bodies, the West Virginia Department of Environmental Protection (2016 W Va. Plan, p.12) clearly states it will evaluate developing numeric nutrient criteria or establishment of a Treatment Technology approach “should a Gulf of Mexico TMDL be created similar to that which has been developed and adopted for the Chesapeake Bay.” In other words, West Virginia will act after EPA leads through TMDL development or an approved EPA alternative restoration approach for water bodies not meeting nutrient water quality standards. West Virginia is open to EPA guidance or federal initiatives to help develop the process. [W VA DEP 2016]

Ohio

Ohio still lacks enforceable numeric nutrient standards for phosphorus and nitrogen for the Ohio River and the Ohio River Basin, even though Ohio Environmental Protection Agency (“OEPA”) has considered implementing rules numerous times over the past decade.

OEPA’s own Nutrient Reduction Strategy Fact Sheet from December 2011³⁹ states:

“Nutrient pollution is a major water quality problem in Ohio and throughout the nation. While efforts to control nutrient enrichment over the past 30 years yielded some positive results, current evidence shows the need to develop newer solutions and hone the focus on existing strategies to effectively reduce nutrients in our waterways.”

Ten years ago, OEPA said: “approximately 48% of Ohio’s watersheds are degraded by nutrient loading from phosphorus and nitrogen . . . Severe algal blooms are damaging the health of Lake Erie and some inland lakes.”⁴⁰ OEPA’s Nutrient Reduction Strategy of 2011 featured eleven steps, including: adopt nutrient water quality standards; reduce P concentration in discharges from municipal wastewater treatment plants; and implement manure management plans for additional Ohio livestock farms.⁴¹

³⁷ 50 Pa. Bull 3426.

³⁸<https://dep.wv.gov/WWE/Programs/wqs/Documents/Public%20Meetings/2016%20November%2015/2016%20WVNutrientPlan.pdf>

³⁹ “Ohio’s Nutrient Reduction Strategy,” December 2011

⁴⁰ <https://www.epa.state.oh.us/dsw/wqs/NutrientReduction>

⁴¹ “Ohio’s Nutrient Reduction Strategy,” December 2011

In December 2011, OEPA stated: “Ohio EPA is continuing to pursue the adoption of nutrient standards as a component of an overall nutrient reduction strategy for the State of Ohio” (Response 19) and that “the Agency has plans to propose numeric criteria for nutrients in the near future.” (Response 118) In the state’s Response to Comments on the state’s 2010 Triennial Review of its Pollution Control Standards, Ohio stated: “Ohio EPA is developing numerical water quality criteria for phosphorus. Those criteria are expected to be available for public review and comment in 2012.”⁴²

In March 2013, OEPA published an Early Stakeholder Outreach – OAC 3745-1 *Developing Rules to Reduce the Impacts of Nutrients in Surface Waters*⁴³ to establish the uses and criteria for how Ohio’s surface waters will be managed and regulated. The rulemaking was supposed to address the need through the most appropriate means to protect beneficial uses of water from adverse impacts due to cultural eutrophication. The rulemaking did not move forward.

Ohio’s Nutrient Reduction Strategy of 2013 relied upon the initiatives of the U.S. EPA’s Mississippi River / Gulf of Mexico Watershed Nutrient Task Force, including the 2008 Gulf Hypoxia Action Plan for Reducing, Mitigating, and Controlling Hypoxia in the Northern Gulf of Mexico and Improving Water Quality in the Mississippi River Basin. The U.S. EPA updated its framework in 2015 to include a recommendation for developing numeric nutrient standards, and continued this work through its 2017 Report to Congress.

OEPA’s strategies in 2013 and in the 2015 update⁴⁴ called for stakeholder involvement. The stakeholder process led to recommendations for stream monitoring and developing watershed action plans, but not setting numeric standards. It is worth contrasting the lack of progress in the Ohio River Basin to the work in the Western Lake Erie Basin, where a TMDL is being developed for the Maumee River Watershed specifically for nutrients.

Following the signing of Ohio Senate Bill 1 on April 2, 2015, R.C. 6111.03 began to require monthly monitoring for dissolved orthophosphate (as P).

In August 2018, OEPA once again published an Early Stakeholder Outreach related to Nutrient Water Quality Standards, this time proposing to modify OAC 3745-1-36 to create a water quality standard for Ohio’s large rivers. The rule was exploring implementing nutrient standards based on the following criteria: (1) sestonic chlorophyll; (2) 5-day Biological Oxygen Demand (BOD5); (3) 24-hour Dissolved Oxygen Range (D.O.); (4) Total Kjeldahl Nitrogen (TKN); and (5) A screening value for Total Suspended Solids (TSS) for sites where chlorophyll data are

⁴² Ohio EPA Response to Comments December 2011

⁴³ Ohio EPA, *Developing Rules to Reduce the Impacts of Nutrients in Surface Waters*. “Cultural eutrophication is the result of releasing large amounts of nutrients into rivers and lakes. If left unchecked, cultural eutrophication can result in harmful algal blooms, the depletion of dissolved oxygen and fish kills. Cultural eutrophication associated with high levels of phosphorus and nitrogen is one of the leading causes of impairment of aquatic life in Ohio’s lakes, streams and rivers.”

⁴⁴ Ohio Nutrient Reduction Strategy 2015 Addendum

lacking. In addition, the possible rule would have considered a target phosphorus concentration for over-enriched segments as demonstrated by the standard.⁴⁵

While OEPA conducted extensive research on the viability and efficacy of the 2018 proposed rule and requested comments from the public, the rule never moved past the early stakeholder outreach phase of rule review.

To date, OEPA has not proposed and adopted numeric nutrient criteria as part of the state's water quality standards.⁴⁶ The agency has considered the question in multiple rulemakings since 2011. And though OEPA has narrative standards, they have not resulted in meaningful progress toward eliminating nutrient pollution in the Ohio River.

OEPA's "Free From" standards found at OAC 3745-1-04 are applicable to all waters. The criteria are reactive, rather than preventative, and have not prevented impacts to human health and the environment from excess nutrients. The Clean Water Act requires "criteria to protect beneficial uses." Water quality criteria must protect the "most sensitive use." (40 CFR 131). In addition, Paragraphs (F) and (G) of OAC 3745-1-04 exempt the "Free Froms" standards from applying under some conditions.

Just as OEPA has failed to limit nutrient pollution into the Ohio River through rulemakings or other policies, the agency has not reduced nutrient pollution through the permitting process. The agency has not implemented a meaningful systemic approach to nutrient management through its permits, though there have been a few limited examples of nutrient management in a few specific cases.

Permits allowing discharge to the Great Miami River include the "notice" that they may have nutrient limits in future permits. Two upstream plants (Dayton and Western Regional), with significant nutrient loading, were instructed to comply with P limits within 36 months. Similarly, the City of Dayton WWTP was supposed to have limits, according to the fact sheet for permit 1PF00000*OD which would have expired about Jan 2021. A modification was issued in September 2019 for permit 1PF00000*PD, expiring Jan 31, 2021. That permit has a P compliance schedule which requires compliance with seasonal phosphorus loading limit by July 1, 2022. The Western Regional WRF also received a permit modification.

Treatment facilities that discharge directly to the Ohio River include Mill Creek WWTP, the Little Miami WWTP, and Muddy Creek. These three facilities have design flows at peak flow, of 240 MGD, 90 MGD, and 22 MGD, an indication of the impact they can have upon the Ohio River. None of these three facilities has any limits on nutrients.

⁴⁵ *Early Stakeholder Outreach – Nutrient Water Quality Standards for Ohio's Large Rivers (OAC 3745-1-36)*, Ohio Environmental Protection Agency, (August 2018), available at: https://epa.ohio.gov/Portals/35/rules/ESO%20fact%20sheet_large%20river%20nutrients_aug18.pdf

⁴⁶ While Ohio regulators have not acted, Ohio researchers have developed the science necessary to set standards for P for large rivers. See [Miltner, Eutrophication Endpoints for Large Rivers in Ohio, USA](https://pubmed.ncbi.nlm.nih.gov/29302742/), <https://pubmed.ncbi.nlm.nih.gov/29302742/> (recommending standard of .130 mg/L TP for large rivers)

Nutrient enrichment remains one of the top causes of impairment in Ohio and one of the two top causes of impairment in 38 segments of Large Rivers in the state. Neither point sources nor non-point sources are being effectively addressed to reduce nutrient pollution in the Ohio River Basin. While OEPA has proposed solutions over the past decade, a regional/national approach, instituted by the U.S. EPA, including numeric nutrient standards, would require the agency to follow through with its vocalized commitments to nutrient reduction in the Ohio River.

Kentucky

The US EPA maintains a web page that tracks state progress toward developing numeric nutrient water quality criteria at:

<https://www.epa.gov/nutrient-policy-data/state-progress-toward-developing-numeric-nutrient-water-quality-criteria#tbl>

The N/P Criteria Progress Map shows that Kentucky is at Level 1, with “No N and/or P Criteria” as is Pennsylvania, Ohio, Indiana and Tennessee. Illinois is at Level 2, where it has been since 1998. Based upon the EPA data, only one state – West Virginia – has made any progress, moving from Level 1 to Level 3 in 2013.

The US EPA conclusion regarding Kentucky is consistent with the Kentucky Division of Water (DOW) description of the progress, or lack thereof, within the Commonwealth of Kentucky. The Kentucky DOW explanation can be found here:

<https://eec.ky.gov/Environmental-Protection/Water/Protection/Pages/Nutrient-Reduction-Strategy.aspx>

The Kentucky Nutrient Reduction Strategy found on that page is dated March 2014. At page 42, at Appendix B, Kentucky has attached the September 2012 “Nutrient Criteria Development Plan” which begins as follows:

This plan supersedes the previous (October 2008) document entitled Nutrient Criteria Development Plan for the Commonwealth of Kentucky, as Revised (2008), submitted to EPA (United States Environmental Protection Agency) in January 2009. Explained within this document the Kentucky Division of Water (DOW) establishes its intent to develop state-specific nutrient criteria rather than adopt the EPA published section 304(a) nutrient criteria. The current plan for DOW brings together the tenets of that document, but expands on the complexity of this subject, both from the technical and administrative challenges this process entails. This plan outlines the nutrient field studies the commonwealth has undertaken during approximately the last 10 years, the environmental relationships considered in developing numeric nutrient criteria that are protective of the aquatic resources, but also reasonable in consideration of the implementation and assessment procedures and processes such a complex regulation demands. This plan revision is in response to policy issued by EPA in 2001 that encourages states to provide a narrative framework in order to show progress toward criteria development. In 2000 and 2001, EPA published recommended nutrient criteria

for lakes and reservoirs and rivers and streams based on national nutrient ecoregion data. The EPA expects states to develop a plan for adopting nutrient criteria into their water quality standards with an approach, including a strategy, milestones and schedule that are mutually agreed upon by states and EPA. States can use the criteria published by EPA or develop their own criteria by a scientifically defensible methodology. If states do not demonstrate substantial progress in adopting criteria according to the plan or have not developed a plan by the end of 2004, EPA has proposed to promulgate their ecoregional criteria. Under the Act (Clean Water Act) Section 303(c)(4)(B) the EPA administrator may exercise authority granted him under the Act and promulgate revised or new water quality criteria for a state where necessary to meet requirements under the Act. Therefore, it is imperative the commonwealth continue to show progress in developing numeric nutrient criteria through annual updates to this mutually agreed upon plan between the DEP - (Kentucky Department for Environmental Protection) DOW and EPA.

At page 72, this document contains a timeline, starting in 2003, as follows:

Nutrient Criteria Development I (Past, Current and Future) Year Activities

- 2003
1. *Continue wadable streams nutrient and biological sampling.*
 2. *Continue boatable waters methods development (summer activity).*
 3. *Continue large and small reservoir sampling (May – October).*
 4. *Continue work on nutrient grant to migrate multi-agency reservoir data into a common database; resolve QA/QC issues and identify data gaps.*
 5. *Initiate contacts with state agencies, USACE and TVA regarding interstate and border waters criteria development (winter activity).*
 6. *Participate in ORSANCO nutrient workgroup for Ohio River criteria.*

Kentucky DOW anticipated that ORSANCO would adopt Ohio River Nutrient Criteria by 2006:

- 2006
1. *Adopt criteria for wadable streams in each bioregion.*
 2. *Adopt criteria for intrastate reservoirs.*
 3. *Continue boatable water criteria development with effect-based approach.*
 - a. *Test ORSANCO criteria approach to other boatable waters with goal of establishing criteria in 2009 (next triennial review period).*
 4. *Continue workgroup activities on interstate and border waters with goal of adopting criteria in 2009 (next Kentucky triennial review period).*
 5. *Complete all elements of nutrient development grant.*
 6. *Adopt nutrient criteria for the Ohio River into ORSANCO standards.*

Kentucky DOW anticipated that the Kentucky Nutrient Reduction Strategy would be finalized in 2012-2013 [Note that these timelines are found as an appendix to the draft March 2014 Nutrient Reduction Strategy], and that Kentucky DOW would begin to promulgate in stream nutrient criteria as part of the 2018 triennial review:

- 2018 *1. Enter the triennial review with wadable stream and intrastate reservoir nutrient criteria adoption planned, but contingent on technical variables as well as direction from leadership.*
- 2. Continue toward development of boatable water and interstate reservoir nutrient criteria development.*
- 3. Wetlands remain under consideration and progress is contingent on methodology development as described in this plan.*

Kentucky DOW has failed to meet any of these milestones.

On May 24, 2016, Kentucky DOW submitted a revision of the 2016 Nutrient Criteria Development Plan to reflect changes in milestones based upon feedback from US EPA Region IV. These “new” milestones note that the 2006 date for ORSANCO criteria for the Ohio River was not met, that the Kentucky Nutrient Reduction Strategy would be finalized in 2014 to 2017 [this milestone was not met], and the above referenced 2018 triennial review milestone is now shown as 2018-2021.

See attached Exhibit C, letter dated May 1, 2020 from Hank Graddy, Kentucky Sierra Club, to ORSANCO, asserting that the ORBA Ohio River Plan for 2020-2025 completely omits setting numeric nutrient limits for the Ohio River. In September, 2020 this five-year strategic plan for the Ohio River was finalized without any mention of setting numeric nutrient limits for the Ohio River. That failure was one of the failures described herein that makes this petition necessary and urgent.

Indiana

The Wabash River in Indiana drains 75% of Indiana watersheds, making it the second leading contributor of nutrients to the Gulf Dead Zone in the Ohio River Basin. In the northern Indiana Lake Erie watersheds, the state entered into an MOU requiring use of the Erie P Market framework to guide the generation and sale of P credits. Indiana is also one of three states, along with Ohio and Kentucky, taking a leading role to develop and implement the Electrical Power Research Institute’s experimental water quality nutrient trading program for the Ohio River.⁴⁷ Indiana is eager to help dischargers devise ways to lessen the impact of regulation. However, Indiana has not been nearly as enthusiastic regarding establishing protective regulations or proactive numeric N and P criteria.

Under Indiana law, it is very difficult for the Indiana Department of Environmental Management (IDEM) to adopt protective water quality standards in the absence of minimum federal regulations because of restrictions on imposing requirements not required by U.S. EPA. Significant environmental regulations often must even be adopted by the Indiana General Assembly. For these reasons, it is critical for EPA to adopt nutrient criteria and to require states follow suit.

⁴⁷ <http://wqt.epri.com>

Illinois

Despite the December 2018 recommendations of the Illinois Nutrient Science Advisory Committee that Illinois adopt numeric nutrient standards based on science developed in Wisconsin and elsewhere,⁴⁸ Illinois has not adopted numeric standards for N in any waters or for P for any of its rivers or streams.⁴⁹

Illinois, through its permitting system, is developing phosphorus targets in connection with development of Nutrient Assessment and Reduction Plans (NARPs) for Illinois waters that have been assessed as impaired or to have a risk of eutrophication. See 2019 Biennial Report on Illinois Nutrient Loss Reduction Strategy implementation at p. 100⁵⁰ (Illinois 2019 Biennial Report). However, those plans do not focus on the Ohio River or other waters downstream from Illinois. Moreover, NARP development and implementation would greatly benefit from EPA using its scientific resources to determine numeric water quality standards and water quality restoration plans for the Ohio River.

B. States are Not Using Their Narrative Standards to Derive Nitrogen or Phosphorus Permit Limits that are Protective of Receiving Waters or Downstream Waters.

In the past, some of the petitioners reviewed the status of Ohio River basin states' efforts to derive numeric translator formulas with which to interpret their respective general narrative standards, and presented evidence that only one of the ten, Tennessee, had done so (but see below). This situation has not changed from 2004 when EPA denied the Sierra Club's Petition.

Furthermore, NO state has undertaken a rigorous assessment of the impacts from N and P pollution to the mainstem Ohio River. Also, NO state has completed a TMDL for the mainstem river despite serious, stark adverse impacts from nutrient pollution manifested as extreme, repeated, highly toxic HABs that now last for months each year and extend for hundreds of river miles from West Virginia as far downstream as Indiana.

The ongoing, two-decades-long failure to either adopt numeric standards or prepare effective methods with which to interpret and implement state narrative standards has crippled the ability of the states to derive effluent limits in NPDES permits that protect the designated uses of Ohio surface waters.

The Clean Water Act focuses predominantly on point source pollution, which includes concentrated animal feeding operation in 33 U.S.C. §1362(14). Yet, none of the Ohio River basin states has derived or is deriving water quality-based effluent limits (WQBELs) for N or P

⁴⁸ <https://www2.illinois.gov/epa/topics/water-quality/standards/Documents/NSAC%20Report%20-%20Final.pdf>. The recommended phosphorus criteria are far lower than what is currently occurring in many waters in the Ohio Basin.

⁴⁹ Illinois has a 0.05 mg/L standard for certain lakes, 35 Ill. Adm. Code 302.205, which unfortunately has been poorly implemented.

⁵⁰ <https://www2.illinois.gov/epa/topics/water-quality/watershed-management/excess-nutrients/Pages/nutrient-loss-reduction-strategy.aspx>

in NPDES permits despite the requirements of 40 CFR 122.44(d). Thus, the states' narrative water quality standards are being ignored in permit design.

As discussed below, various state agencies are on record stating that this failure to derive and impose WQBELs for nutrients is due to the fact that, although the states have narrative standards, the states have not adopted numeric water quality standards for nutrients.

Pennsylvania

Pennsylvania does not have numeric nutrient water quality criteria. Instead, PA DEP uses narrative criteria to regulate nutrients in Pennsylvania waterways. 25 Pa. Code §93.6(a) (“Water may not contain substances attributable to point or nonpoint source discharges in concentration or amounts sufficient to be inimical or harmful to the water uses to be protected or to human, animal, plant or aquatic life.”). These criteria prohibit nutrient levels that are harmful to the specific water body in question but do not set a numerical cap on different levels of nutrients. Based on this narrative criteria, a Pennsylvania waterbody is impaired by nutrients when excessive plant or algal growth causes a decrease in DO such that the DO level goes below the required amount necessary to support the designated use of that waterbody.⁵¹ This method of addressing nutrient pollution is extremely cumbersome, time consuming and limited to the situation in which a serious impairment is already evident. Additionally, PA Code Chapter 96.5(c) specifically requires that when the determination is made that a P discharge contributes or threatens to impair existing or designated uses in lotic (stream and river) systems, the NPDES Permit Quality Review (November 2016, p.23) discharge will be limited to an average monthly concentration of 2 mg/L, though more stringent controls on point source discharges may be imposed, or may be otherwise adjusted as a result of a TMDL which has been developed.

A 2 mg/L limit is likely too weak to prevent eutrophication, as has been shown by numerous studies around the country.⁵² PA DEP and the EPA have worked to develop nutrient TMDLs as well as alternative restoration plans for various streams, particularly in southeastern Pennsylvania.

West Virginia

As of 2016 West Virginia admittedly was not using narrative criteria to establish NPDES permits with West Virginia DEP stating, “West Virginia is currently evaluating the application of its narrative water quality criteria to see if nutrient impairment issues can be adequately addressed based on stream monitoring and algal bloom assessment programs.” (2016 W. Va. Plan p. 2) Petitioners are aware of no NPDES limits on TP or TN in W. Virginia.

⁵¹ DEP, Implementation Guidance for Section 95.9

Phosphorus Discharges to Free Flowing Streams (1997), *available at*

<http://www.depgreenport.state.pa.us/elibrary/GetDocument?docId=7617&DocName=IMPLEMENTATION%20GUIDANCE%20FOR%20SECTION%2095.9%20PHOSPHORUS%20DISCHARGES%20TO%20FREE%20FLOWING%20STREAMS.PDF%20%20%3Cspan%20style%3D%22color%3Agreen%3B%22%3E%3C%2Fspan%3E%20%3Cs>

⁵² See e.g. Miltner Eutrophication Endpoints for Large Rivers in Ohio, USA, 0.13 mg/L cited above, and Wisconsin phosphorus standard of 0.1 mg/L for non-wadable waters. NR 102.06(3)

The West Virginia Department of Environmental Protection (WVDEP) has developed a 303(d) Listing Methodology for Algae Blooms, which is currently being used in lieu of TP or TN nutrient criteria for streams within the state (WVDEP-LM, 2013). To facilitate this approach, West Virginia has developed an Algae Monitoring and Assessment Standard Operating Procedure (WVDEP-SOP, 2015) for determining stream impairment due to excess filamentous algae.

In 2016 WVDEP concluded:

“To date, nutrient pollution issues within the state have largely been determined to be point source related. Funding to help nutrient pollution contributing sources maintain or adopt maximum technologies needed to reduce the concentration of pollution discharges and maintain water quality standards remains a challenge. As future funding may become available increased efforts can be directed toward continuing to reduce the point source nutrient problem within state waterbodies.” (2016 W. Va. Plan p.14)

Federal action is plainly needed for West Virginia to move forward effectively to protect its waters and downstream waters.

Ohio

As explained in Section A of this document, narrative standards are not being used to set NPDES permit limits for even the largest Ohio River dischargers. Narrative standards have been recognized by OEPA and U.S. EPA in the past to be ineffective in controlling nutrients and both have recognized and supported implementation of numeric nutrient standards. However, there is no such standard for the Ohio River Basin. Work by OEPA has failed to achieve water quality standards through permits or TMDLs.

Kentucky

From the 2014 draft Kentucky Nutrient Reduction Strategy, page 1:

In 2011, Kentucky had more than four thousand permits, excluding resource extraction and construction general permits, which may discharge nitrogen or phosphorus. More than 96% of these are minor facilities (in the case of domestic wastewater treatment plants these are facilities with a design capacity of less than 1 million gallons per day). There are one hundred thirty-six major dischargers. Of the four thousand permits, fifty-two percent have ammonia limits, with less than 1% having limits or monitoring for nitrite/nitrate or Total Kjeldahl Nitrogen (TKN) and none have limits for Total Nitrogen (TN). About 2% have Total Phosphorus (TP) limits, while 9% have monitoring for TP (ICIS 12/17/13).

In 2013, Sierra Club, KWA and others sued EPA for approving a *weakened narrative* nutrient water quality standard, adopted by the Kentucky Division of Water (KY DOW) in response to litigation brought by two citizens who complained that KY DOW issued a new Kentucky

Pollutant Discharge Elimination System (KPDES) permit to a new publicly owned treatment works (POTW) in Western Boone County without any nutrient limits. See: *Energy and Environment Cabinet et al v Tim Guilfoile and Betsy Bennett*, 2014-CA-00415 (Ky. App. 2015).

This permit challenge revealed that the Kentucky Energy and Environment Cabinet (EEC) had failed to properly apply the “no reasonable potential” analysis to justify the absence of nutrient limits. *Kentucky Waterways Alliance et al v EPA*. 3:13-cv-01207 (W.D. Ky.) was settled with clarification concerning the application of the narrative standard, but with concerns KY DOW may continue to fail to apply appropriately the “no reasonable potential” analysis.

Since October 2018, the Kentucky Sierra Club has reviewed all KY DOW public notices for KPDES permit issuance/renewals for POTWs. Through December 2019, the review found that KY DOW had issued 18 KPDES renewals without setting nutrient effluent limits based upon a wholly unexplained determination that there was no reasonable potential for a violation or excursion to occur. In addition, for six KPDES permits indicating that there was reasonable potential for a violation or excursion, KY DOW required Whole Effluent Toxicity limits but not nutrient limits. The three KPDES permits with numeric nutrient limits all discharged into an impaired stream for which a TMDL had been developed.

Kentucky, then, like Ohio, Pennsylvania, and West Virginia is placing only weak limits on discharges to waters that are already clearly impaired without giving consideration to downstream water bodies including the Ohio River.

Indiana

While developing its nutrient reduction strategy, Indiana implemented a non-rule policy (NRP) in 2014 that requires POTWs that discharge more than 1 MGD of effluent to meet a monthly average of 1.0 mg/L TP. It also requires monitoring of TP to be included on permits.⁵³ As each POTW permit comes up for review, the new limits and monitoring requirements are included.

While this action by IDEM certainly demonstrates the least that upstream states could do to limit phosphorus discharges to the Ohio River, it is plainly inadequate. **No scientist that has considered the issue has concluded that phosphorus levels anything close to 1 mg/L are tolerable in streams.**

Illinois

Illinois has established P limits on major dischargers discharging to impaired waters and is developing nutrient assessment and reduction plans to address certain waters where there is a risk of eutrophication. (Illinois 2019 Biennial Report)⁵⁴ Illinois is also establishing technology-based effluent limits (TBELs) on phosphorus for other major dischargers beginning in 2030. While these limits on phosphorus are useful, they are not being set to prevent violations of water quality standards in the Ohio River segments bordering Illinois, or in other downstream waters.

⁵³ https://www.in.gov/isda/files/Indiana%20State%20Nutrient%20Reduction%20Strategy_Version%205%20Final.pdf

⁵⁴ <https://www2.illinois.gov/epa/topics/water-quality/watershed-management/excess-nutrients/Documents/NLRS-Biennial-Report-2019-Final.pdf> at 101

There are no limits on N discharges to prevent impact on the Ohio River or downstream water bodies.

Tennessee

Tennessee has prepared a numeric translator of its narrative nutrient standard.⁵⁵ Unfortunately, the Tennessee Department of Environmental Conservation (TDEC) misused the reference stream approach in developing its numeric translator. For example, TDEC used 50 streams as “reference” conditions for nutrient sub-ecoregion 71i despite knowledge that most of those streams had been substantially degraded by nutrient pollution, so much so that most of them did not differ in TP and nitrate + nitrite (NO_x) levels from those pollutant concentrations in other streams of the sub-ecoregion (Burkholder 2017 and references therein). Thus, TDEC’s numeric translator does not protect Tennessee surface waters from continued degradation due to nutrient pollution.

Moreover, TDEC’s numeric translator does not appear to be commonly used to derive effluent limits in NPDES permits even in those cases where it is clear under the translator that limits are necessary. According to Vojin Janjic, Assistant Manager of Permits Section for TDEC, most permits contain only a requirement to report monitoring results for N and P in discharge monitoring reports. Few have explicit numeric limits for N and even fewer for P.⁵⁶

C. Flowing Waters Are Not Being Assessed and 303(d)-Listed Due to Violations of Narrative Standards, and TMDLs Are Not Being Completed for Narrative Violations in Many Impaired Waters.

Petitioners reviewed the practices of Ohio River Basin states in assessing intrastate waters for compliance with state narrative standards for nutrients, listing of such waters as impaired by nutrients on 303(d) lists, and preparing TMDLs to restore nutrient-impacted waters to support designated uses. It is difficult, however, to draw conclusions because it does not appear that much work has been done to study nutrient pollution in the Ohio River Basin or write TMDLs for Ohio River Tributaries.

Some limited assessment, 303(d) listing, and TMDL preparation based on interpretation of narrative standards has been accomplished for P in lakes. Little is being done to assess, list, and restore flowing waters related to P impacts.

ORSANCO

ORSANCO has increased monitoring⁵⁷ due to increased algal blooms and taste and odor problems in past years, but not developed TMDLs for nutrients.

⁵⁵ Gregory M. Denton, Debbie Arnwine and Sherry H. Wang, Development of Regionally- Based Interpretations of Tennessee's Narrative Nutrient Criterion, Tennessee Department of Environment and Conservation (August 2001).

⁵⁶ Telephone interview by Dana L. Wright, Director of Policy and Legislative Affairs, Tennessee Clean Water Network, with Vojin Janjic, Assistant Manager of Permits Section for the Tennessee Department of Environment and Conservation (July 18, 2008)

⁵⁷ <http://www.orsanco.org/data/nutrients/>

“ORSANCO, through its Ohio River Watershed Pollutant Reduction Program, is assisting states and U.S. EPA⁵⁸ in the development of TMDLs for the Ohio River.”⁵⁹ However, ORSANCO’s progress to develop TMDLs has been limited to dioxin (2000), PCBs (2002) and an “on hold” process for bacteria.⁶⁰

“Nearly half of the Ohio River is impaired for the contact recreation use caused by bacteria levels that exceed the applicable criteria for the protection of that use.”⁶¹

The Ohio River TMDL for bacteria began with a contract in 2007.⁶² The last project report update was December 15, 2016. Project status indicates there will be a draft TMDL for internal review only which is complete.⁶³ Phase 5 of the project, Completion and public notice of the draft TMDL’s, status is “Project will continue when funding is available.”⁶⁴

As to nutrient reduction, “The Clean Water Action Plan, a presidential initiative released in 1998, directed US EPA to develop numeric nutrient criteria for the nations waters. Numeric criteria will drive water quality assessments and management.”⁶⁵

ORSANCO has provided no update nor has USEPA developed numeric nutrient criteria, despite the presidential initiative.

Pennsylvania

As discussed above, without numeric nutrient standards, it is difficult for PA DEP to create TMDLs for waters impaired by nutrients. Many of the nutrient TMDLs that have been developed in southeastern Pennsylvania have been the subject of litigation. Pennsylvania appears to have completed one nitrogen TMDL since 2000 and has completed a few phosphorus TMDLs, only a handful of which are located in the Ohio Basin.⁶⁶ This is not because there are few Pennsylvania waters impaired by nutrients; nutrient pollution remains one of the leading causes of impairment for Pennsylvania’s streams and lakes as evidenced by PA DEP’s useful interactive map. Pennsylvania has also worked on “alternative restoration plans,” rather than TMDLs, for some nutrient-impaired waterbodies.⁶⁷

⁵⁸ <http://www.epa.gov/owow/tmdl>

⁵⁹ <http://www.orsanco.org/programs/watershed-pollutant-reduction/total-maximum-daily-loads-tmdls/>

⁶⁰ <http://www.orsanco.org/programs/watershed-pollutant-reduction/total-maximum-daily-loads-tmdls/>

⁶¹ Ibid

⁶² <http://www.orsanco.org/wp-content/uploads/2016/06/QAPP.pdf>

⁶³ <http://www.orsanco.org/wp-content/uploads/2016/06/Bacteria-TMDL-Progress-Update-12-16.pdf>

⁶⁴ <http://www.orsanco.org/programs/bacteria-tmdl/>

⁶⁵ <http://www.orsanco.org/programs/nutrient-reduction-activities/>

⁶⁶ <https://www.ahs.dep.pa.gov/TMDL/>

⁶⁷ See, e.g., PA DEP, Kishacoquillas Creek Watershed Alternative Restoration Plan, Sept. 2017, *available at* http://www.dep.state.pa.us/dep/deputate/watermgmt/wqp/wqstandards/tmdl/Kishacoquillas_Creek_ARP.pdf; EPA, Impaired Waters Restoration Process: Planning, <https://www.epa.gov/tmdl/impaired-waters-restoration-process-planning> (last accessed December 14, 2020).

Approximately half of Pennsylvania falls in the Chesapeake Bay watershed, and so is subject to the requirements of the Chesapeake Bay TMDL. The Chesapeake Bay TMDL sets limits and mandates reductions in nitrogen, phosphorus, and sediment pollution across the six states and the District of Columbia in the Chesapeake Bay watershed. The Chesapeake Bay TMDL is a potential model with built in accountability measures for addressing complex nutrient pollution across multiple states, with thousands of tributaries and thousands of point and non-point sources.⁶⁸

West Virginia

West Virginia acknowledges that algae can be a problem.⁶⁹ but it does not appear that West Virginia has even assembled a list of impaired waters since 2016⁷⁰ which, of course would be based on data collected from before that year.

Ohio

OEPA's 2020 Integrated Water Quality Monitoring and Assessment Report (May 2020) reports the following overall status of Ohio's Assessment Units:

11	Full Attainment
85	Some Uses Full Attainment
52	Use Attainment Unknown/Insufficient Information
206	Use Impaired, TMDL Complete
26	Use impaired, Not a Pollutant
1203	Use Impaired, TMDL needed

OEPA lists, on their website, only four TMDLs that are in progress in the state. Two of these are in the Ohio River Basin—the Upper Scioto Watershed and the Mohican River—which are impaired for nutrients. It is worth noting that OEPA's recent Draft Loading Analysis Plan for the East Fork of the Little Miami River does include language supporting development of a TMDL for nutrient impairment for significant portions of that watershed.⁷¹

There is a lack of reporting/updating on the progress or success of the TMDLs that exist. Ohio is currently moving to a twelve-year, two-pronged probabilistic approach to its water quality monitoring, a shift OEPA argues is a “method to better estimate statewide water quality trends through probabilistic surveys.”⁷² Numerous organizations have identified potential issues with the agency's new two-pronged approach, including the Midwest Biodiversity Institute.⁷³ This proposal, if enacted, will radically change the quality of data provided by OEPA for TMDL development.

⁶⁸ See <https://www.epa.gov/chesapeake-bay-tmdl>.

⁶⁹ <https://dep.wv.gov/WWE/watershed/Algae/Pages/default.aspx>

⁷⁰ https://dep.wv.gov/wwe/watershed/ir/pages/303d_305b.aspx

⁷¹ *Loading Analysis Plan and Supporting Data Acquisition Needed for the East Fork Little Miami River Basin*, Ohio EPA, November 2020, available at:

https://epa.ohio.gov/Portals/35/tmdl/LAPs/Little%20Miami/EFLMR_LAP_Draft.pdf

⁷² DSW Monitoring Strategy Fact Sheet, June 2019_final

⁷³ Midwest Biodiversity Institute comments on “two-prong strategy”

TMDLs that lack timelines and agencies responsible for implementing specific projects limit the success of the TMDL process. OEPA's Integrated Report contains two tables of short-term TMDL development, but no dates are included to determine when OEPA expects to finish them. Given the slow pace of Ohio's TMDL process, and the long-term delay in developing numeric nutrient criteria or a TMDL for the Ohio River tributaries regarding nutrients pollution, we can probably expect a significant amount of time to pass before OEPA develops the type of protections requested in this petition.

Kentucky

Kentucky's (2016) Integrated Report to Congress on the Condition of Water Resources in Kentucky stated that 58% of streams and rivers are impaired for aquatic life. The second most important cause was identified as Nutrient/Eutrophication Biological Indicators. Fully 25% of this state's lakes and reservoirs were listed as impaired, with Nutrient/Eutrophication Biological Indicators as the leading cause.

The 2014 draft Kentucky Nutrient Reduction Strategy includes figures showing the distributions of yields of TN and TP into the Gulf of Mexico, illustrating that Kentucky is a very substantial contributor of total phosphorus and a substantial contributor of TN. Kentucky recently published the report, *Nutrient Loads and Yields in Kentucky 2005 -2017*⁷⁴, which concluded that N had trended up slightly. There was no statistically significant change in P loads.

Indiana

IDEM evaluates total phosphorus data in two completely separate ways and only evaluates nitrogen data for the purpose of developing TMDLs for waters where impaired biotic communities have been found.

When making nutrient assessments, IDEM evaluates nitrogen and phosphorus data in combination with other data including DO concentrations, pH and excessive algae that may indicate a nutrient problem. IDEM collects samples and evaluates flowing waters to determine the extent to which N may be contributing to the impairment. TP data collected from rivers and streams are evaluated in combination with other parameters to determine the extent to which nutrients may be impacting aquatic life use. TP data collected from Indiana's lakes and reservoirs are evaluated in combination with other parameters to determine the degree to which nutrient enrichment may be impacting recreational uses.

In order for a river or stream to be listed on Indiana's 303(d) for nutrients, monitoring data must show evidence of nutrient impairments, and the concentrations of nutrients in the waterbody must be high enough to adversely affect the aquatic ecosystem and affect the aquatic communities. IDEM does not evaluate nitrogen data independently for the purpose of making aquatic life use assessments or developing its 303(d) list.⁷⁵

⁷⁴ <https://eec.ky.gov/Environmental-Protection/Water/Protection/Pages/Nutrient-Reduction-Strategy.aspx>

⁷⁵ <https://www.in.gov/idem/nps/3365.htm>

Indiana has reported to EPA that none of the state's nutrient-impaired rivers has all impairments addressed by a TMDL or an alternative restoration plan.⁷⁶

Illinois

The Illinois Environmental Protection Agency (IEPA) has done TMDLs for few lotic waters anywhere in Illinois. Illinois assesses lakes as impaired based on the state's numeric standard of 50 µg/L Total P (TP). 35 Ill. Adm. Code 302.205. Demonstrating that useful work can be done where there are numeric standards in place, Illinois has done a number of TMDLs for lakes.

As discussed above, Illinois does not have numeric standards for N or for P in lotic waters. In 2008, IEPA used circular logic to “justify” removal of Total N (TN) as a cause of impairment, explaining that it was removed because the state had not developed a numeric standard(s) for TN in any of its surface waters⁷⁷—although nearly a decade before, EPA had called for states to adopt TN criteria as critically needed for surface water protection nationwide

And, despite Illinois' status as **the** largest state contributor of TN and TP to the Gulf of Mexico, IEPA refuses to prepare TMDLs for TN or TP in interstate waters that receive nutrient pollution from Illinois, deferring such actions to EPA.

III. PETITIONERS' REQUESTS OF EPA – EPA SHOULD PROMPTLY PREPARE AND PUBLISH NUMERIC CRITERIA FOR PHOSPHORUS AND NITROGEN FOR THE STATES IN THE OHIO RIVER BASIN AND PREPARE A TMDL FOR THE OHIO RIVER.

Clearly, action by EPA is needed **now** – not simply more studies, reports, task forces, committees, commissions, and conferences. EPA has long known concrete steps that should be taken to begin to control N and P pollution.

Further, it is clear from the foregoing discussion that numeric water quality standards for N and P are **necessary** to meet the requirements of the Clean Water Act. Under Section 303(c)(4) of the Clean Water Act, 33 U.S.C. 1313(c)(4), EPA “shall *promptly* prepare and publish revised water quality standards” where a new or revised standard is necessary to meet the requirements of the Clean Water Act. 33 U.S.C. § 1313(c)(4) (emphasis added). See also *The Raymond Proffitt Foundation v. U.S. Environmental Protection Agency*, 930 F. Supp. 1088, 1103-04 (E.D. Pa. 1996).

Still further, it has been shown that the states have largely failed to prepare TMDLs necessary for numerous waters in the Ohio River basin that are impaired by N and P pollution and that no TMDL for nutrients has been established for the mainstem of the Mississippi River or any portion of the Gulf of Mexico. **The law is clear:** EPA has the authority to establish TMDLs for

⁷⁶ <https://www.epa.gov/nutrient-policy-data/waters-assessed-impaired-due-nutrient-related-causes>

⁷⁷ <https://www2.illinois.gov/epa/Documents/epa.state.il.us/water/tmdl/303-appendix/2008/appendix-f-response-summary.pdf>

impaired waters and the duty to do so where the states have failed to act. *Scott v. City of Hammond*, 741 F.2d 992 (7th Cir. 1984).

Accordingly, the EPA should grant this petition filed pursuant to Section 4(d) of the Administrative Procedure Act, 5 U.S. C § 553(e). EPA should exercise its powers under Sections 303(c)(4) and 303(d) of the Clean Water Act, 33 U.S.C. § 1313(c)(4),(d), to prepare and publish numeric TN and TP water quality standards and establish TMDLs needed to protect the nation's waters, including the Ohio River and other waters within the Mississippi River basin where the need has been so clearly shown. In particular, petitioners request that EPA take each of the following steps to meet the requirements and advance the goals of the Clean Water Act:

Regarding numeric water quality standards:

- 1) EPA should prepare and publish revised numeric water quality standards for N for every "navigable water," as defined by 33 U.S.C. § 1362(7), for which a numeric water quality standard(s) for N has not been submitted to EPA pursuant to 33 U.S.C. §1313(c)(3) and found by EPA to be consistent with the CWA.
- 2) EPA should prepare and publish revised numeric water quality standards for P for every "navigable water," as defined by 33 U.S.C. § 1362(7), for which a numeric water quality standard(s) for P has not been submitted to EPA pursuant to 33 U.S.C. §1313(c)(3) and found by EPA to be consistent with the CWA.

In establishing criteria, EPA must take full account of its own regulation, at 40 C.F.R. § 131.10(b), which states: "In designating uses of a water body and the appropriate criteria for those uses, the State shall take into consideration the water quality standards of downstream waters and shall ensure that its water quality standards provide for the attainment and maintenance of the water quality standards of downstream waters." Accordingly, it is not enough to establish numeric criteria for upstream waters that only account for the degradation that nutrients cause locally. EPA must also ensure that compliance with those waters' criteria will lead to full compliance with the swimmable and fishable goals of the Clean Water Act, and will protect the designated uses of downstream waters from degradation due to nutrient pollution.

The Natural Resource Council Report made the following statements related to the Mississippi River, which could be applied just as well to the Ohio River:

Under Section 303(c)(4)(B), the EPA can establish a water quality standard "in any case where the Administrator determines that a revised or new standard is necessary to meet the requirements" of the Clean Water Act. Accordingly, the EPA can establish a more demanding standard than any of the states included within a significant national watershed as long as, in the EPA's judgment, that standard is necessary "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters" or to achieve the fishable and swimmable goal of the Clean Water Act. (NRC report at 127)

In addition, petitioners request that EPA establish TMDLs for TN and TP for the following water bodies:

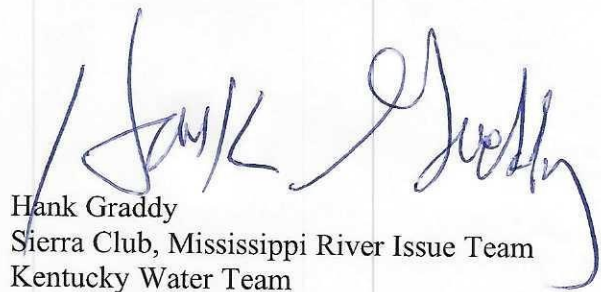
- 1) The mainstem of the Ohio River and every segment thereof; and
- 2) The tributaries of the Ohio River that do not meet the criteria EPA establishes for N nor P.

CONCLUSION

The Ohio River and the people who live near it have been severely impacted by N and P pollution that the states in the watershed have proven unable to control. The United States Environmental Protection Agency must now fulfill the role it was given by Congress to address a serious problem that the states have failed to correct.



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Rich Cogen, Executive Director
Ohio River Foundation

Robin Blakeman, Project Coordinator
Ohio Valley Environmental Coalition

Jessica O'Neill, Senior Attorney
PennFuture

John Blair
Valley Watch

Angie Rossier, Executive Director
West Virginia Rivers Coalition

Exhibit A



Washington University in St. Louis

SCHOOL OF LAW

Civil Justice Clinic
Interdisciplinary Environmental Clinic

July 30, 2008

Benjamin H. Grumbles
Assistant Administrator for Water
U.S Environmental Protection Agency
Office of Water (4101M)
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

Dear Mr. Grumbles:

Please find enclosed a Petition for Rulemaking Under the Clean Water Act for Numeric Water Quality Standards for Nitrogen and Phosphorus and Total Maximum Daily Loads for the Mississippi River and the Gulf of Mexico.

This Petition is submitted on behalf of the Gulf Restoration Network, Louisiana Environmental Action Network, Tennessee Clean Water Network, Public Employees for Environmental Responsibility, Kentucky Waterways Alliance, Missouri Coalition for the Environment, Iowa Environmental Council, Prairie Rivers Network, Environmental Law & Policy Center, Midwest Environmental Advocates, Minnesota Center for Environmental Advocacy, Natural Resources Defense Council, and the Sierra Club.

The Exhibits to the Petition will follow under separate cover.

If you have any questions, please call Kris Sigford at 651.223.5967, Albert Ettinger at 312.795.3707 or Elizabeth Hubertz at 314.935.8760.

Sincerely,

Elizabeth J. Hubertz

cc: Petitioners

**BEFORE THE UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF WATER**

Petition for Rulemaking)
Under the Clean Water Act)
)
)
Numeric Water Quality Standards for)
Nitrogen and Phosphorus and TMDLs for the)
Mississippi River and the Gulf of Mexico)
)
_____)

I. SUMMARY

Scientists and the United States Environmental Protection Agency (“EPA”) have known for decades that many marine and fresh water bodies of the United States are being harmed by nitrogen and phosphorus pollution. Eight years ago, EPA explained that excess levels of nitrogen and phosphorus are responsible for impairing the Gulf of Mexico and a huge list of waters in nearly every state.¹ Nitrogen and phosphorus pollution causes or contributes to low dissolved oxygen levels and has numerous adverse effects on aquatic life and on the economic, aesthetic, and recreational value of our rivers, lakes, and streams.

Human health effects have also been traced to nitrogen and phosphorus pollution. Excess nitrogen and phosphorus lead to high levels of algae in the water. Before such water is suitable for drinking it must be treated, and cancer-causing trihalomethanes are produced as an unwanted side effect during the treatment process.² Further, nitrogen and phosphorus pollution affects

¹ Nutrient Criteria, Technical Guidance Manual, Rivers and Streams, EPA -822-B-00-002 (July 2000) (“Nutrient Criteria Guidance”).

² Nutrient Criteria Guidance at 4-5.

human health by stimulating the growth of cyanobacteria. As the National Research Council Committee on the Mississippi River and the Clean Water Act (“NRC”)³ recently explained:

Excess nutrients in lakes, ponds, slow-moving streams, and brackish areas in the upper ends of estuaries often lead to blooms of cyanobacteria (blue-green algae) that produce toxic substances. Exposure of humans to these toxic substances through contact, inhalation of water spray, or oral ingestion can cause debilitating illness and even death. Recreational activities such as swimming and water skiing can result in exposure to contaminated water, as can being on the water in recreational or commercial fishing. Little is known about the transfer of cyanobacterial toxins into the food web, but recent studies indicate that there may be both environmental effects and human health concerns.⁴

In fact, as demonstrated by the NRC Report and by numerous documents and studies discussed below, nitrogen and phosphorus pollution:

- is causing a huge dead zone in the Gulf of Mexico that threatens numerous human and ecological communities as well as the basic health of the Gulf,
- is impairing fresh water systems in the Mississippi River Basin and in other watersheds across the country, and
- has not been addressed by effective EPA action although EPA has long recognized the massive problems caused by nitrogen and phosphorus pollution.

Moreover, although EPA has offered many plans and methods for addressing the nitrogen and phosphorus pollution problem, those plans have failed, because they have not been backed by direct action by EPA. As discussed below, it is unreasonable to expect states to develop numeric nitrogen and phosphorus standards to protect their own waters, let alone protect downstream waters which they may have little political will to protect. Further, purely voluntary programs to control nitrogen and phosphorus pollution are not getting the job done. Still further,

³ National Research Council Committee on the Mississippi River and the Clean Water Act, *Mississippi River Water Quality and the Clean Water Act: Progress, Challenges and Opportunities*, 44-45, 74 (2008), <http://nap.edu/catalog/12051.html> (“NRC Report”).

⁴ NRC Report at 45.

although EPA has claimed in the past that the states' narrative water quality standards are adequate to allow states to write National Pollutant Discharge Elimination System ("NPDES") permit limits and establish total maximum daily loads ("TMDLs") for nitrogen and phosphorus, as a practical matter, these claims are demonstrably untrue. Most states are doing precious little to control nitrogen and phosphorus pollution and as long as EPA continues its hands-off approach, the situation will not improve.

Currently, the states in the Mississippi River Basin have no numeric water quality standards for phosphorus in rivers or streams or for nitrogen in any waters. Further, most states do not even try to limit nitrogen and phosphorus discharges in NPDES permits. As a result, the impairment of fresh water systems in the Mississippi River Basin and across the country is largely uncontrolled and this year's Gulf of Mexico Dead Zone is the second largest on record. This is true even though EPA long ago recognized that important steps could be taken by the states to address the problem of nitrogen and phosphorus pollution, and that EPA has the clear authority to act if the states fail to do so. In particular, EPA has clear authority to establish numeric water quality standards governing nitrogen and phosphorus pollution under Section 303(c) of the Clean Water Act (CWA), 33 U.S.C. §1313(c), and to establish TMDLs under Section 303(d), 33 U.S.C. §1313(d). As was recently explained in the NRC Report:

The EPA is authorized to step in and address water quality problems that may exist because of limited state action in setting and enforcing water quality standards related to the Clean Water Act provisions. Indeed, the EPA has the statutory duty to do so. A more aggressive role for EPA in this regard is crucial to maintaining and improving water quality in the Mississippi River and the northern Gulf of Mexico.

There are currently neither federal nor state water quality standards for nutrients for most of the Mississippi River, although standards for nutrients are under development in several states. Both numerical federal quality criteria and state water quality standards for nutrients are essential precursors to reducing nutrient inputs to the river and achieving water quality objectives along the Mississippi River and for the Gulf of Mexico. A TMDL could be set for the Mississippi River and the northern Gulf of Mexico. This would entail the adoption by EPA of a numerical nutrient goal (criteria) for the terminus

of the Mississippi River and the northern Gulf of Mexico. An amount of aggregate nutrient reduction, across the entire watershed, necessary to achieve that goal then could be calculated. Each state in the Mississippi River watershed then could be assigned its equitable share of reduction. The assigned maximum load for each state then could be translated into numerical water quality criteria applicable to each state's waters.

The EPA should develop water quality criteria for nutrients in the Mississippi River and the northern Gulf of Mexico. Further, the EPA should ensure that states establish water quality standards (designated uses and water quality criteria) and TMDLs such that they protect water quality in the Mississippi River and the northern Gulf of Mexico from excessive nutrient pollution. In addition, through a process similar to that applied to the Chesapeake Bay, the EPA should develop a federal TMDL, or its functional equivalent, for the Mississippi River and the northern Gulf of Mexico.⁵

Petitioners Gulf Restoration Network, Louisiana Environmental Action Network, Tennessee Clean Water Network, Public Employees for Environmental Responsibility, Kentucky Waterways Alliance, Missouri Coalition for the Environment, Iowa Environmental Council, Prairie Rivers Network, Environmental Law & Policy Center, Midwest Environmental Advocates, Minnesota Center for Environmental Advocacy, Natural Resources Defense Council, and the Sierra Club request under Section 4 of the Administrative Procedure Act, 5 U.S.C. § 553(e), that EPA use its powers to control nitrogen and phosphorus pollution. Petitioners and/or their members commercially fish, swim, drink water, work with, recreationally fish, canoe, engage in nature study, and otherwise use water bodies that are negatively impacted by nitrogen and phosphorus pollution. For the reasons set forth in greater detail below, EPA should adopt numeric water quality standards for the portion of the ocean protected by the Clean Water Act but outside the jurisdiction of any state and for all water bodies in all states for which numeric water quality standards controlling nitrogen and phosphorus pollution have not yet been established. In the alternative, EPA should do this for the Northern Gulf of Mexico and for all

⁵ NRC Report at 137.

waters of the United States within the Mississippi River Basin. At a minimum, EPA should establish water quality standards to control nitrogen and phosphorus pollution in the mainstem of the Mississippi River and the Northern Gulf of Mexico.

Further, EPA should establish TMDLs for nitrogen and phosphorus for the Gulf of Mexico, the Mississippi River and each Mississippi River tributary that fails to meet the numeric standards set for nitrogen and phosphorus for which a TMDL has not already been prepared. In any event, EPA should prepare a TMDL for nitrogen and for phosphorus for the mainstem of the Mississippi River and the Northern Gulf of Mexico.

II. NITROGEN AND PHOSPHORUS POLLUTION NEGATIVELY AFFECTS THE GULF OF MEXICO.

Nutrient pollution is devastating the Northern Gulf of Mexico. According to many reports, including those recently drafted by the respected scientists at the NRC and the United States Environmental Protection Agency Science Advisory Board (“USEPA-SAB”), as well as by the Mississippi River/Gulf of Mexico Watershed Nutrients Task Force (“Task Force”), excessive levels of nitrogen and phosphorus — known collectively as “nutrients” — have observable and detrimental effects on saltwater environments, such as the Northern Gulf of Mexico.

The excess nitrogen and phosphorus in these systems have serious consequences, including the creation of harmful algal blooms; the development of areas of lowered dissolved oxygen known as “hypoxic zones” or “dead zones;” the loss of sub-aquatic vegetation, changes in the species composition of benthic organisms, and damage to coral reefs.⁶

⁶ NRC Report at 209; National Research Council, *Clean Coastal Waters: Understanding and Reducing the Effects of Nutrient Pollution* (2000); E. Selman, S. Greenhalgh, R. Diaz, and Z.

A. The Nature and Extent of The Gulf of Mexico Dead Zone.

Due to the excessive nitrogen and phosphorus pollution flowing from the Mississippi and Atchafalaya River Systems, a large zone of hypoxia has developed in the Northern Gulf of Mexico. There are 169 of these hypoxic zones throughout the world. The Gulf's dead zone is the largest in North America and the second largest in the world.⁷ In the Gulf of Mexico, hypoxia is deemed to occur when dissolved oxygen levels are less than two milligrams per liter (“mg/L”). At this level, the fish and shrimp that normally live on the bottom can no longer be found.⁸ The hypoxic region in the Gulf of Mexico extends up to 125 kilometers (“km”) offshore and ranges from the mouth of the Mississippi River in eastern Louisiana west to the coastal waters of Texas.⁹ Since 1985, when scientists began regular measurements of the hypoxic zone, its area has fluctuated, although several years it has exceeded 20,000 square kilometers (“km²”) or about the size of Massachusetts (see Figure 1). The Gulf's dead zone has twice the total surface area of

Sugg, *Eutrophication and hypoxia in coastal areas: A global assessment of the state of knowledge*, World Resources Institute Policy Note (March 2008); P.M. Vitousek, J.D. Aber, R.W. Howarth, G.E. Likens, P.A. Matson, D.W. Schindler, W.H. Schlesinger & D.G. Tilman, *Human Alterations of the Global Nitrogen Cycle: Sources and Consequences*, 7(3) Ecological Applications, 737-750 (1997).

⁷ Selman, *supra* note 4; N.N. Rabalais, R.E. Turner, and D. Scavia, *Beyond Science into Policy: Gulf of Mexico Hypoxia and the Mississippi River*, 52 *BioScience* 129-142 (2002). See also Homepage, Hypoxia in the Northern Gulf of Mexico, at www.gulfhypoxia.net (last visited July 26, 2008).

⁸ See *Overview*, Mapping the “Dead Zone” at www.gulfhypoxia.net (last visited July 26, 2008).

⁹ U.S.EPA, Science Advisory Board, *Hypoxia in the Northern Gulf of Mexico*, (2008), [http://yosemite.epa.gov/sab/sabproduct.nsf/C3D2F27094E03F90852573B800601D93/\\$File/EPA-SAB-08-003complete.unsigned.pdf](http://yosemite.epa.gov/sab/sabproduct.nsf/C3D2F27094E03F90852573B800601D93/$File/EPA-SAB-08-003complete.unsigned.pdf); N.N. Rabalais, *et al.*, *Characterization and Long-Term Trends of Hypoxia in the Northern Gulf of Mexico: Does the Science Support the Action Plan?*, 30(5) *Estuaries and Coasts* 753-772 (2007).

the entire Chesapeake Bay, and its volume is several orders of magnitude greater than the hypoxic water volume of Chesapeake Bay.¹⁰

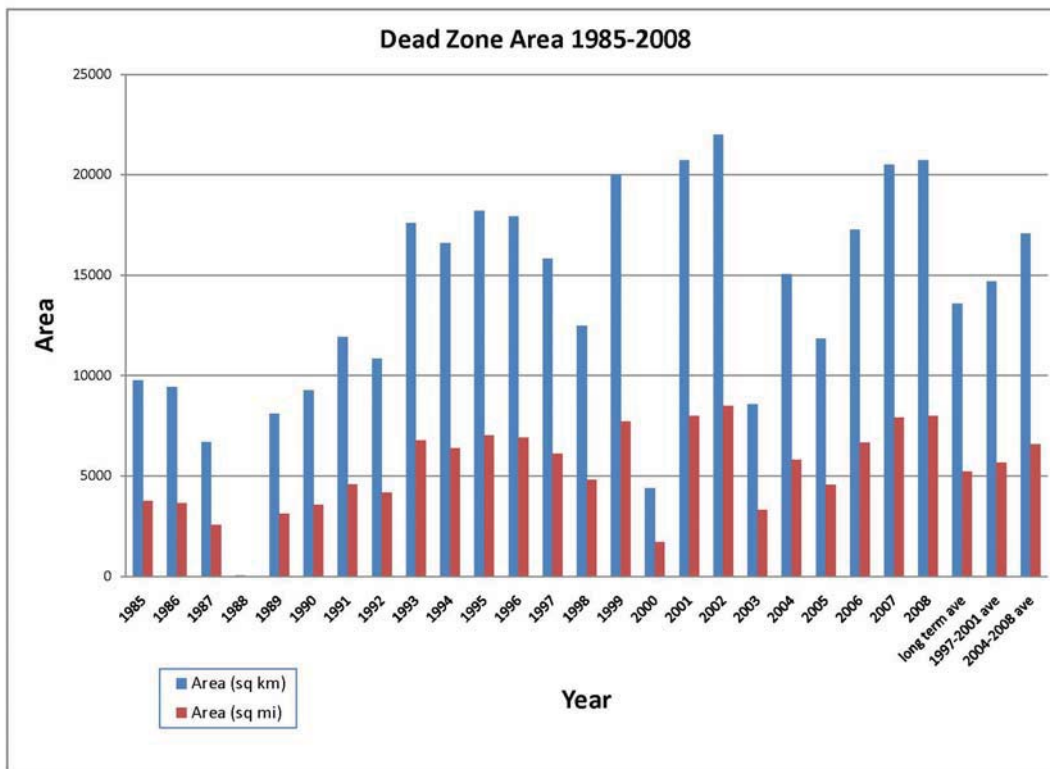


Figure 1. Areal extent of the Northern Gulf of Mexico Dead Zone, 1985-2008.

The hypoxic zone is a giant ecological imbalance triggered far upstream from the Gulf. It begins with the discharge of large amounts of nitrogen and phosphorus from the Mississippi and Atchafalaya Rivers into the Gulf. The nitrogen and phosphorus pollution enriches the water and causes the growth of massive algal (phytoplankton) blooms each summer. Dead phytoplankton

¹⁰ “Overview – What is Hypoxia?” Hypoxia in the Northern Gulf of Mexico at www.gulphypoxia.net (last visited July 26, 2008).

cells, along with fecal pellets from zooplankton that have eaten the phytoplankton, sink to the lower strata of the Gulf, and provide a large source of available carbon. Bacteria consume this carbon at a high rate, and in the process also consume dissolved oxygen. Because of salinity and temperature differences, the water in the Gulf naturally stratifies. As a result of this stratification, the bacteria and other organisms near the bottom use up the oxygen faster than it can be replenished. When this happens, a hypoxic zone, or sometimes an anoxic zone – an area with *no* dissolved oxygen – forms in the bottom strata of the Northern Gulf. When a hypoxic zone forms, the shrimp and fish that can swim away do so. Those creatures that cannot escape suffocate and die. The ultimate consequence is an environment where little to no sea life exists.¹¹

B. The Social and Economic Costs of The Dead Zone.

The lack of oxygen in the Dead Zone poses a serious threat to species diversity in the Gulf and to its \$2.8 billion commercial and recreational fishing industry.¹² In the 2008 NRC Report, the authors describe the effects of hypoxia on coastal shrimp and fish:

Shrimp, as well as the dominant fish, the Atlantic croaker, are absent from the large areas affected by hypoxia (Renaud, 1986; Craig and Crowder, 2005; Craig et al., 2005). There is a negative relationship between the catch of brown shrimp—the largest economic fishery in the northern Gulf of Mexico—and the relative size of the midsummer hypoxic zone (Zimmerman and Nance, 2001). The catch per unit effort of brown shrimp declined during a recent interval in which hypoxia was known to expand (Downing et al., 1999). The presence of a large hypoxic water mass when juvenile brown shrimp are migrating from coastal marshes to offshore waters inhibits their growth to a larger size and thus affects the poundage of captured shrimp (Zimmerman and Nance, 2001). The unavailability of suitable habitat for shrimp and croaker forces them into the warmest

¹¹ “Mapping the ‘Dead Zone,’” Hypoxia in the Northern Gulf of Mexico, at www.gulfhypoxia.net (last visited July 26, 2008).

¹² National Centers for Coastal Ocean Science, *Gulf of Mexico Ecosystems & Hypoxia Assessment (NGOMEX)* (2007).

waters inshore and also cooler waters offshore of the hypoxic zone with potential effects on growth, trophic interactions, and reproductive capacity (Craig and Crowder, 2005).¹³

C. The Importance of Urgent Federal and State Action.

The USEPA-SAB succinctly demonstrated the importance of timely action to reduce nitrogen and phosphorus pollution in the Mississippi River, observing:

Biological changes have occurred in the benthic communities of the [Northern Gulf of Mexico], and there is evidence that the living resources are impacted by hypoxia. The Gulf of Mexico ecosystem appears to have gone through a regime shift with hypoxia such that today the system is more sensitive to inputs of nutrients than in the past, with nutrient inputs inducing a larger response in hypoxia as shown for other coastal marine ecosystems (Chesapeake Bay, Danish coastal water). The USEPA-SAB Panel therefore provides the following recommendation: *Nutrients should be reduced as soon as possible before the system reaches a point where even larger reductions are required to reduce the area of hypoxia.*¹⁴

These observations have been echoed on by Dr. Nancy Rabalais of the Louisiana Universities Marine Consortium (LUMCON) whose website (gulfhypoxia.net) states:

[W]hile hypoxic environments have existed through geologic time and are common features of the deep ocean or adjacent to areas of upwelling, their occurrence in estuarine and coastal areas is increasing, and the trend is consistent with the increase in human activities that result in nutrient over-enrichment. No other environmental variable of such ecological importance to estuarine and coastal marine ecosystems around the world has changed so drastically, and in such a short period of time, as dissolved oxygen. The severity of hypoxia (either duration, intensity, or size) increased where hypoxia occurred historically or hypoxia exists now when it did not occur previously. The severity of hypoxia has increased in the northern Gulf of Mexico according to indicators identified in sediment samples from the affected area, and the size and frequency of occurrence have increased as the flux of nitrate increased during the last half of the 20th century.¹⁵

¹³ NRC Report at 61.

¹⁴ U.S. EPA, Science Advisory Board, *Hypoxia in the Northern Gulf of Mexico*, *supra* note 9 at 52 (emphasis added).

¹⁵ “Overview –What is Hypoxia?” Hypoxia in the Northern Gulf of Mexico at gulfhypoxia.net (last viewed July 26, 2008).

D. Scientific Recommendations.

The scientific community has concluded that direct action must be taken in order to address the Dead Zone. The USEPA-SAB stated that since the 2007 Dead Zone was the third largest since measurements began, “it is even more important to proceed in a directionally correct fashion to manage factors affecting hypoxia.” Subsequently, the USEPA-SAB Panel recommends, in order to reduce the hypoxic zone to 5,000 km² (the goal accepted in the 2001 and re-affirmed in the 2008 Action Plans):

a dual nutrient strategy targeting at least a 45% reduction in riverine total nitrogen flux (to approximately 870,000 metric tonne/yr or 960,000 ton/yr) and at least a 45% reduction in total phosphorus flux (to approximately 75,000 metric tonne/yr or 83,000 ton/yr). Both of these reductions refer to changes measured against average flux over the 1980-1996 time period ...with most recent model runs showing a 45-55% required reduction for N in order to reduce the size of the hypoxic zone.¹⁶

The Panel further states that this reduction is conservative, given that “a number of studies have suggested that climate change will create conditions for which larger nutrient reductions, *e.g.* 50 to 60% for nitrogen, would be required to reduce the size of the hypoxic zone.”¹⁷

The USEPA-SAB study stressed the importance of a dual-nutrient (nitrogen and phosphorus) removal strategy for improving the water quality of both the Mississippi-Atchafalaya River Basin and the Northern Gulf of Mexico. It found that plans that target nitrogen will not address phosphorus impairments throughout the basin, and that phosphorus reductions play an important role in addressing the Dead Zone in the Northern Gulf.¹⁸ The NRC also endorsed an approach targeting both nitrogen and phosphorus pollution, finding that while nitrogen is the primary nutrient of concern in the northern Gulf of Mexico hypoxic zone, excess

¹⁶ USEPA-SAB, *supra* note 9 at 2.

¹⁷ *Id.* at 2.

¹⁸ *Id.* at 3.

phosphorus should also be addressed, as it may be a limiting nutrient to phytoplankton growth in the spring, and “in the immediate plume of the Mississippi River as it discharges into the Gulf of Mexico. Given the importance of reducing both nitrogen and phosphorus in various forms, it is necessary to consider management of both of these nutrient inputs.”¹⁹ The 2008 Action Plan likewise targets both nitrogen and phosphorus.²⁰

In order to reach the goals accepted by the scientific community, a basin-wide approach to reducing nitrogen and phosphorus pollution is necessary. Recent models, including the U.S. Geological Survey SPARROW Model (SPATIally Referenced Regressions on Watershed Attributes), demonstrate the contribution from each mainstem state; these contributions illustrate the importance of nitrogen and phosphorus pollution reductions in all contributing states, as shown in Figure 2 below. The duty to coordinate and implement such a basin-wide approach should be assumed by EPA. In fact the NRC Report states that the Clean Water Act “provides the EPA with multiple authorities that would allow it to assume a stronger leadership role in addressing Mississippi River and northern Gulf of Mexico water quality.”²¹ As part of this authority, the NRC states that

A TMDL [Total Maximum Daily Load] could be set for the Mississippi River and the northern Gulf of Mexico. This would entail the adoption by EPA of a numerical nutrient goal (criteria) for the terminus of the Mississippi River and the northern Gulf of Mexico ... the EPA should develop [this] federal TMDL, or its functional equivalent, for the Mississippi River and the northern Gulf of Mexico.²²

¹⁹ NRC Report at 63.

²⁰ See Gulf Hypoxia Action Plan (2008), <http://www.epa.gov/msbasin/taskforce/pdf/ghap2008.pdf> (“2008 Action Plan”).

²¹ *Id.* at 7.

²² *Id.* at 12.

Figure 2. Share of the total nitrogen and phosphorus flux delivered to the Gulf of Mexico from sources in states in the Mississippi and Atchafalaya River Basins, taken from U.S. Geological Survey SPARROW Model. Ranks are out of the 31 states that drain into the Mississippi Atchafalaya River Basins.²³

State	TN Percent (Rank)	TP Percent (Rank)
Illinois	16.8 (1)	12.9 (1)
Iowa	11.3 (2)	9.8 (3)
Indiana	10.1 (3)	8.4 (6)
Missouri	9.6 (4)	12.1 (2)
Arkansas	6.9 (6)	9.6 (4)
Kentucky	6.1 (6)	9.0 (5)
Tennessee	5.5 (7)	5.3 (7)
Ohio	5.4 (8)	4.1 (9)
Mississippi	3.4 (9)	4.4 (8)
Nebraska	3.2 (10)	3.3 (11)
Kansas	3.1 (11)	2.6 (12)
Minnesota	2.9 (12)	2.0 (16)
Wisconsin	2.7 (13)	2.4 (14)
Oklahoma	2.5 (14)	3.3 (10)
Pennsylvania	1.9 (15)	1.9 (17)
West Virginia	1.8 (16)	2.1 (15)
Louisiana	1.7 (17)	2.4 (13)
Alabama	1.1 (18)	0.9 (19)
South Dakota	0.9 (19)	1.6 (18)
North Carolina	0.6 (20)	0.2 (23)
Texas	0.6 (21)	0.7 (20)
Virginia	0.5 (22)	0.4 (21)
Montana	0.4 (23)	0.1 (26)
North Dakota	0.2 (24)	0.1 (25)
New York	0.2 (25)	0.2 (22)
Georgia	0.2 (26)	0.1 (27)
Wyoming	0.1 (27)	<0.1 (30)
Colorado	0.1 (28)	0.2 (24)
Maryland	<0.1 (29)	<0.1 (28)
Michigan	<0.1 (30)	<0.1 (29)
New Mexico	<0.1 (31)	<0.1 (31)

²³ Table showing estimated state contributions, in descending order, in R.B. Alexander, *et al.*, *Differences in Phosphorus and Nitrogen Delivery to the Gulf of Mexico from the Mississippi Basin* 42:3 Environmental Science Technology 822-30 (2008), available at http://water.usgs.gov/nawqa/sparrow/gulf_findings/

III. NITROGEN AND PHOSPHORUS POLLUTION IMPAIR FRESHWATER SYSTEMS.

Nitrogen and phosphorus pollution lead to myriad problems in freshwater systems throughout the Mississippi River Basin and the nation as a whole. Some problems are caused by high concentrations of the nutrients themselves; for example, direct toxicity of high levels of nitrate in drinking water to humans and to aquatic organisms in natural waters. Most problems caused by nitrogen and phosphorus pollution, however, result from the stimulating effect these pollutants have on plant and microbial growth, altering the balance of natural communities, robbing the water column of oxygen, and promoting the growth of pathogenic and toxin-producing microorganisms. These problems prevent waters from attaining the basic Clean Water Act “fishable/swimmable” goals, threaten the health of human and wildlife users of these waters, and impose significant costs on drinking water suppliers. Nitrogen and phosphorus pollution harm the Mississippi River and its tributaries as follows:

- Damage to recreational use of waters;
- Damage to aquatic plant and wildlife communities;
- Damage to drinking water supplies; and
- Damage to aesthetic quality of waters.

A. Damage To Recreational Use Of Waters.

1. Toxic Cyanobacteria.

Many studies, with both field and laboratory experimental verification, have shown that cyanobacteria thrive in waters polluted by nitrogen as well as phosphorus.²⁴ For example, in

²⁴ See reviews in *Toxic Cyanobacteria in Water – A Guide to Their Public Health Consequences, Monitoring and Management*. Sponsors for the World Health Organization (I.

many enriched north temperate lakes, total phosphorus concentrations at spring overturn are strongly related to late summer algal biomass that can be dominated by cyanobacteria.²⁵

Nitrogen is also important in causing cyanobacteria blooms.²⁶

The term “toxic cyanobacteria” (or “toxic blue-green algae”) refers to species or strains of species that are capable of toxin production.²⁷ Toxic cyanobacteria produce toxic substances called cyanobacterial toxins or cyanotoxins.²⁸ These toxins are released into the environment when cyanobacterial cells break open during senescence or natural decay, because of treatment with algicides (herbicides), or in the stomach of an organism that has ingested them.

Cyanobacterial toxins can cause respiratory distress and neurological problems in people and pets swimming in or ingesting contaminated water²⁹ – in fact, as discussed below, dogs have been rapidly killed by exposure to cyanotoxins after swimming in ponds, reservoirs or lakes, and a human death in Wisconsin was related to recreational exposure. Although cyanotoxins commonly accumulate in fish liver and other organs that are not consumed by humans, these toxins also can accumulate in fish muscle (i.e., the fish fillets that are consumed by humans),

Chorus & J. Bartram eds.,1999); R.L. Oliver & G.G. Ganf, “Freshwater Blooms,” *The Ecology of Cyanobacteria: Their Diversity in Time and Space* 149-94 (B.A. Whitton and M. Potts, eds., 2000); J.M. Burkholder, *Cyanobacteria*, *Encyclopedia of Environmental Microbiology*, 952-982 (G. Bitton, ed., 2002) (forthcoming); C. Bauer, *The Effects of Increased Nutrient Concentrations in Streams* (2007), attached as Exhibit A.

²⁵ Oliver & Ganf, *supra* note 24; J. Kalff, *Limnology*, (2002); Burkholder, *supra* note 24 and references therein.

²⁶ Oliver & Ganf, *supra* note 24; Burkholder, *supra* note 24 and references therein.

²⁷ Burkholder, *supra* note 24.

²⁸ See reviews in Burkholder, *supra* note 24.

²⁹ Benjamin H. Grumbles, Memorandum, Office of Water Numeric Nutrient Standards Strategy, Attachment 1 at 3 (May 25, 2007), attached as Exhibit B.

sometimes making fish unsuitable for human consumption.³⁰ Unfortunately, there is little testing for cyanotoxins in fish by the U.S. Food and Drug Administration or other entities.

2. Examples from the Mississippi River Basin.

Severe illnesses associated with the ingestion of cyanobacteria during recreational activities are not merely anecdotal, and are certainly not limited to a few “problem” waterways. Toxins from cyanobacteria have caused severe illnesses in pets and several reported pet deaths, including eight dog deaths reported in several Minnesota counties between 2004 and 2007, and at least one reported dog death in Wisconsin in 2004.^{31 32} A Wisconsin woman experienced physical symptoms, including extreme joint pain, headaches, rash, upset stomach, and fatigue, attributed to ingestion of algae ridden water during a night time swim in a recreational lake in Madison, Wisconsin. This is the fourth report of similar illnesses in the region this year.³³

³⁰ “Report shows algae toxins found in fish and shellfish,” *The Eureka Reporter*, Apr. 10, 2008, <http://www.eurekareporter.com/article/080410-algae-toxins-found-in-fish-and-shellfish>.

³¹ Minnesota Pollution Control Agency, *What you should know about blue green algae*, Water Quality/Surface # 1.03, (Dec. 2007), <http://www.pca.state.mn.us/publications/wq-s1-03.pdf>; Minnesota Pollution Control Agency, Bulletin, *Some Minnesota Lakes Seeing Toxic Algae Blooms*, (Sept. 28, 2004) (“The MPCA, Department of Health (MDH), and Department of Natural Resources (DNR) are advising people not to swim or wade in these lakes and to keep pets or farm animals out of the water until the algae clears up.”)

³² Wisconsin Dep’t of Natural Resources, “Blue-Green Algae in Wisconsin Waters, Frequently Asked Questions,” (undated), <http://dnr.wi.gov/lakes/bluegreenalgae/>; Wisconsin Dep’t of Natural Resources, News Release, *Avoid swimming in water with mats of blue-green algae*, (Jun. 11, 2004), http://www.vilaslandandwater.org/water_resources_pages/blue_green_alga/blue_green_alga_200_dnr_release.pdf.

³³ Sandy Cullen, *Mendota swim sickens woman; blue-green algae blamed*, *Wisconsin State Journal*, (July 22, 2008), <http://www.madison.com/wsj/home/local/297407>.

Worse yet, the Dane County, Wisconsin coroner ruled that ingestion of cyanobacterial toxins caused the death of a teenage boy in July 2002.³⁴

High concentrations of cyanobacteria often deter or prohibit local residents and recreational tourists from utilizing freshwater resources. While the “pea-green soup” or “green paint” appearance, mats, and stench (especially of rotting cyanobacteria blooms, which smell like vomit) are often enough to dissuade many residents from swimming or boating in affected waters, each summer local communities in Minnesota, Wisconsin, Iowa, and Illinois are forced to officially “close” beaches throughout each state to deter public recreation in these potentially toxic waters.³⁵ In 2006 alone, the Iowa Department of Natural Resources issued advisories at seven different Iowa beaches when samples showed algal toxin levels at these beaches exceeded recommended World Health Organization guidelines.³⁶ The presence of toxic blue-green algae forced cancellation of the swimming portion of a Wisconsin triathlon expected to draw as many as 2,000 people to the lakefront.³⁷ Certain jobs necessitate contact with these heavily algae-laden waters, and agencies may issue recommendations to avoid contact and inhalation exposure to agency staff, volunteer lake monitors, and others with required occupational exposure, such as

³⁴ Don Behm, *Coroner cites algae in teen's death, Experts are uncertain about toxin's role*, Milwaukee Journal Sentinel, JS Online.com (Sep. 6, 2003), <http://www.jsonline.com/story/index.aspx?id=167645>.

³⁵ *James Madison, Olbrich beaches closed*, The Capital Times, (Jul. 10, 2008), <http://www.madison.com/tct/mad/topstories/295579>.

³⁶ Iowa Department of Natural Resources, “Highlights 2006,” DNR Water Fact Sheet 2007-9, (Jan. 2007).

³⁷ Mike Johnson, *Algae Stops Pewaukee Triathlon's swim*, Milwaukee Journal Sentinel, (July 9, 2008), <http://www.jsonline.com/story/index.aspx?id=771125>.

water rescue, military, construction, and maintenance personnel.³⁸ However, despite the health threats, resource management agencies often do not conduct any routine monitoring for blue-green algae or blue-green algal toxins.³⁹



Figure 3. Boy swimming in blue-green algae, Lake Byllesby, Minnesota.

³⁸ Wisconsin Dep't of Natural Resources, *Occupational exposure to algal toxins* (April 2008), <http://dnr.wi.gov/lakes/CLMN/miscpdfs/Occupational%20exposure%20to%20algal%20toxins.pdf>.

³⁹ See *Blue-green Algae in Wisconsin Waters*, *supra* note 26; M. J. Lindon and S. A. Heiskary, Minnesota Pollution Control Agency, *Environmental Bulletin: Blue-green Algal Toxin (Microcystin) Levels in Minnesota Lakes*, (July 2008)(detailing monitoring results of 62 lakes 2004-2007).



Figure 4. Dog near blue-green algae infested water.



Figure 5. Blue-green algae.

B. Damage to Aquatic Plant and Wildlife Communities.

Various authors have developed conceptual models of important ecological processes that are altered by nitrogen and phosphorus pollution.⁴⁰ Nitrogen and phosphorus pollution harms aquatic communities through:

- Stimulating algal and cyanobacterial growth;

⁴⁰ See Bauer, Ex. A at 4-5, 7-10; S.B. Bricker, *et al.*, *Effects of Nutrient Enrichment in the Nation's Estuaries: A Decade of Change*, NOAA Coastal Ocean Program Decision Analysis Series No. 26, National Centers for Coastal Ocean Service (2007).

- Stimulating microbial growth, including growth of some microbial pathogens;
- Direct toxicity to beneficial aquatic life and wildlife that use the aquatic resources; and
- Other undesirable alterations of the aquatic food web.

1. Nitrogen and phosphorus pollution stimulates algal overgrowth in rivers and streams.

As discussed by Bauer, the effects of increased nitrogen and phosphorus concentrations in flowing waters on algae have been studied through (1) correlation between nutrients and algal abundance or biomass, which is generally measured as phytoplankton (floating or sestonic algae) or periphyton (algae attached to the stream bottom) chlorophyll-*a* concentrations, (2) direct measurement of rates of primary production, and (3) nutrient addition studies (bioassays), including the use of nutrient-diffusing substrata.⁴¹ Smith and others reviewed the large body of literature showing that increased nitrogen and phosphorus stimulate algal growth across aquatic ecosystems.⁴² Additional reviews of data from experiments with nutrient-diffusing substrata indicate that nutrients often limit algal growth in streams (in 60 to 75% of the experiments reviewed), and co-limitation of algal growth by both nitrogen and phosphorus is more likely to occur than limitation by either nutrient alone.⁴³ It should be noted, however, that streams in close proximity with similar geomorphology can have different patterns of nutrient limitation,

⁴¹ See Bauer, Ex. A at 4-7.

⁴² V.H. Smith, G.D. Tilman & J.C. Nekola. *Eutrophication: Impacts of Excess Nutrient Inputs on Freshwater, Marine, and Terrestrial Ecosystems*, 100 *Environmental Pollution* 179-196 (1999).

⁴³ W.K. Dodds & E. Welch, *Establishing Nutrient Criteria In Streams*, 19 *J. North American Benthological Soc.*, 186-196 (2000); S.N. Francoeur, *Meta-Analysis Of Lotic Nutrient Amendment Experiments: Detecting And Quantifying Subtle Responses*, 20 *J. North American Benthological Soc.*, 358-368 (2001); J. Tank & W. K. Dodds, *Responses Of Heterotrophic And Autotrophic Biofilms To Nutrients In Ten Streams*, 48 *Freshwater Biology* 1031-1049 (2003).

depending upon their morphometry and the characteristics of their watersheds, and nutrient limitation can change from year to year.⁴⁴

Researchers consistently have reported significant positive relationships between nutrient concentrations and both suspended and benthic algal biomass in streams. Specifically, researchers have found that:

- Nitrogen and phosphorus concentrations influence algal biomass in streams, explaining up to 38% of the variation in benthic algal biomass.⁴⁵
- Increases of dissolved nitrogen and phosphorus led to increased biomass and increased frequency of benthic algal blooms.⁴⁶
- Soluble reactive phosphorus concentrations explained 23% of the variability in monthly chlorophyll-*a* concentrations in New Zealand streams.⁴⁷
- Increased nitrogen and phosphorus concentrations can promote increased benthic algal production in streams.⁴⁸
- In a survey of temperate streams across four continents (most in North America), there was a relationship between increased nutrients and increased levels of suspended algae in stream water, measured as chlorophyll-*a*.⁴⁹

⁴⁴ A.P. Wold & A.E. Hershey, *Spatial And Temporal Variability Of Nutrient Limitation In Six North Shore Tributaries To Lake Superior*, 18 J. North American Benthological Soc., 2-14 (1999).

⁴⁵ W.K. Dodds, V. H. Smith & K. Lohman, *Nitrogen And Phosphorus Relationships To Benthic Algal Biomass In Temperate Streams*, 59 Canadian Journal of Fisheries and Aquatic Sciences 865-874 (2002), as corrected, W.K. Dodds, *et al.*, *Erratum: Nitrogen And Phosphorus Relationships To Benthic Algal Biomass In Temperate Streams*, 63 Canadian Journal of Fisheries and Aquatic Sciences 1190-1191 (2006).

⁴⁶ J.F. Biggs, *Eutrophication Of Streams And Rivers: Dissolved Nutrient - Chlorophyll Relationships For Benthic Algae*, 19 J. North American Benthological Soc., 17-31 (2000).

⁴⁷ *Id.*

⁴⁸ W.K. Dodds, V. H. Smith & B. Zander, *Developing Nutrient Targets To Control Benthic Chlorophyll Levels In Streams: A Case Study Of The Clark Fork River*, 31 Water Research 1738-1750 (1997); Dodds and Welch, *supra* note 43.

⁴⁹ E.E. Van Nieuwenhuysse & J. R. Jones, *Phosphorus-Chlorophyll Relationship In Temperature Streams And Its Variation With Stream Catchment Area*, 53 Canadian Journal of Fisheries and Aquatic Science 99-105 (1996).

- In streams in the Missouri Ozarks, there was a relationship between increased nutrients and increased sestonic chlorophyll-*a* in streams.⁵⁰
- In large rivers, both total phosphorus and total nitrogen were significant predictors of sestonic algal cell counts.⁵¹
- Total phosphorus concentrations explained 76% of the variability in suspended algal biomass (as chlorophyll-*a*), and total nitrogen was significantly related to algal biomass.⁵²
- In rivers across several ecoregions in Minnesota, a significant positive relationship between total phosphorus and sestonic chlorophyll-*a* was found.⁵³
- In Illinois streams, a significant amount of the variation in suspended and benthic algal biomass was explained by phosphorus concentrations.⁵⁴
- Concentrations of soluble nutrients in Midwestern streams were all positively correlated with rates of gross primary production, with nutrients explaining 50 to 90% of the variation in production.⁵⁵
- Nutrient concentrations, benthic algae, and gross primary production were significantly higher in agricultural areas, as compared to reforested and forested areas.⁵⁶

⁵⁰ K. Lohman, & J.R. Jones, *Nutrient-sestonic Chlorophyll Relationships in Northern Ozark Streams*, 56 *Can. J. Fish. Aquat. Sci.* 124-130 (1999).

⁵¹ D.M. Soballe & B.L. Kimmel, *A Large-Scale Comparison Of Factors Influencing Phytoplankton Abundance In Rivers, Lakes, And Impoundments*, 68 *Ecology* 1943–1954 (1987).

⁵² B.K. Basu & F.R. Pick, *Factors Regulating Phytoplankton And Zooplankton Biomass In Temperate Rivers*, 41 *Limnology and Oceanography*, 1572-1577 (1996).

⁵³ S. Heiskary & H. Markus, *Establishing Relationships Among In-Stream Nutrient Concentrations, Phytoplankton Abundance And Composition, Fish IBI And Biochemical Oxygen Demand In Minnesota USA Rivers* (2003), available at: <http://www.pca.state.mn.us/publications/reports/biomonitoring-mnr/riverrelationships.pdf>.

⁵⁴ A.M. Morgan et al., *Relationships Among Nutrients, Chlorophyll-a, And Dissolved Oxygen In Agricultural Streams In Illinois*, 35 *J. Environmental Quality* 1110-1117 (2006).

⁵⁵ M.J. Bernot, et al., *Nutrient Uptake In Streams Draining Agricultural Catchments Of The Midwestern United States*, 51 *Freshwater Biology* 499-509 (2006).

These relationships have been found despite the fact that the flowing water environment of streams often rapidly transports suspended algae through the systems, and despite the fact that in comparison to lakes, streams often are low-light environments, characterized by shading from overhanging terrestrial vegetation or reduced light penetration from suspended sediments.⁵⁷ Run-of-river impoundments are intermediate between lakes and streams in many features, but generally are more turbid and flush more rapidly than lakes.⁵⁸ In such systems, again, both phosphorus and nitrogen have been reported to be important factors causing algal abundance, including cyanobacteria.⁵⁹ Cyanobacterial toxins can be harmful to aquatic life such as zooplankton and fish as well as humans, and high-biomass blooms can result in fish kills.⁶⁰

2. Phosphorus and nitrogen pollution stimulates microbial growth.

Phosphorus and nitrogen stimulate the growth and production of heterotrophic organisms such as bacteria and fungi.⁶¹ Dodds' review of literature related to heterotrophic production supported the generalization that increased nutrient concentrations lead to increased bacterial counts and activity, increased fungal biomass, and, ultimately increased degradation of organic

⁵⁶ M.E. McTammany, E.F. Benfield & J.R. Webster, *Recovery Of Stream Ecosystems Metabolism From Historical Agriculture*, 26 J. North American Benthological Soc. 532-545 (2007).

⁵⁷ R.G. Wetzel, *Limnology* (3rd ed. 2001).

⁵⁸ *Id.*

⁵⁹ M.F. Knowlton & J.R. Jones, *Natural variability in lakes and reservoirs should be recognized in setting nutrient criteria*, 22 Lake and Reservoir Management 161-166 (2006); B.W. Touchette, *et al.*, *Eutrophication And Cyanobacteria Blooms In Run-Of-River Impoundments In North Carolina, U.S.A.*, 23 Lake and Reservoir Management 179-192 (2007).

⁶⁰ W.K. Dodds, *Freshwater Ecology* 134-35 (2002).

⁶¹ W.K. Dodds, *Eutrophication and Trophic State in Rivers and Streams*, 51 Limnology and Oceanography 671-680 (2006).

materials. Often, these effects were associated with both increased concentrations of nitrogen and phosphorus.⁶² Increased respiration due to the stimulation of heterotrophic activity can also lead to increased fluctuation in daily dissolved oxygen concentrations and to conditions of hypoxia and anoxia that can cause the death of fish and other beneficial aquatic life.

Increased disease from microbial pathogens, low-oxygen conditions, and other stressors can also be linked to nitrogen and phosphorus pollution.⁶³ Lemly observed fouling of macroinvertebrate gill structure and reduced survival in eutrophic waters.⁶⁴ Similarly, higher incidence of abnormalities on fishes was correlated to increasing nutrient concentrations in Ohio waters.⁶⁵ Furthermore, high nitrogen and phosphorus concentrations increased trematode parasite transmission into snails (due to increased algal and snail production) and increased production of parasite life stages (due to improved snail density and health) that may increase the risk of infection for amphibians.⁶⁶ Trematode infections induce severe limb malformations and mortality in amphibians. Nitrogen and phosphorus pollution is one factor, among several interactive stressors, that helps to explain the increase in mortality and limb malformations in amphibian populations observed worldwide.

⁶² *Id.*

⁶³ K.D. Lafferty & R.D. Holt, *How Should Environmental Stress Affect The Population Dynamics Of Disease*, 6 *Ecology Letters* 654-664 (2003).

⁶⁴ A.D. Lemly, *Using Bacterial Growth On Insects To Assess Nutrient Impacts In Streams*, 63 *Environmental Monitoring and Assessment* 431-446 (2000).

⁶⁵ Ohio Environmental Protection Agency, *Association Between Nutrients, Habitat, And The Aquatic Biota In Ohio Rivers And Streams*, Technical Bulletin MAS/1999-1-1, available at: http://www.epa.state.oh.us/dsw/guidance/assoc_load.pdf.

⁶⁶ P.T.J. Johnson, *et al.*, *Aquatic Eutrophication Promotes Pathogenic Infection in Amphibians*, 104 *Proceedings of the National Academy of Sciences* 15781-15786 (2007).

3. Direct toxicity of nitrate on aquatic organisms.

Some studies suggest that high levels of nitrate can be toxic to aquatic animals. For example, Camargo and others found that some invertebrate and amphibian species can sustain detrimental health effects or mortality when exposed to nitrate levels around 10 mg/L over a sustained period.⁶⁷ Acute toxicity tests showed lethal effects of nitrate to two *Echinogammarus* species (LC₁₀ ranged from 8.5 to 22.2 mg NO₃-N/L) and chronic toxicity tests on amphibians, particularly embryos (lowest observed effect concentrations (“LOEC”), and no observed effect concentrations (“NOEC”) ranged from 5 to 30.1 mg NO₃-N/L) support the premise that nitrate can be detrimental to survival and reproduction of aquatic animals. Comparison of acute to chronic results for amphibians, the only taxa where such information is available, indicates that chronic effects of nitrate toxicity occur at lower levels than demonstrated using acute tests alone. Salmonid eggs and fry have been shown to be very sensitive to nitrate (NOEC/LOECs ranged from 1.1 to 7.6 mg/L NO₃-N).⁶⁸ Environmentally relevant concentrations of nitrate (less than 10 mg NO₃-N/L) depressed tadpole survival in mesocosm experiments.⁶⁹

4. Nitrogen and phosphorus pollution alters the structure of aquatic animal communities.

Chronic nitrogen and phosphorus pollution from anthropogenic nutrient additions, sometimes called cultural eutrophication, shifts aquatic ecosystems out of balance and

⁶⁷ J.A. Camargo, A. Alonso, & A. Salamanca, *Nitrate Toxicity To Aquatic Animals: A Review With New Data For Freshwater Invertebrates*, 58 *Chemosphere* 1255-1267 (2005).

⁶⁸ J.W. Kincheloe, G.A. Wedemeyer, & D.L. Koch, *Tolerance Of Developing Salmonid Eggs And Fry To Nitrate Exposure*, 23 *Bulletin of Environmental Contamination and Toxicology* 575-578 (1979).

⁶⁹ G.R. Smith, *et al.*, *Effects Of Nitrate On The Interactions Of The Tadpoles Of Two Ranids* (*Rana clamitans* and *R. catesbiana*), 40 *Aquatic Ecology* 125-130 (2006).

dramatically alters food webs with many detrimental effects.⁷⁰ Nitrogen and phosphorus over-enrichment detrimentally affects aquatic life, and leads to aquatic life use impairment. These indirect effects are attributed mostly to changes in the dissolved oxygen regime and alteration of food and habitat resources.

a. *Dissolved oxygen regime.*

Changes in algal and bacterial production alter the amount of dissolved oxygen (“DO”) present in flowing waters. These changes in DO content of water and sediment can affect macroinvertebrate and fish community structure through a multitude of direct and indirect pathways including direct mortality or physiological stress, altered behavior or habitat preferences, and alteration of metal and ion availability. Through these mechanisms, even the occasional accrual of high levels of filamentous algae may have important biological effects on stream biota. For example, in Illinois streams, a significant relationship was found between presence of high levels of filamentous algae and diel oxygen flux, where filamentous algal abundance explained 62% of the variation in DO flux.⁷¹

In Minnesota rivers, increased total phosphorus and total Kjeldahl nitrogen were positively correlated with increased biological oxygen demand and DO flux.⁷² Data from the Ohio EPA also indicate that low daytime DO and wide DO swings (between day and night) are

⁷⁰ See J.M. Burkholder, *Eutrophication and oligotrophication*, in 2 Encyclopedia of Biodiversity, 649-70 (S. Levin, ed., 2001).

⁷¹ Morgan, *supra* note 54.

⁷² Heiskary & Markus, *supra* note 53.

likely in small streams when total phosphorus concentrations exceed 120 micrograms per liter (“µg/L”).⁷³

b. *Changes in food and habitat resources, and effects on aquatic animals.*

Most indirect effects on aquatic animals from nitrogen and phosphorus pollution are caused by changes in food quantity and quality (such as algae and organic matter) and habitat quantity and quality.⁷⁴ Direct studies of the effects of nutrient amendments on streams and the resulting change in algal abundance and composition have shown major changes in the abundance and types of consumers including macroinvertebrates and fishes present in the nutrient-enriched streams.⁷⁵

Correlational evidence, as summarized by Bauer, has shown large changes in macroinvertebrate and fish communities with increasing nutrient concentrations using several state-wide databases:

- In New York wadeable streams, eutrophic macroinvertebrate communities (significantly different in community composition from oligotrophic macroinvertebrate communities) were likely when nitrate exceeded 0.98 mg/L NO₃ and total phosphorus exceeded 65 µg/L. There was also a substantial increase in the

⁷³ Bauer, Ex. A at 12 (personal communication with Bob Miltner of the Ohio EPA).

⁷⁴ See Burkholder, *supra* note 70.

⁷⁵ A.D. Rosemond, *Interactions Among Irradiance, Nutrients, And Herbivores Constrain A Stream Algal Community*, 94 *Oecologia* 585–594 (1993); J.W. Feminella & C.P. Hawkins, *Interactions Between Stream Herbivores And Periphyton: A Quantitative Analysis Of Past Experiments*, 14 *J. North American Benthological Soc.* 465-509 (1995); N. Bourassa, N. & A. Cattaneo, *Control Of Periphyton Biomass In Laurentian Streams*, (Quebec), 17 *J. North American Benthological Soc.* 420-429 (1998); A.M.H. deBruyn, D.J. Marcogliese, & J.B. Rasmussen, *The Role Of Sewage In A Large River Food Web*, 60 *Canadian Journal of Fisheries and Aquatic Sciences* 1332-1344 (2003); L.A. Deegan, *et al.*, *Effects Of Fish Density And River Fertilization On Algal Standing Stocks, Invertebrate Communities, And Fish Production In An Arctic River*, 54 *Canadian Journal of Fisheries and Aquatic Sciences* 269-283 (1997).

percentage of “moderately impacted” samples and a decrease in the percentage of “non-impacted” samples at sites determined to be eutrophic.⁷⁶

- An analysis of over 1500 sites in Ohio, with low and high levels of nutrients, shows nutrient concentrations were correlated with significant decreases in fish community health scores in wadeable streams. Significant declines in the number of sensitive fish species and significant increases in tolerant fishes in wadeable streams were found with increasing nutrient concentrations.⁷⁷
- In Wisconsin wadeable and nonwadeable streams, fish and macroinvertebrate community health indices varied significantly in response to phosphorus and nitrogen concentrations. The biological metrics showed “threshold” responses where the mean response (i.e., metric score) above the threshold was determined to be different from the mean response below the threshold.⁷⁸
- In EPA Region 7, comprised of Iowa, Missouri, Kansas, and Nebraska, analysis of nutrient and biological data showed strong relationships between sestonic chlorophyll-*a* and total phosphorus and total nitrogen. Macroinvertebrate species richness was correlated with total phosphorus concentrations, where 11 to 32% of the variance in response is explained by nutrients.⁷⁹
- In Michigan and Kentucky, increased algal abundance, increased Cladophora cover and changes in algal community metrics were related to increased total phosphorus concentrations. Changes in macroinvertebrate and fish measures were also correlated with increasing total phosphorus concentrations. These changes in macroinvertebrates and fishes included declines in sensitive species and declines in measures of biological integrity.⁸⁰

⁷⁶ A.J. Smith, R.W. Bode & G.S. Kleppel, *A Nutrient Biotic Index (NBI) For Use With Benthic Macroinvertebrate Communities*, 7 *Environmental Indicators* 371-386 (2007).

⁷⁷ R.J. Miltner & E.T. Rankin, *Primary Nutrients And The Biotic Integrity Of Rivers And Streams*, 40 *Freshwater Biology* 145-158 (1998).

⁷⁸ D.M. Robertson, *et al.*, *Nutrient Concentrations And Their Relations To The Biotic Integrity Of Wadeable Streams In Wisconsin*, Professional Paper No. 1722 (2006); L. Wang, D.M. Robertson, & P.J. Garrison, *Linkages Between Nutrients And Assemblages Of Macroinvertebrates And Fish In Wadeable Streams: Implication To Nutrient Criteria Development*, 99 *Environmental Management*, 194-212 (2007).

⁷⁹ Bauer, Ex. A at 15, 18 and chart (personal communication with Don Huggins).

⁸⁰ *Id.* at 18 (personal communication with R.J. Stevenson).

5. Examples from the Basin.

The above studies review damage to aquatic resources and indicate the nitrogen and phosphorus levels at which they occur. Following are additional examples of harms to aquatic life observed in the Mississippi River Basin.

A large fish kill on Lake Benton, in Lincoln County, Minnesota was caused by excessive algal growth.⁸¹



Figure 6. Photo of Lake Benton (Minnesota) Fish Kill, September 27, 2004.

Overabundant algal growth caused by excess nutrient pollution also affects aquatic wildlife, such as the “serious detrimental effects on duck populations on this historic prime waterfowl resource” at Heron Lake, Minnesota.⁸²

⁸¹ Minnesota Pollution Control Agency, *supra* note 31.

The Arkansas Game and Fish Commission has been fighting nutrient-fueled aquatic plant growth in the Felsenthal National Wildlife Refuge.

The breadth of nutrient-related damage to aquatic systems is well illustrated in state 305(b) reports from several Mississippi River states.

- The Minnesota Pollution Control Agency recognizes that lake impairments caused by excess nutrient loading has been “one of the leading causes of polluted conditions reported in the 305(b) reports.”⁸³
- Illinois lists algae as the cause of impairment in approximately 75% of the state’s impaired lakes and lists total nitrogen as the cause of impairment in approximately 20% of the states impaired rivers or streams.
- Louisiana lists total phosphorus as the cause of impairment in approximately 20% of its impaired lakes, and 20% of its impaired rivers and streams.
- Iowa and Wisconsin list algae as the cause of impairment in approximately 42% and 38%, respectively, of each state’s impaired lakes.
- Kentucky lists nutrients as the cause of impairment in approximately 13% of the state’s impaired rivers and streams.
- Tennessee lists nutrients as the cause of impairment for approximately 14% of the state’s impaired lakes and reservoirs.

C. Damage to Drinking Water Supplies.

The nitrate form of nitrogen and the excessive algal growth caused by nitrogen and phosphorus pollution in public water supplies pose direct and indirect threats to consumers. In some cases, the pollution and algae can be reduced through the use of water treatment technology, although this imposes substantial costs on ratepayers.⁸⁴ Sometimes, however, the

⁸² Minnesota Pollution Control Agency, *Statement of Need and Reasonableness Book II of III*, (July 2007), <http://www.pca.state.mn.us/water/standards/sonar-book2.pdf>.

⁸³ *Id.* at 30.

⁸⁴ *See* Nutrient Criteria Guidance, *supra* note 1 at 4-5.

problems may be so severe and the cost of treatment so prohibitive that water supplies must be abandoned.

The primary threats to drinking water from nutrient pollution are:

- Taste-and-odor problems;
- Blue baby syndrome;
- Trihalomethanes; and
- Cyanotoxins from cyanobacteria.

1. Taste and odor problems.

Excessive algal growth with its associated bacterial and fungal assemblages leads to taste-and-odor problems in drinking water supplies. A wide array of freshwater planktonic and benthic algae, including numerous cyanobacteria, produces cucumber-like, fishy, rancid, oily, or “skunk-like” odorous compounds. Many algal volatile organic compounds (“AVOCs”) have been identified, some of which are also produced by bacteria or fungi.⁸⁵ Relatively few AVOCs – certain terpenoids, sulfur compounds, and polyunsaturated fatty acid (“PUFA”) derivatives – cause most algal-associated taste-and-odor problems. Nutrient-poor systems rarely have detectable odors; rather, PUFAs occur frequently and in higher abundance in nutrient over-enriched systems.

Several biosynthetic pathways are involved in synthesis of AVOCs. Some are synthesized during normal growth, whereas others are produced when cellular integrity is compromised, which often occurs during decomposition of cyanobacterial blooms, or changes from oxygenated to anoxic conditions. Addition of copper sulfate or other herbicides that are

⁸⁵ See Burkholder, *supra* note 24; Burkholder *et al.*, *supra* note 70.

commonly used in efforts to control cyanobacterial blooms can also promote production of strong odorous compounds.

Water suppliers can address these problems to some extent, but at a cost that is eventually passed along to consumers. Notably, two common taste-and-odor compounds produced by cyanobacteria are geosmin and 2-methylisoborneol (“G-MIB”). These compounds are not effectively removed by conventional treatment processes (coagulation-sedimentation-chlorination), and variably removed by activated carbon.

2. Blue baby syndrome.

Excessive levels of nitrogen in the form of nitrate in drinking waters can cause blue baby syndrome (methemoglobinemia) in infants. Infants less than six months old are particularly susceptible to this potentially-fatal illness where a disruption in hemoglobin levels in blood impairs the supply of oxygen throughout the body. EPA’s drinking water standard for nitrate was adopted specifically to protect against this illness. It is possible to reduce levels of nitrate during drinking water treatment, which comes at an increased cost to water suppliers and consumers.⁸⁶

3. Trihalomethanes.

As EPA has described, the formation of trihalomethanes during drinking water treatment processes is a problem caused by nutrient pollution.⁸⁷ Stimulation of algal growth by nutrient pollution leads to high levels of organic matter in drinking water supplies, which in turn lead to the production of trihalomethanes during disinfection. Trihalomethanes are carcinogens,

⁸⁶ National Primary Drinking Water Regulations, Final Rule, EPA, 56 Fed. Reg. 3526, 3537-38, (Jan. 30, 1991); National Research Council, *Nitrate and Nitrite in Drinking Water*, (1995).

⁸⁷ Nutrient Criteria Guidance, *supra* note 1, at 4-5.

regulated by EPA through a human health-based water quality standard of 80 mg/L for total trihalomethanes.⁸⁸ It is possible but expensive to address the problem by modifying the water treatment process or by switching to alternative disinfection processes.

4. Cyanotoxins.

As discussed previously, the growth and abundance of potentially-toxic cyanobacteria are directly stimulated by nutrient pollution in freshwater systems. Some cyanobacteria strains produce toxic substances called cyanobacterial toxins or cyanotoxins.⁸⁹ Ingesting cyanobacterial toxins can cause neurotoxicity, hepatotoxicity, various cytotoxicity effects, and gastrointestinal effects in humans, as well as skin irritation and rashes. Some common cyanotoxins are malignant tumor promoters, based upon studies with small mammals. The available evidence supports the premise that extended exposure to low levels of cyanobacterial toxins can have chronic effects on humans. At present there are no drinking water standards specifically for cyanobacteria and their toxins, but since 1998 the Contaminant Candidate List has included cyanobacteria (blue-green algae) and their toxins as contaminants.⁹⁰

In 2001 the EPA identified several cyanobacterial toxins as high priorities for potential health risks in source and finished waters of drinking water utilities in the U.S. The World Health Organization has set 1 µg microcystin-LR L⁻¹ in drinking water as a guideline for human health protection.⁹¹ The guideline is based on one common cyanotoxin, a type of microcystin (among more than 80 types of microcystins), despite the fact that multiple toxins often are

⁸⁸ See 40 C.F.R. §.141.64(b).

⁸⁹ Burkholder, *supra* note 24.

⁹⁰ U.S. EPA, Consumer Confidence Reports, (undated) available at <http://www.epa.gov/safewater/ccr/>.

⁹¹ World Health Organization, *Algae And Cyanobacteria In Fresh Water*, Guidelines for Safe Recreational Waters, Volume 1 – Coastal and Fresh Waters (2003).

present in affected waters, because supporting animal and human toxicity data are incomplete for most other cyanotoxins.⁹²

Many studies, with both field and laboratory experimental verification, have shown that cyanobacteria thrive in waters polluted by nitrogen as well as phosphorus.⁹³ In turbid waters, light generally is the resource that is most important in limiting algal production, including cyanobacteria, but when light limitation is relieved – for example, if there is enough time between rainstorms and episodic sediment loading events – cyanobacteria respond strongly to both phosphorus and nitrogen enrichment.⁹⁴ The effects of nutrient over-enrichment on cyanotoxin production are more complex, and depend upon the species, strain, the group of toxins, and other environmental conditions.⁹⁵ Microcystin production tends to be directly proportional to growth rate which, in turn, generally increases with increasing phosphorus and nitrogen concentrations.⁹⁶

⁹² Burkholder, *supra* note 24.

⁹³ See Chorus & Bartrum, *supra* note 24; Oliver & Ganf, *supra* note 24; Burkholder, *supra* note 24; Bauer, Ex. A at 9.

⁹⁴ Touchette *et al.*, *supra* note 59.

⁹⁵ Chorus & Bartram, *supra* note 24.

⁹⁶ P.T. Orr & G.J. Jones, *Relationship between Microcystin Production and Cell Division Rates in Nitrogen-Limited Microcystis aeruginosa Cultures*, 43(7) *Limnol.Oceanogr.* 1604-14 (1998); Chorus & Bartram, *supra* note 24; J.L. Graham, *et al.* *Environmental Factors Influencing Microcystin Distribution And Concentration In The Midwestern United States*, 38 *Water Research* 4395-4404 (2004) *but see* G.L. Boyer, *The Occurrence of Cyanobacterial Toxins in New York lakes: Lessons from the MERHAB-Lower Great Lakes Program*, 23 *Lake and Reservoir Management* 153-60 (2007).

If blooms of cyanobacteria are detected, drinking water can be treated to remove toxins, but at more expense for water treatment plant operators.⁹⁷ Carbon filters, for example, can remove cyanotoxins effectively, but they are expensive and, therefore, not routinely used in many systems. Moreover, screening of treated public water systems is imperfect – for many cyanotoxins, routine analytical methods are still being developed, toxicity thresholds do not exist and water is usually only screened after other evidence of a potential problem is detected.

5. Examples from the Basin.

This summer Minneapolis residents complained to city officials that the water from their taps is simply too "stinky" to drink—the smell being caused by too much algae present in the city's drinking water supply, the Mississippi River. St. Paul residents, after many years of similar problems invested \$10 million to install a granular activated carbon system that "improved the aesthetic quality of the water."⁹⁸

Iowa has several surface waters listed as impaired for drinking water use because of high nitrate concentrations in source water.⁹⁹ These include the Des Moines and Raccoon Rivers upstream of Des Moines (population 193,189); the Cedar River which is the drinking water source for the City of Cedar Rapids (population 108,772); the South Skunk River upstream of

⁹⁷ J.A. Westrick, *Cyanobacterial Toxin Removal In Drinking Water Treatment Processes And Recreational Waterways*, Proceedings of the Interagency, International Symposium on Cyanobacterial Harmful Algal Blooms (ISOC-HAB): State of the Science and Research Needs, 261-76 (H.K. Hudnell, ed., 2007).

⁹⁸ Rodrigo Smith and Paul Walsh, *Water In Minneapolis And Nearby Suburbs May Smell And Taste Funky For Two More Weeks*, Minneapolis Star Tribune (July 11, 2008), <http://www.startribune.com/local/24310144.html>.

⁹⁹ Iowa Department of Natural Resources, *Category 5 of Iowa's 2005 Integrated Report, The List of Impaired Waters*, (May 1, 2007) (draft), http://wqm.igsb.uiowa.edu/WQA/303d/2006/draft_2006_Category-5_303d-list.pdf.

Oskaloosa (population 10,600); and the Middle Raccoon River upstream of Panora (population 1,100).

In Illinois, Lake Georgetown, in Vermilion County, had to be abandoned as a drinking water source for the City of Georgetown in 2003 because of high nitrate levels. The City now uses a groundwater source in Indiana for its water supply.¹⁰⁰ Also, because of nitrate levels in excess of the drinking water standard, three Central Illinois reservoirs (the Streator reservoir,¹⁰¹ Lake Decatur,¹⁰² and Lake Vermilion¹⁰³) water suppliers have had to install ion exchange systems to remove nitrate at their water treatment plants. The cost for the system at the Streator Reservoir was \$1.6 million.¹⁰⁴ Costs for the Lake Decatur system were \$7.5 million, plus Operation and Maintenance costs of \$40-50,000 per year and media replacement every 10 years at a cost of \$3 million.¹⁰⁵

Several states along the mainstem of the Mississippi River report trihalomethane problems with public drinking water supplies. Iowa, for example, reports 14 violations at eight public water suppliers serving nearly 45,000 people in 2007.¹⁰⁶ Missouri reports 18 communities

¹⁰⁰ Personal communication from Rick Cobb, Illinois EPA.

¹⁰¹ Illinois EPA and USGS, Source Water Assessment Program Fact Sheet, IAWC - Streator, LaSalle County (May 2, 2002).

¹⁰² Illinois EPA and USGS, Source Water Assessment Program Fact Sheet, Decatur, Macon County (March 1, 2002).

¹⁰³ Illinois EPA and USGS, Source Water Assessment Program Fact Sheet, Consumers Illinois Water Co. Vermilion Division, Vermilion County (May 2, 2002).

¹⁰⁴ Personal communication from Rick Cobb, Illinois EPA.

¹⁰⁵ *Id.*

¹⁰⁶ Iowa Department of Natural Resources, *Public Drinking Water Program 2007, Annual Compliance Report*, 17 (June 2008).

with trihalomethane violations in 2006.¹⁰⁷ Tennessee reports 48 water treatment facilities with major violations during 2004.¹⁰⁸

C. Damage To Aesthetic Quality Of Waters.

Nutrient pollution impairs the aesthetic quality of freshwater systems mainly by:

- Significantly reducing water clarity,
- Causing floating mats of live and decomposing algae, and
- Producing hypo- and anoxic conditions resulting in unpleasant odors and fish kills.

The stimulation of freshwater algae and cyanobacteria by nutrient pollution described herein results in excessive quantities of planktonic and sestonic algae in lakes, rivers, and streams. Water clarity is decreased significantly by the algae as they overgrow the system and form blooms. During the day, these microscopic plant-like creatures make oxygen from photosynthesis, but at night, the many tiny cells consume much or all of the oxygen that was in the water so that fish suffocate to death. As the algal blooms die, bacteria use oxygen to decompose them, exacerbating the low-oxygen situation. When waters have little or no oxygen (conditions known as hypoxia and anoxia, respectively), anaerobic bacteria growing on the bottom sediments produce hydrogen sulfide, methane, and other offensive-smelling gases that are byproducts of anaerobic respiration. Anoxic conditions can kill fish and other aquatic organisms, leading to further visual and odor impacts on the aesthetic quality of waters.

¹⁰⁷ Missouri Department of Natural Resources, 2006 *Annual Compliance Report of Missouri Public Drinking Water Systems*, 28 (undated), <http://www.dnr.mo.gov/env/wpp/fyreports/index.html>

¹⁰⁸ Tennessee Dep't of Environment and Conservation, *Annual Report of the Violations of the Federal Safe Drinking Water Act, January 1, 2004 through December 31, 2004*, 28-70 (July 2005).

The following photos illustrate the aesthetic impact on waters within the Mississippi River Basin states:



Figure 7. Algae Bloom (Minnesota Pollution Control Agency).

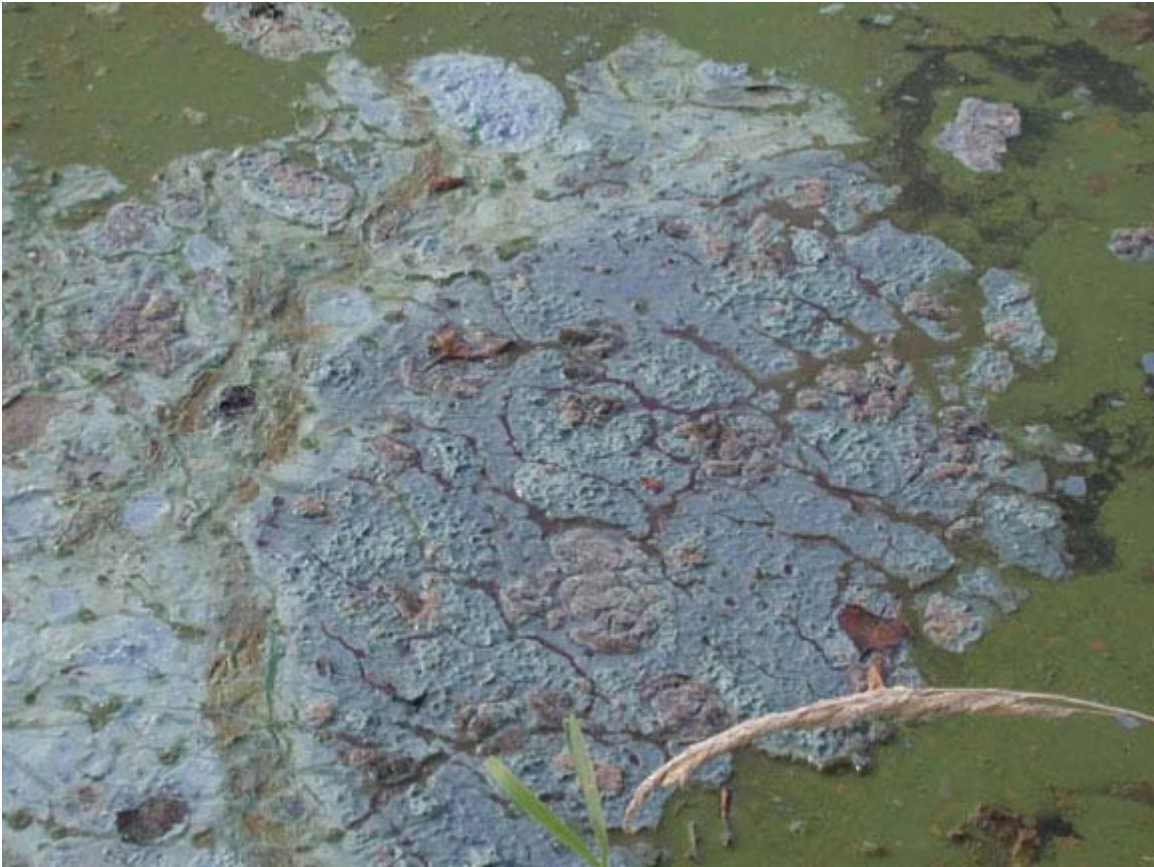


Figure 8. Photo of Lake Crystal, Minnesota.



Figure 9. Algae, Wisconsin Department of Natural Resources.

IV. THE EPA'S HISTORY OF INACTION.

As already noted, although the EPA is aware of the extent and severity of nutrient-caused problems in the Gulf,¹⁰⁹ in United States coastal waters in general,¹¹⁰ and in the nation's freshwater resources the federal government's response has been slow in coming, slow in moving once it arrived, and largely inefficacious. Despite the many attempts noted below, this summer's Dead Zone is the second largest on record and would likely have been the largest if not for the happenstance of Hurricane Dolly, and EPA is still pondering its response.

A. The Earthjustice Petition And The EPA's Response.

In 1985, LUMCON began the first "concerted, continuous and consistent" study of hypoxia in Louisiana and Texas with funding from National Oceanic and Atmospheric Administration.¹¹¹ That year, the large hypoxic Dead Zone in the Gulf of Mexico measured approximately 3800 square miles, larger than the states of Rhode Island and Delaware combined.¹¹² The size of the Gulf's Dead Zone increased during the early 1990s. In 1993, the year of the Mississippi River's

¹⁰⁹ Since at least 1972, studies have documented hypoxic regions in the Gulf of Mexico. LUMCON, Hypoxia in the Northern Gulf of Mexico, <http://www.gulfhypoxia.net/Overview/> (last visited July 15, 2008). As nutrient levels in the Mississippi River have grown since the 1950s, over that same period, the hypoxic zones have grown in size and severity as well.

¹¹⁰ For example, a large hypoxic zone in the Chesapeake Bay attracted significant popular attention during the late 1980s. Philip S. Gutis, *Growing Harm Seen to Key Fish Source*, N.Y. Times, Aug. 14, 1987, at A1.

¹¹¹ Overview, Hypoxia in the Northern Gulf of Mexico, <http://www.gulfhypoxia.net/Overview/> (last visited July 15, 2008).

¹¹² *Id.*

disastrous flooding, it reached a high point of nearly 6800 square miles, larger than the state of Connecticut.¹¹³

Dr. Nancy Rabalais, one of the LUMCON researchers, brought her research to the attention of the environmental community in 1994. In response, nearly 20 environmental groups approached the Sierra Club Legal Defense Fund, now Earthjustice, and asked the lawyers there to petition the EPA to convene an interstate management conference. Section 319(g)(1) of the Clean Water Act allows a state to petition the EPA to call such a conference when some portion of the navigable waters of that state fail to meet applicable water quality standards because of non-point source pollution from other states. The purpose of such a conference is to “develop an agreement among such States to reduce the level of pollution in [the affected] portion and improve the water quality of such portion”¹¹⁴ and the Earthjustice petition sought to bring together, under the auspices of the EPA, all of the states contributing to the Dead Zone in the Gulf.

The Earthjustice petition was filed in 1995, and denied later that year. Instead, in December 1995, the EPA, through its Gulf of Mexico Program, held a conference to address some of these same issues. At this conference, the EPA said that it would not take action immediately, but acknowledged that it needed to do something to address the Dead Zone. That “something” turned out to be the development of a “strategy” over the next year or so, involving the states upstream from the Dead Zone. The EPA promised to work through the existing Gulf of Mexico Program to achieve these goals and to educate the upriver contributors to the Dead Zone

¹¹³ *Id.*

¹¹⁴ Clean Water Act § 319(g)(1), 33 U.S.C. § 1329(g)(1).

about the effects of their activities. It promised “on-the-ground” nutrient reduction strategies with set goals by 1997.¹¹⁵

Two more meetings were held in 1996 to discuss how the EPA and other federal agencies could involve the upstream states in working to address the Dead Zone. A federal interagency working group asked the White House Office of Science and Technology to study the problem, through its Committee on Environment and Natural Resources.¹¹⁶ But the promised “nutrient reduction strategies” with “set goals” did not materialize.

B. The Mississippi River/Gulf Of Mexico Watershed Nutrient Task Force.

Two years after the Earthjustice petition, the EPA convened the first meeting of the Mississippi River/Gulf of Mexico Watershed Nutrient Task Force (“Nutrient Task Force”). This group consisted of six federal agencies, seven state agencies and two senior tribal representatives.¹¹⁷ According to Robert Perciasepe, then the Assistant Administrator of the Office of Water at the EPA, the Task Force would meet three to four times a year and would focus on programs already underway. Mr. Perciasepe expressed a desire that the Task Force “not wait until the problem is too large to handle.”¹¹⁸ Environmental advocates attending the meeting

¹¹⁵ Final Meeting Summary for the First Meeting of the Mississippi River/Gulf of Mexico Watershed Nutrient Task Force 6 (1997), <http://www.epa.gov/msbasin/taskforce/summaries/1stsummary.htm>.

¹¹⁶ Mississippi River Basin & Gulf of Mexico Hypoxia Meeting Summaries, <http://www.epa.gov/msbasin/taskforce/summaries.htm> (last visited July 9, 2008).

¹¹⁷ First Meeting Summary 6 (Dec. 4, 1997), <http://www.epa.gov/msbasin/taskforce/summaries/1stsummary.htm>.

¹¹⁸ *Id.* at 1.

urged the Task Force to “develop action items ... rather than merely studying the science,” to move “at a much faster pace” than the previous two years, and to set goals “now.”¹¹⁹

The Task Force continued its meetings, but although commenters continued to urge the Task Force to develop specific numeric goals and criteria,¹²⁰ it did not move at a faster pace, immediately develop action items, or set nutrient goals. Instead, it developed a “strategy.”¹²¹ It studied the science.¹²² It concluded that hypoxia in the Gulf had increased since the 1950s and that this increase was caused primarily by nitrogen loading from the Mississippi River.¹²³ In 1999, two years after the Task Force was convened it finally began to develop an "Action Plan" – only after receiving a legislative mandate to do so.¹²⁴

Two years later – nearly six years after the Earthjustice Petition, and a year after the legislative deadline – the Task Force unveiled its Action Plan for Reducing, Mitigating and

¹¹⁹ *Id.* at 6-8.

¹²⁰ Final Meeting Summary, Sixth Meeting of the Mississippi River/Gulf of Mexico Watershed Nutrient Task Force 6-7 (Jun, 15-16, 2000), <http://www.epa.gov/msbasin/taskforce/summaries/1stsummary.htm>.

¹²¹ Final Meeting Summary, Third Meeting of the Mississippi River/Gulf of Mexico Watershed Nutrient Task Force 4-5 (Sep. 24, 1998), <http://www.epa.gov/msbasin/taskforce/summaries/3rdsummary.htm> (discussing strategy).

¹²² Final Integrated Assessment, Executive Summary, 2-3 (May 2000), http://oceanservice.noaa.gov/products/hypox_finalexecsumm.pdf.

¹²³ Sixth Meeting Summary 2 (summary of remarks by Don Scavia of NOAA).

¹²⁴ The Harmful Algal Bloom and Hypoxia Research and Control Act of 1998 (HABHRCA), Pub. L. No.105-383, was enacted on November 13, 1998. This statute addressed hypoxia on a national basis, not just in the Gulf. It established a federal hypoxia Task Force, provided for “assessments” of the consequences of hypoxia, and required a plan for controlling hypoxia by March 30, 2000. *See* 16 U.S.C. § 1451. The success of this provision is best demonstrated by the fact that the act was reauthorized in 2004, four years after the “plan” was originally due, this time calling for the development of a “plan” by 2005. P.L. 108-456 at 118 STAT. 3633.

Controlling Hypoxia in the Northern Gulf of Mexico (the “2001 Action Plan”). The 2001 Action Plan called for the reduction of the Dead Zone to less than 5000 square kilometers by 2015, and listed 11 short-term actions to achieve the Action Plan’s goals.¹²⁵ None of those actions involved any sort of numeric criteria, however, and none of them involved any real *action*. Instead, the "action plan" suggested the establishment of additional committees, the development of additional “strategies” and further study of the problem, as well as the creation of “indicators” that could allegedly determine the progress of any nutrient management action, although it did not explain how these indicators would be used.¹²⁶

By design, the 2001 Action Plan encouraged voluntary action instead of mandates, the use of existing government programs instead of new rules or regulations, and the establishment of lofty goals instead of specific criteria.¹²⁷ And it got pretty much what one could expect from such a Plan – a continuation of the status quo. In 2008, the NRC Report found that the results of the Action Plan were “limited.”¹²⁸ A group of 11 Gulf of Mexico scientists wrote the EPA, similarly lamenting the “lack of progress toward the goal” of reducing the hypoxic zone, and only “modest” implementation of any action.¹²⁹ In fact in its 2008 Action Plan, the Task Force

¹²⁵ Action Plan for Reducing, Mitigating and Controlling Hypoxia in the Northern Gulf of Mexico, at 9, 13-14 (2001) (“2001 Action Plan”).

¹²⁶ 2001 Action Plan at 25-28.

¹²⁷ 2001 Action Plan at 9 (voluntary compliance).

¹²⁸ NRC Report at 209.

¹²⁹ *Id.* (summarizing June 2007 letter to the EPA from University of Maryland Center for Environmental Science).

itself observed that the activities inspired by 2001 Action Plan “have not resulted in a reduction of the hypoxic zone.”¹³⁰

C. Other Government Initiatives Do Not Solve The Problem.

The Task Force was a federal initiative devoted solely to the Gulf and Mississippi River. In addition to the Task Force, the EPA had in place a number of concurrent water quality initiatives that might have been expected to help reduce the hypoxic zone by encouraging and assisting in the development of numeric nitrogen and phosphorus criteria. Despite these expectations, they did not.

1. Clean Water Action Plan.

The Task Force referred to the Clean Water Action Plan (“CWAP”) as a source of funding and as a vehicle through which nitrogen and phosphorus pollution could be ameliorated. The CWAP, issued on February 19, 1998, contained 111 “key actions designed to reinvigorate efforts to restore and protect the nation’s waters.”¹³¹ Approximately 28 of them related in some way to hypoxia and/or nitrogen and phosphorus pollution in the Gulf and Mississippi River.¹³²

The EPA explained that the CWAP was a “blueprint” and that it intended to “identify the major sources of nitrogen and phosphorus in our waters” and to “identify actions to address”

¹³⁰ 2008 Action Plan at 9.

¹³¹ Table of Contents, cleanwater.gov, <http://water.usgs.gov/owq/cleanwater/action/toc.html>, (last visited July 3, 2008).

¹³² First Meeting Summary 2-3.

them.¹³³ In the section of CWAP entitled “Reduce Nutrient Over-enrichment,” the EPA explained its goals:

EPA will develop nutrient criteria – numerical ranges for acceptable levels of nutrients (i.e., nitrogen and phosphorus) in water. ... EPA will develop nutrient criteria for the various water body types and ecoregions of the country by the year 2000. ... Within three years of the EPA issuance of applicable criteria, all states and tribes should have adopted water quality standards for nutrients. Where a state or tribe fails to adopt a water quality standard for nutrients within that three-year period, EPA will begin to promulgate water quality standards for nutrients.¹³⁴

The CWAP however, was “not a regulation and [did] not establish a regulatory program.”¹³⁵ Nor was it designed specifically to address the Gulf hypoxia problem. Although the EPA did develop recommended numeric nutrient criteria, the states did not adopt numeric nutrient standards by 2003, and EPA did not begin to promulgate its own numeric water quality standards for nutrients by July 2004. The CWAP, like the 2001 Action Plan, did not reduce the Gulf’s Dead Zone.

2. EPA’s National Nutrient Strategy.

On June 25, 1998, the EPA published the National Strategy for the Development of Regional Nutrient Criteria in the Federal Register.¹³⁶ In the National Strategy, the EPA explained that it planned to issue “technical guidance” to assist the states in developing numeric nutrient criteria “by the end of the year 2001” and that it expected “all States and Tribes to adopt and

¹³³ Water Quality Standards Regulation, Part II, 63 Fed Reg. 129, 36778 (July 7, 1998) (describing CWAP).

¹³⁴ CWAP at 59.

¹³⁵ 65 Fed. Reg. 202, 62567 (Oct 18, 2000).

¹³⁶ 63 Fed. Reg. 34648 (Jun. 25, 1998).

implement numerical nutrient criteria into their water quality standards by December 31, 2003.”¹³⁷

Although the EPA did develop recommended numeric nutrient criteria for ecoregions by the end of 2000, the EPA was already backpedaling on enforcing adoption of numeric standards by the states. It explained that the states and tribes now had until “the end of 2004” to adopt nutrient standards, but again promised that the EPA itself would promulgate nutrient water quality standards if it looked like the states or tribes were going to miss the deadline.¹³⁸ However, not only did the states and tribes miss the 2004 deadline, as of mid-2007,¹³⁹ only two states, Tennessee and Hawaii, had anything that approached numeric nitrogen or phosphorus criteria that covered rivers and streams. No state has any numeric nutrient criteria or standards applicable to the Mississippi River.¹⁴⁰ And, despite its earlier commitment to step in if the states failed to act in a timely manner, the EPA has given no indication that it intends to do so, even though the states and tribes are not even close to the National Strategy’s goals.

D. The Environmental Community Tries Again To Convince The Agency To Take Action With No Better Result.

Frustrated with the lack of progress in the Action Plan, the CWAP, and the National Nutrient Strategy, members of the environmental community formally asked the EPA to address the problem. In 2003, the Ozark Chapter of the Sierra Club petitioned the EPA to promulgate

¹³⁷ 63 Fed. Reg. 34648-49.

¹³⁸ Nutrient Criteria Development, 66 Fed. Reg. 1671, 1673-4 (Jan. 9, 2001).

¹³⁹ Current Status: National Nutrient Strategy, Chart, (May 14, 2007) <http://www.epa.gov/waterscience/criteria/nutrient/strategy/status.html>, visited July 14, 2008.

¹⁴⁰ *Id.* See also NRC Report at 126.

water quality standards for the Mississippi and Missouri Rivers located in an eight-state region near the waters' confluence.¹⁴¹ The Petition asked the EPA to publish standards that were consistent from state to state and that reflected criteria sufficient to achieve and maintain fishable/swimmable waters and satisfy the requirements of the Clean Water Act.¹⁴²

The Sierra Club specifically sought to have the EPA promulgate its own numeric nutrient criteria, both to insure uniformity along the River and to protect the health of the River and the Gulf.¹⁴³ Using the Dead Zone as a “graphic demonstration” of the failure of the existing state-oriented system, the Petition pointed out that the Dead Zone owed its size and existence to “excessive nutrients, primarily nitrogen, carried to the Gulf by the Mississippi and Atchafayala Rivers ...” and that only the EPA had the authority to ensure that the “cumulative effects” of nutrients from all of the states would not contribute to the Dead Zone.¹⁴⁴ The Sierra Club urged the EPA to use this authority to step in and act.

The year following the Sierra Club's petition, the Natural Resources Defense Council (“NRDC”) and the Environmental Law and Policy Center (“ELPC”) sent a letter to Benjamin Grumbles, the Acting Assistant Administrator of the EPA for Water, specifically directing the

¹⁴¹ See Petition to the United States Environmental Protection Agency for Rulemaking to Protect Interstate Waters Under the Clean Water Act, (February 25, 2003), attached as Exhibit C. The portion of the Mississippi River involved in the Petition ran from Burlington, Iowa to Memphis, Tennessee. *Id.* at 2.

¹⁴² CWA § 303(c)(4), 33 U.S.C. § 1313(c)(4).

¹⁴³ Petition, Ex. C, at 3.

¹⁴⁴ Petition, Ex. C at 16-17 (*quoting* 2001 Action Plan). The Petitioner was not alone in recognizing the failure of the existing scheme. In 2003, the Government Accountability Office (GAO) had similarly recognized that nutrient pollution was one of the largest contributors to the nation's impaired waters and recommended that the EPA take the lead in publishing numeric nutrients criteria. See U.S. Gov. Accountability Office, Improved EPA Guidance and Support Can Help States Develop Standards that Better Target Cleanup Efforts, 37-39 (2003).

agency's attention to nitrogen and phosphorus pollution.¹⁴⁵ The letter pointed out that the states were far behind the goals for progress set by the EPA, and noted further that the states were attempting to set numeric nutrient criteria using methods that the EPA had found to be scientifically difficult and had rejected in its own materials.¹⁴⁶ The NRDC/ELPC letter also demonstrated that the states were not including nitrogen and phosphorus limits in NPDES water permits and that the failure to promulgate numeric nutrient criteria was leading to the construction of water treatment plans that could not reasonably treat for phosphorus when those criteria eventually arrived. Like the Sierra Club Petition, the letter sought the EPA's immediate intervention in the problem.¹⁴⁷

Circumstances seemed auspicious for a positive response from the EPA to the Sierra Club petition. The EPA had agreed to accept the Petition as part of the Settlement of another water-quality standards lawsuit and to grant or deny it within one year of receipt. A 2003 U.S. Government Accountability Office report had highlighted the same inconsistencies and problems with the EPA's existing regulatory framework as the Petitioner. The Environmental Groups' letter reminded the EPA of what it already knew – that the states and tribes were years late in establishing numeric nutrient criteria. The Dead Zone had reached its largest size ever – 22,000 square kilometers – two years before.

However, although the facts of agency inaction had become crystal clear, the Sierra Club's Petition met with no more success than did the Earthjustice Petition filed nearly a decade

¹⁴⁵ Letter from National Resource Defense Council and Environmental Law and Policy Center to EPA, Office of Water, dated March 5, 2004, attached as Exhibit D.

¹⁴⁶ Ex. D at 2.

¹⁴⁷ Ex. D. at 2, 4.

earlier. The EPA determined that it was “unnecessary for EPA to federally promulgate numeric criteria for the petition area, at this time, to meet the requirements of the CWA under CWA section 303(c)(4)(B).”¹⁴⁸ The EPA claimed it was better that the states focus on developing numeric nutrient standards for Mississippi River tributaries, rather than focusing on the River itself.¹⁴⁹ According to the EPA, all of the states bordering the Mississippi River already had their own narrative standards for tributary streams and most were working to develop numeric nutrient standards for those same tributaries.¹⁵⁰

EPA promised to “work with” the states to help them develop numeric criteria for the tributaries and “expected” that the states would meet the deadlines set out in its November 2001 policy memo for their development.¹⁵¹ It also pledged to conduct more monitoring and research on the Mississippi River, to work with the Task Force, and to convene a stakeholders meeting to “discuss the development and adoption of appropriate ambient water quality criteria for nutrients” in the Mississippi River.¹⁵²

E. Current Efforts To Reduce The Hypoxic Zone.

After the EPA’s Response to the Sierra Club’s 2003 Petition, concerned interests waited to see whether those efforts would bear fruit. The EPA convened the promised stakeholders

¹⁴⁸ Decision on Petition for Rulemaking to Publish Water Quality Standards for the Mississippi and Missouri Rivers Within Arkansas, Illinois, Iowa, Kansas, Kentucky, Missouri, Nebraska, and Tennessee (“Response”) at 29 (Jun. 25, 2004), attached as Exhibit E.

¹⁴⁹ *Id.* at 29-30.

¹⁵⁰ *Id.* at 27-29.

¹⁵¹ *Id.* at 29.

¹⁵² *Id.* at 30 (monitoring and research); 31-32 (convene meeting).

meeting in St. Louis, but the states did not meet the 2004 deadline for the development of numeric standards and EPA did not promulgate numeric nutrient standards for the states in the period that followed.

In 2007, having observed that more than 90% of all states still did not have numeric nutrient criteria, a group of environmental organizations, led by the NRDC, asked the EPA to impose specific technological limits on nitrogen and phosphorus pollution found in one known nutrient source – discharges by publicly owned treatment works (“POTWs”).¹⁵³ The NRDC Petitioners reminded the EPA that it had just recognized in a memo to state water program directors that nutrient pollution was “pervasive” and that additional measures even beyond the numeric nutrient criteria were necessary to address the problem.¹⁵⁴ Pointing out that significant scientific and technological developments had occurred since the last regulatory update during the 1980s, the NRDC Petition requested that the EPA either adopt the suggested effluent limits for total phosphorus and total nitrogen or develop its own specific effluent criteria.¹⁵⁵ The EPA has not issued a decision on the NRDC Petition.

The Task Force continued to meet to reconsider the science and policy goals of the Action Plan, ultimately releasing its reassessment in 2008. The Task Force initiated this reassessment in 2004, in accordance with the requirements of the renewed Harmful Algal Bloom

¹⁵³ Petition for Rulemaking Under the Clean Water Act, Secondary Treatment Standards for Nutrient Removal (Nov. 27, 2007) (“NRDC Petition”), attached as Exhibit F.

¹⁵⁴ *Id.* at 51.

¹⁵⁵ *Id.* at 7, 51 (citing Memorandum from Benjamin H. Grumbles, EPA Assistant Administrator for Water to State Water Program Directors 1-2 (May 25, 2007)); 54.

and Hypoxia Research and Control Act (“HABHRCA”).¹⁵⁶ The reassessment document was due in 2006, but it was not released until 2008. The reassessment – the Gulf Hypoxia Action Plan of 2008 – concluded that “much work remained to be done to implement” the 2001 Action Plan and, as mentioned above, that existing efforts had not resulted in a reduction of the Gulf’s hypoxic zone.¹⁵⁷ In fact, if the five-year average size of the Gulf of Mexico Dead Zone prior to the 2001 Action Plan is compared to the current five year average, the Dead Zone’s extent has actually increased during the time when the 2001 Action Plan was supposed to be reducing it.

Most recently, the EPA has asked the NRC to study the scientific and technical aspects of implementing a TMDL requirement for nutrients across the Mississippi River Basin in order to “improve local water quality” and “reduce[e] the extent of the Gulf of Mexico hypoxic zone.”¹⁵⁸ The scope of the project includes a summary of “existing scientific knowledge” and an identification and evaluation of the “processes and options for allocating nutrient ... load reduction responsibilities to the Mississippi River watersheds, major tributaries or basin states.”

The NRC characterizes this request as a “follow up” to its 2008 report.¹⁵⁹ In the 2008 NRC Report, the authors reviewed much of the science and history included in this Petition.¹⁶⁰

¹⁵⁶ Final Meeting Summary, Sixteenth Meeting of the the Mississippi River/Gulf of Mexico Watershed Nutrient Task Force 16 (2008), <http://www.epa.gov/msbasin/taskforce/summaries/16thsummary.htm>.

¹⁵⁷ 2008 Action Plan 4, 10.

¹⁵⁸ Project Information, The Mississippi River and the Clean Water Act: Scientific, Modeling and Technical Aspects of Nutrient Pollutant Load Allocation and Implementation, (2008) <http://www8.nationalacademies.org/cp/projectview.aspx?key=48944>.

¹⁵⁹ *Id.*

¹⁶⁰ NRC Report 89, 94-95, 113, 126.

They observed the same failures of the Task Force and the Nutrient Strategy to achieve reductions in the size of the Gulf's hypoxic zone and offer this conclusion: "Without [numeric nutrient] standards, whether they are adopted by the states or the EPA, there is little prospect of significantly reducing or eliminating hypoxia in the northern Gulf of Mexico."¹⁶¹ The authors recommend that individual states or the EPA adopt numeric nutrient standards immediately to protect freshwater tributaries, but caution that this alone would not solve the Gulf's Dead Zone problem. In order to solve the problem, they also recommend that the EPA immediately establish numeric nutrient criteria for the Gulf and the Mississippi River's mouth, then allocate the aggregate amount of nutrient reduction among the states.¹⁶²

In sum, the EPA has long known that nitrogen and phosphorus pollution pose a continuing and growing problem for the nation's saltwater and freshwater resources. Yet despite this knowledge, and despite the efforts chronicled above, nitrogen and phosphorus pollution is still a threat to state and national waters.¹⁶³ As discussed below, the time for talk is over. The need is great now and the EPA is the only actor able to make the real changes needed to solve the serious problems in the Mississippi River and the Gulf of Mexico.

¹⁶¹ NRC Report 126.

¹⁶² *Id.* at 127, 137.

¹⁶³ On July 17, 2008, Earthjustice filed suit against EPA for failure to promulgate nitrogen and phosphorus standards applicable to water bodies in the State of Florida following sending a 60-day notice letter to EPA on April 29, 2008. *See* Complaint, *Florida Wildlife Fed. Inc. v. Johnson*, No. 4:08-cv-00324-RH-WCS (N.D. Fla.).

V. CONTRARY TO THE EXPECTATIONS AND PAST REPRESENTATIONS OF EPA, THE STATES ARE NOT TAKING NECESSARY ACTION TO CONTROL NITROGEN AND PHOSPHORUS POLLUTION.

As discussed above, the Ozark Chapter of the Sierra Club petitioned EPA in 2003 requesting, in part, that EPA publish numeric criteria for nutrients in the petition area. In its June 25, 2004 decision denying the petition, EPA detailed its evaluation of this specific request as follows:

- EPA first looked at whether states in the petition area had adopted numeric nitrogen or phosphorus criteria to protect designated uses;
- EPA next looked to see if petition states had adopted narrative criteria applicable to nutrients and whether there were accompanying procedures to derive numeric criteria; and
- EPA identified the status of petition states' efforts to adopt numeric criteria.¹⁶⁴

EPA found that the states were poised to adopt numeric nutrient criteria and that these controls on intrastate tributaries would lead to needed near-term reductions in nutrient loadings to the Mississippi River and Gulf of Mexico. EPA further found that, in the interim, petition states' narrative criteria served to establish nitrogen and phosphorus limits in NPDES permits, list waters as nutrient-impaired on section 303(d) lists, and develop TMDLs to restore those waters.¹⁶⁵

This document has already examined the impacts that nitrogen and phosphorus loadings are having on the Gulf and freshwater tributaries of the Mississippi River. The following section repeats EPA's 2003-2004 examination of petition states' nutrient control activities and demonstrates that, contrary to EPA's conclusions, state general narrative standards are not

¹⁶⁴ Ex. E at 26-32.

¹⁶⁵ *Id.*

effectively protecting designated uses, and that as a result, “the response authorities of the Clean Water Act and other laws are not fully engaged.”¹⁶⁶

A. States Are Not Moving Ahead on Numeric Standards.

Petitioners reviewed the July 2008 status of the 10 Mississippi River mainstem states’ efforts to adopt numeric nutrient criteria and found that:

- None of the 10 states has adopted numeric phosphorus standards for rivers and streams. Wisconsin alone has draft phosphorus criteria for rivers and streams, but does not have an estimated date for adoption;
- Only two of the 10 states have adopted numeric phosphorus standards for lakes and reservoirs (Minnesota and Illinois). Two more states (Wisconsin and Missouri) have draft phosphorus criteria for lakes, but no firm estimated date for adoption; and
- None of the 10 states has adopted numeric nitrogen criteria for lakes/reservoirs or rivers/streams. Missouri has developed draft numeric nitrogen criteria (for classified, non-oxbow lakes only). No other state has proposed draft criteria for nitrogen for either lakes or rivers. In fact, officials from at least two states (Kentucky and Illinois) have verbally indicated that the state has presently abandoned attempts to develop numeric nutrient standards.

As a result, 10 years after the launch of the National Nutrient Strategy, mainstem states are still wholly dependent on general narrative criteria to protect designated uses for flowing waters in their jurisdiction. Lacking EPA action, this state of affairs is likely to continue for many years, as several mainstem states have either not met deadlines promised in their Nutrient Criteria Development Plans or have explicitly stated that they are waiting for EPA to act.¹⁶⁷

¹⁶⁶ *Id.*

¹⁶⁷ See Chart, *Narrative Standards Applicable to Nutrients for Mississippi River Mainstem States*, attached as Exhibit G (listing current narrative standards for each of the mainstem states).

B. States Are Not Using Their Narrative Standards to Derive Nitrogen or Phosphorus Limits Protective of Receiving Waters in Permits.

Petitioners reviewed the status of mainstem states' efforts to derive numeric translator formulas with which to interpret their respective general narrative standards, and found that only one of the 10, Tennessee, had done so. This is the same state of affairs that existed when EPA denied the Sierra Club's Petition in 2004. The failure to either adopt numeric standards or prepare effective methods with which to interpret and implement state narrative standards has crippled the ability of the states to derive effluent limits protective of designated uses in NPDES permits.

None of the 10 mainstem states is deriving water quality based effluent limits for phosphorus or nitrogen in NPDES permits to implement the state's narrative water quality standard. A small proportion of NPDES permits issued by Minnesota, Wisconsin, and Illinois contain one mg/L phosphorus effluent limits due to state rules requiring such a limit for new or expanding dischargers of a specified size.¹⁶⁸

As discussed below, various state agencies are on record stating that this failure to derive and impose water quality based effluent limits ("WQBELs") for nutrients is due to the fact that, although the state has narrative standards, the state has not adopted numeric water quality standards for nutrients.

¹⁶⁸ See Minn. R. Ch. 7053.0255; Wis. Admin. Code § 217.04; 35 Ill. Admin. Code § 304.123, 302.205.

Minnesota

The Minnesota Pollution Control Agency (“MnPCA”) recently conducted a non-degradation review for a proposed new discharge to the Long Prairie River. The Agency declined to derive and impose a WQBEL for phosphorus due to the lack of numeric criteria or standards for flowing waters:

The mass balance for phosphorus was evaluated at three effluent concentrations to demonstrate the relative increases of each on the river concentrations of TP [total phosphorous]. Each level of effluent phosphorus results in a substantial increase over the background concentration of TP in the river. [Note: the Agency selected the highest of the three evaluated concentrations for the permit.] ...Currently, we have no state nutrient standards for nitrogen and phosphorus to address stream eutrophication. When these are developed, lower concentration effluent limits may be considered in the future as needed to protect the Long Prairie River.¹⁶⁹

The MnPCA has developed a circular argument that insures continued water quality degradation: It will not impose WQBELs unless the receiving water is 303(d) listed; but it does not assess or 303(d) list flowing waters for compliance with the narrative standard; and it does not intend to adopt numeric standards for several years:

As stated in your comment letter, neither Jewitts Creek nor the North Fork of the Crow River is listed as impaired for phosphorus. MCEA’s [Minnesota Center for Environmental Advocacy’s] comment letter references an impairment in this stretch, thus requiring water quality based effluent limits as outlined under Section 303 of the Clean Water Act, when in fact, no such impairment has been listed. The nearest downstream waterbody impaired for nutrients is Lake Pepin. This discharge does not have reasonable potential to cause or contribute to the Lake Pepin impairment. If MCEA has issues with whether an impairment needs to be listed, the

¹⁶⁹ Minnesota Pollution Control Agency, *Nondegradation Review, Central Lakes Region Sanitary District*, Environmental Outcomes Division, 5 (undated), attached as Exhibit H.

comments should be directed via the 303(d) impaired waters listing, not the NPDES permitting process.¹⁷⁰

Excess nutrients, TP in particular, are having impacts on rivers and streams throughout the state . . . presently, rivers and streams are not being assessed for nutrient impairment because the Agency does not have nutrient standards (or criteria based on a narrative standard) for rivers and streams.

...The Agency is probably at least three years away from being ready to promulgate river and stream standards.¹⁷¹

Wisconsin

The Wisconsin Department of Natural Resources (WDNR) similarly refuses to derive WQBELs in NPDES permits to implement its narrative standard, and has in fact issued guidance directing permit writers not to do so:

Until there is guidance or a rule that establishes a general or site-specific methodology for determining reasonable potential to attain narrative water quality standards as applied to nutrients, WPDES permits should not be issued with nutrient limits based on narrative water quality standards.¹⁷²

¹⁷⁰ Lisa M. McCormick, Pollution Control Specialist Senior, Minnesota Pollution Control Agency, *Response to Comments—Litchfield Wastewater Treatment Facility*, (January 31, 2008), attached as Exhibit I.

¹⁷¹ State of Minnesota, Minnesota Pollution Control Agency, *Staff Post-Hearing Response to Public Comments*, 18 (October 3, 2007) <http://www.pca.state.mn.us/water/standards/posthearing-publiccomments.pdf>.

¹⁷² Russ Rasmussen, State of Wisconsin, *Correspondence/Memorandum: Determining Reasonable Potential for Narrative Standards*, 3 (December 14, 2006) attached as Exhibit J.

WDNR has recently noted that development of numeric nitrogen water quality criteria are not a priority for the 2008 to 2011 triennial review, meaning WDNR does not expect to begin promulgation of these standards until at least 2012.¹⁷³

Illinois

The Illinois Environmental Protection Agency (IEPA) also declines to include effluent limits derived from its narrative standard:

There are no existing water quality standards for nutrients that apply to Hickory Creek. A narrative standard exists prohibiting plant and algal growth of other than natural origin. This is a very difficult standard to apply to a permit.¹⁷⁴

As with Minnesota, the IEPA has also admitted that it is years away from promulgating numeric nutrient standards:

We estimate that it will probably be another four or five years before we know what phosphorus water quality standards should be in Illinois and to know how different sources of phosphorus would have to be dealt with.¹⁷⁵

¹⁷³ Wisconsin Department of Natural Resources, *2008-2011 Triennial Standards Review Cycle, Topic Descriptions*, 8 (July 2, 2008), http://www.dnr.state.wi.us/org/water/wm/wqs/tsr/documents/Topic_Descriptions.pdf.

¹⁷⁴ Responsiveness Summary, *In the Matter of New Lenox, Application for NPDES Permit Renewal*, No. IL0020559, at 6 (IEPA Oct. 31, 2003), attached as Exhibit K.

¹⁷⁵ *Id.*

Missouri

In response to comments on a proposed new discharge to the nutrient-impaired Lake of the Ozarks submitted by petitioner Missouri Coalition for the Environment, the Missouri Department of Natural Resources (MoDNR) declined to impose effluent limits for nutrients until numeric water quality standards were adopted by the state or EPA adopted stronger technology-based limits:

Determining numerical guidelines for nutrients through a reasonable potential analysis or wasteload allocation analysis cannot be done during the brief period of time of this public notice but encompasses a much larger policy change. Developing the nutrient criteria that will protect the waters of the state will require significant analysis of water quality data, some of which is already available and some of which still needs to be collected. It will also require input from citizens concerned with the impact of implementation of nutrient criteria.

Until federal regulations are promulgated which address the need for additional nutrient removal, such as total phosphorus or total nitrogen, the department continues to collect data to determine if nutrient contribution from domestic wastewater causes impairment. Rest assured that when nutrient limitations are promulgated at a federal level or when resolved by the Missouri Clean Water Commission, the department will implement effluent limitations in an expeditious manner for all appropriate facilities as indicated by impairment of watersheds.¹⁷⁶

Further evidence of the failure of Missouri's narrative standard is provided in the MoDNR's response to comments on another NPDES permit:

Your first comment appears to express a concern that the final effluent limits contained in the proposed permit will be sufficient to protect water quality, especially with respect to dissolved oxygen, conductivity, phosphate, turbidity, color, odor, and suspended solids. ...With respect to phosphate and turbidity, again there are no stream standards

¹⁷⁶ Letter to Kim Knowles, Missouri Coalition for the Environment from Kevin Hess, Chief, Water Pollution Section, Missouri Department of Natural Resources (Apr. 16, 2008), attached as Exhibit L.

for either parameter although we agree the values you cite seem high. It is our hope that upgrades to the treatment system will lead to significantly improved effluent quality. So we see no reason to change the proposed future effluent limits based on the data you present.¹⁷⁷

Kentucky

Petitioners are not aware of any NPDES permits in Kentucky containing phosphorus or nitrogen limits derived to protect water quality.

Tennessee

Alone among the mainstem states, Tennessee has prepared a numeric translator of its narrative nutrient standard.¹⁷⁸ Unfortunately, the translator appears to be little used to derive effluent limits in NPDES permits. According to Vojin Janjic, Assistant Manager of Permits Section for the Tennessee Department of Environment and Conservation (TDEC), most permits contain only a requirement to report monitoring results for nitrogen and phosphorus in discharge monitoring reports, and few have explicit numeric limits for nitrogen and even fewer for phosphorus.¹⁷⁹

¹⁷⁷ Letter to Edward J. Heisel from James A. Rhodes, Stl Ouis Regional Office, Missouri Department of Natural Resources, RE: Permit #MO-0045420 (January 24, 2008), attached as Exhibit M.

¹⁷⁸ Gregory M. Denton, Debbie Arnwine and Sherry H. Wang, Development of Regionally-Based Interpretations of Tennessee's Narrative Nutrient Criterion, Tennessee Department of Environment and Conservation (August 2001).

¹⁷⁹ Telephone interview by Dana L. Wright, Director of Policy and Legislative Affairs, Tennessee Clean Water Network, with Vojin Janjic, Assistant Manager of Permits Section for the Tennessee Department of Environment and Conservation (July 18, 2008).

Arkansas

Petitioners are aware of just one NPDES permit containing a phosphorus limit imposed by Arkansas Department of Environmental Quality derived to protect water quality in the immediate receiving water (the Ouachita River). A state rule extends (non-WQBEL) phosphorus limits (ranging from one to five mg/L) only to point sources discharging to waters officially listed on Arkansas' 303(d) list if phosphorus is identified as the major cause of impairment.¹⁸⁰

Mississippi

The Mississippi Department of Environmental Quality has also repeatedly deferred imposition of nutrient effluent limits in NPDES permits until numeric criteria are developed:

The State is currently in the process of determining nutrient and sedimentation water quality criteria for the receiving stream. We do have a reopener clause in the permit which allows the permit to be modified if the effluent standard, limitation or regulation contains different conditions or is otherwise more stringent than the effluent limitations of the permit; or if pollutants not limited in the permit are deemed necessary; or if the results of a completed TMDL require more stringent limitation or additional monitoring. Should any future data indicate that excessive nutrients associated with this discharge cause or contribute to adverse effects to water quality, appropriate limitations will be determined and incorporated into the permit accordingly.¹⁸¹

Also, the State is currently in the process of determining nutrient water quality criteria. Therefore, phosphorous limitations are not incorporated in the draft permit at this time. We do have a reopener clause in the permit which allows the permit to be modified if the effluent standard, limitation or regulation contains different conditions or is

¹⁸⁰ Arkansas Pollution Control and Ecology Commission, Reg. 2.509, *Nutrients*, (undated) available at: <http://www.adeq.state.ar.us/regs/default.htm>.

¹⁸¹ Letter from Samar I. Patel, Environmental Permit Division, Mississippi Department of Environmental Quality Re: Terra proposed NPDES Permit Renewal, No. MS0000574, at 10, (November 21, 2007), attached as Exhibit N.

otherwise more stringent than the effluent limitations of the permit; or if pollutants not limited in the permit are deemed necessary; or if the results of a completed TMDL require more stringent limitation or additional monitoring.¹⁸²

Louisiana

Louisiana similarly does not issue NPDES permits with WQBELs for phosphorus or nitrogen derived from the narrative standard. The stated position of the Louisiana Department of Environmental Quality is that when it maintains and protects dissolved oxygen, “nutrients are also controlled and limited.”¹⁸³

C. Flowing Waters Are Not Being Assessed and 303(d)-Listed Due to Violations of Narrative Standards, and TMDLs Are Not Being Done for Narrative Violations in Many Impaired Waters.

Petitioners reviewed the practices of mainstem states in assessing intrastate waters for compliance with state narrative standards for nutrients, listing of such waters as impaired by nutrients on 303(d) lists, and preparing TMDLs to restore nutrient-impacted waters to support designated uses. Some limited assessment, 303(d) listing, and TMDL preparation based on interpretation of narrative standards is being done in the Upper Mississippi basin for phosphorus in lakes. Little is being done to assess, list and restore flowing waters related to phosphorus impacts, and none of the mainstem states is addressing impacts from total nitrogen.

¹⁸² Letter from Harry M. Wilson III, Chief, Environmental Permits Division, Mississippi Department of Environmental Quality, Re: Harrison County Utility Authority Permit No.MS0052574, at 1 (January 17, 2007), attached as Exhibit O.

¹⁸³ Letter to Lisa Jordan from Chuck Carr Brown, Assistant Secretary, Louisiana Department of Environmental Quality, Response to Comments on Village of Morse LPDES permit (October 4, 2007), attached as Exhibit P.

Minnesota

The Minnesota Pollution Control Agency (“MnPCA”) has listed lakes as impaired by nutrients under the narrative standard since 2002, when it developed numeric criteria for phosphorus, chlorophyll-*a*, and Secchi depth to interpret the narrative standard. However, the MnPCA has not developed numeric criteria for nutrients for flowing waters. MnPCA itself succinctly summarizes the result of this failure:

Without a standard (or criterion) there are no assessments, no impaired waterbodies and no TMDLs for that pollutant. The nutrient TMDL for the lower Minnesota River is based on low dissolved oxygen, caused by excess nutrients. The Lake Pepin (Mississippi River) TMDL is based on exceedances of nutrient criteria, applicable because Lake Pepin is a natural lake. Otherwise, there are no pending nutrient-related TMDLs for rivers or streams.¹⁸⁴

The failure to place nutrient-impacted waters on the 303(d) list does not mean the resources are meeting designated uses. MnPCA monitoring efforts have identified 304 river reaches that exceed “ecoregional norms” (informal, unpromulgated values used by the state in 305(b) reports and as regional benchmarks) for phosphorus and nitrogen. These “ecoregional norms” are uniformly higher than EPA’s recommended ecoregional nutrient criteria. Petitioner Minnesota Center for Environmental Advocacy (“MCEA”) asked EPA to list these reaches as impaired, as instructed by the MPCA in its response to MCEA’s comments on the City of Litchfield permit.¹⁸⁵ EPA declined to do so, but directed the MnPCA to develop and utilize

¹⁸⁴ State of Minnesota, Minnesota Pollution Control Agency, *Staff Post-Hearing Response to Public Comments*, at 18 (October 3, 2007), <http://www.pca.state.mn.us/water/standards/posthearing-publiccomments.pdf>.

¹⁸⁵ See *supra* note 164.

numeric criteria interpreting its narrative standard until numeric standards are adopted by the state:

Currently, M[n]PCA does not have numeric nutrient water quality standards for streams. Minnesota does have a narrative standard that prohibits the degradation of the aquatic habitat of all Class 2 waters due to a material increase in undesirable slime growths or aquatic plants, including algae. Minnesota's guidance manual does not contain a numeric interpretation of the narrative standard as may be utilized to determine impairment in streams due to excess nutrients. Minnesota's Plan for Development of Nutrient Criteria identifies 2009 as a target for completion of research and development of numeric nutrient standards for streams. ...EPA understands that M[n]PCA will use the numeric nutrient standards in its assessment program after the standards are adopted by the State and approved by EPA. In the interim, M[n]PCA can use nutrient criteria recommendations published by EPA pursuant to Section 304(a) of the Act or State developed criteria that are protective of designated uses as thresholds for designating nutrient impairments in streams in a future guidance manual.¹⁸⁶

To date, the MnPCA has not done so. Further, the MnPCA is on record in numerous public forums (see, e.g., EPA N-STEPS presentation by MnPCA's Steve Heiskary, July 9, 2008)¹⁸⁷ estimating that numeric criteria for streams will not be complete until 2011.

Wisconsin

The Wisconsin DNR lists lakes as impaired by eutrophication using a Trophic Status Index that includes phosphorus levels. Wisconsin does not list flowing waters based on narrative violations directly caused by excess nitrogen or phosphorus pollution and does not list lakes or streams due to excess nitrogen. The U. S. Geological Survey conducted significant water quality

¹⁸⁶ USEPA, *Decision Document for the Approval of Minnesota's 2008 303(d) List of Impaired Waters*, at 17 (June 10, 2008), attached as Exhibit Q.

¹⁸⁷ Steven Heiskary, *Minnesota River Nutrient Criteria Development: Emphasis on Biological Indicators & Relationships*, slide 37 (July 9, 2008), webcast presentation archived at: <http://n-steps.tetrtech-ffx.com/NTSCHome.cfm>.

monitoring for phosphorus and nitrogen in Wisconsin's wadeable streams, showing that of 240 streams sampled, 191 exceed EPA-recommended ecoregional criteria for phosphorus, and 208 exceed EPA recommended nitrogen criteria.¹⁸⁸

Iowa

The Iowa Department of Natural Resources also lists lakes based on a Trophic Status Index that includes phosphorus. Iowa does not list rivers or streams for excessive phosphorus or nitrogen concentrations. Again, a look at available (2007) data shows that Iowa streams are well in excess of EPA ecoregional criteria, with the 50th percentile of sites at 200 micrograms per liter (ug/L) phosphorus (compared with the EPA Western Corn Belt criterion of 76 ug/L). These streams are averaging 7.4 mg/L nitrate + nitrite as N in 2007 (compared with EPA's total nitrogen criterion of 2.18 mg/L).¹⁸⁹

Illinois

The Illinois Environmental Protection Agency ("IEPA") assesses and lists lakes as impaired based on the state's numeric standard of 50 ug/L phosphorus.¹⁹⁰ The IEPA removed total nitrogen as a cause of impairment as of 2008, stating:

We have stopped using total nitrogen, as a cause of impairment for *aquatic life* use. Total nitrogen appeared as nitrogen (total) on previous 303(d) Lists. We do not have a standard for total nitrogen related to aquatic life. In streams, we typically do not have

¹⁸⁸ United States Geological Survey, *Nutrient Concentrations and Their Relations to the Biotic Integrity of Wadeable Streams in Wisconsin*, (2006).

¹⁸⁹ Iowa Department of Natural Resources, *Iowa's Water, Ambient Monitoring Program, Water Fact Sheet 2008-8* (January 2008), attached as Exhibit R.

¹⁹⁰ 35 Ill. Admin. Code § 302.205.

total nitrogen data. The methods, criteria and the manner in which nitrogen was reported as a cause of impairment of *aquatic life* use have changed many times over previous assessment cycles. These criteria had never been shown to be related to *aquatic life* use impairment in any scientific study and had never been used or proposed as water quality standards. Illinois now believes that the criteria by which it placed total nitrogen on previous 303(d) Lists were not scientifically valid. Illinois does not believe that a scientifically valid criterion currently exists for determining when nitrogen is causing an impairment of *aquatic life* use in this state.”¹⁹¹

Beginning with the 2008 303(d) list, the IEPA also delisted waters impaired by low dissolved oxygen:

Dissolved oxygen (which is a cause of impairment used to indicate low dissolved oxygen) has been changed from a pollutant to a nonpollutant cause of impairment. Although low dissolved oxygen may be caused by pollutants, the impairment does not result from the discharge of dissolved oxygen into the water. Furthermore, federal regulations in CWA Section 502(6) do not define dissolved oxygen or low dissolved oxygen as a pollutant. Because only pollutant causes of impairment appear on the 303(d) List this means that all entries of dissolved oxygen have been delisted.¹⁹²

Although IEPA uses a phosphorus threshold value of 610 ug/L to assess and list streams as impaired (USEPA’s recommended phosphorus criteria for Illinois are 76 ug/L and 35 ug/L), IEPA will not prepare TMDLs for these waters due to its lack of numeric water quality standards for phosphorus:

Those waters meeting the criteria below may be passed over on the list regardless of priority ranking.

...ii) 303(d) listed waters where the potential causes of impairment are pollutants for which there are no numeric water quality standards in Illinois—e.g., phosphorus in streams, and others. Pending development of appropriate numeric water quality standards

¹⁹¹ Illinois Environmental Protection Agency, Bureau of Water, Illinois Integrated Water Quality Report and Section 303(d) List—2008, at 10, (June 2008), attached as Exhibit S.

¹⁹² *Id.*

as may be proposed by the Agency or others and adopted by the Illinois Pollution Control Board, Illinois EPA will continue to work with watershed planning groups and others to identify causes and treat potential sources of impairment.¹⁹³

Finally, despite Illinois' status as the largest state contributor of nitrogen and phosphorus to the Gulf, IEPA also will not prepare TMDLs for nitrogen or phosphorus affected interstate waters, deferring such actions to USEPA:

i) 303(d) listed waters that are interstate waters—e.g., Mississippi River, Ohio River, Lake Michigan and others. In these waters, the Illinois EPA will continue to work closely with other states and USEPA in addressing issues related to Section 303(d) requirements. USEPA is expected to take a lead role in coordinating the state efforts.¹⁹⁴

Missouri

The Missouri Department of Natural Resources will not list nutrient-affected waters as impaired based on its narrative standard:

Missouri is still developing its numeric criteria for nutrients, mainly nitrogen and phosphorous. Until those are developed and put into Missouri's Water Quality Standards, the Listing Methodology developed for Missouri does not recognize any streams as impaired for nutrients.¹⁹⁵

¹⁹³ *Id.* at 110.

¹⁹⁴ *Id.*

¹⁹⁵ Missouri Department of Natural Resources, *2004/2006 Missouri 303(d) List Frequently Asked Questions*, 6 (October 2006), attached as Exhibit T.

Arkansas

The Arkansas Department of Environmental Quality lists four streams as impaired by total phosphorus on its 2004 303(d) list.¹⁹⁶ The basis for these listings is unknown, as the state's listing methodology for narrative standards is simply given as:

Narrative Criteria – Waters will be assessed as “non-support” when violation of any narrative water quality standard has been verified by ADEQ.¹⁹⁷

Mississippi

The Mississippi Department of Environmental Quality (“MsDEQ”) does not use its narrative standard to list waters as impaired by excess nutrients:

Only data for physical/chemical parameters for which Mississippi has adopted numeric water quality criteria in Mississippi's WQS will be used for making a water body 305(b) use support determination and/or a 303(d) listing. Other parameters for which numeric criteria have not been adopted (e.g., nutrients, turbidity/suspended solids, chlorophyll-*a*) will be shown as impairment causes if there is an identified association with exceedances of a parameter for which the state has a numeric criterion (e.g. elevated nutrients causing excursions of the dissolved oxygen criterion).¹⁹⁸

Further, when MDEQ does prepare TMDLs for waterways listed for low dissolved oxygen, the target values derived for nitrogen and phosphorus are often far in excess of EPA

¹⁹⁶ Arkansas' 2004 List of Impaired Waterbodies at: http://www.adeq.state.ar.us/water/branch_planning/pdfs/303d_list_2004.pdf. This appears to be the most recent 303(d) list available for the state.

¹⁹⁷ *Id.* at 7 (source is unpaginated).

¹⁹⁸ Mississippi Department of Environmental Quality, *Mississippi Consolidated Assessment and Listing Methodology, 2008 Assessment and Listing Cycle*, at 4 (undated), attached as Exhibit U.

recommended criteria. For example, recent TMDLs prepared by MDEQ for the Yazoo Basin recommend a target for total nitrogen of 1.05 mg/l and a phosphorus target of 0.16 mg/l (compared with EPA recommended criteria of .76 mg/l nitrogen and .128 mg/L phosphorus).¹⁹⁹

Whatever the shortcomings of TMDLs prepared by MDEQ for nutrient-impacted intrastate waters, the agency makes clear that it will not list or prepare TMDLs for the Mississippi River, a job it defers to EPA:

MDEQ is not listing the Mississippi River on MDEQ's Mississippi 2006 § 303(d) list. In previous lists MDEQ included various segments of the river, but not based on data. Since any TMDL or delisting decision deals with multiple states and multiple EPA Regions, MDEQ considers this a national issue.²⁰⁰

VI. PETITIONERS' REQUESTS OF EPA – EPA SHOULD PROMPTLY PREPARE AND PUBLISH NUMERIC STANDARDS FOR NITROGEN AND PHOSPHORUS FOR THE PORTION OF THE OCEAN UNDER THE JURISDICTION OF THE CLEAN WATER ACT AND FOR THE WATERS OF EVERY STATE FOR WHICH STANDARDS HAVE NOT BEEN ESTABLISHED, AND SHOULD ESTABLISH TOTAL MAXIMUM DAILY LOADS FOR THE MISSISSIPPI RIVER AND THE TERRITORIAL WATERS OF THE GULF OF MEXICO.

It is clear that action by EPA is needed now – not simply more studies, reports, task forces and conferences. EPA has long known concrete steps that should be taken to begin to control nitrogen and phosphorus pollution and the NRC Report confirms both that EPA should establish numeric standards to control nitrogen and phosphorus pollution and that EPA should establish TMDLs to protect the Gulf of Mexico and the mainstem of the Mississippi. As stated by the NRC Report:

¹⁹⁹ Mississippi Department of Environmental Quality, Office of Pollution Control, *Total Maximum Daily Load, Total Nitrogen, Total Phosphorus, and Organic Enrichment/Low Dissolved Oxygen for Burrell Bayou, Yazoo River Basin* at 7 (draft, March 2008), attached as Exhibit V.

²⁰⁰ *Id.* at 15.

The EPA has failed to use its mandatory and discretionary authorities under the Clean Water Act to provide adequate interstate coordination and oversight of state water quality activities along the Mississippi River that could help promote and ensure progress toward the act's fishable and swimmable and related goals.²⁰¹

As shown above, numeric water quality standards for nitrogen and a TMDL are needed to protect the area of the Gulf of Mexico within the jurisdiction of the Clean Water Act outside of the jurisdiction of any state.²⁰²

Further, it is clear from the foregoing that numeric water quality standards for nitrogen and phosphorus are necessary to meet the requirements of the Clean Water Act. Under Section 303(c)(4) of the Clean Water Act, 33 U.S.C. 1313(c)(4), EPA "shall *promptly* prepare and publish revised water quality standards" where a new or revised standard is necessary to meet the requirements of the Clean Water Act. 33 U.S.C. § 1313(c)(4) (emphasis added). *See also The Raymond Profitt Foundation v. U.S. Environmental Protection Agency*, 930 F. Supp. 1088, 1103-04 (E.D. Pa. 1996).

Still further, it has been shown that the states have largely failed to prepare TMDLs necessary for numerous waters in the Mississippi Basin that are impaired by nitrogen and/or phosphorus pollution and that no TMDL has been established for the mainstem of the Mississippi River or any portion of the Gulf of Mexico. The law is clear: EPA has the authority to establish TMDLs for impaired waters and the duty to do so where the states have failed to do so. *Scott v. City of Hammond*, 741 F.2d 992 (7th Cir. 1984).

Accordingly, the EPA should grant this petition filed pursuant to Section 4(d) of the Administrative Procedure Act, 5 U.S. C § 553(e). EPA should exercise its powers under Sections 303(c)(4) and 303(d) of the Clean Water Act, 33 U.S.C. § 1313(c)(4),(d), to prepare and publish

²⁰¹ NRC Report at 7.

²⁰² NRC Report at 74.

numeric water quality standards and establish TMDLs needed to protect the nation's waters, or least the waters in the Mississippi Basin where the need has been most clearly shown above.

In particular, petitioners request that EPA take each of the following steps to meet the requirements and advance the goals of the Clean Water Act:

Regarding numeric water quality standards -

1. EPA should prepare and publish revised numeric water quality standards for nitrogen for every "navigable water," as defined by 33 U.S.C. § 1362(7), for which a numeric water quality standard for nitrogen has not been submitted to EPA pursuant to 33 U.S.C. §1313(c)(3) and found by EPA to be consistent with the CWA.
2. EPA should prepare and publish revised numeric water quality standards for phosphorus for every "navigable water," as defined by 33 U.S.C. § 1362(7), for which a numeric water quality standard for phosphorus has not been submitted to EPA pursuant to 33 U.S.C. §1313(c)(3) and found by EPA to be consistent with the CWA.
3. EPA should prepare and publish revised numeric water quality standards for chlorophyll *a* for every "navigable water," as defined by 33 U.S.C. § 1362(7), for which a numeric water quality standard for chlorophyll *a* has not been submitted to EPA pursuant to 33 U.S.C. §1313(c)(3) and found by EPA to be consistent with the CWA.
4. EPA should prepare and publish revised numeric water quality standards for turbidity for every "navigable water," as defined by 33 U.S.C. § 1362(7), for which a numeric water quality standard for turbidity depth has not been submitted to EPA pursuant to 33 U.S.C. §1313(c)(3) and found by EPA to be consistent with the CWA.

The request is made separately as to each of the four steps described above and jointly and in the alternative for (i) lakes and reservoirs, (ii) rivers and streams, (iii) the contiguous zone of coastal waters and (iv) the part of the ocean subject to CWA jurisdiction outside of the jurisdiction of any state.²⁰³

²⁰³ In establishing criteria, EPA must take full account of its own regulation, at 40 C.F.R. § 131.10(b), which states: "In designating uses of a water body and the appropriate criteria for those uses, the State shall take into consideration the water quality standards of downstream waters and shall ensure that its water quality standards provide for the attainment and maintenance of the water quality standards of downstream waters." Accordingly, it is not enough to establish numeric criteria for upstream waters that only account for the problems that nutrients cause locally; EPA must ensure that compliance with those waters' criteria will lead to

At a minimum, the evidence demonstrates that EPA must prepare and publish water quality standards for nitrogen, phosphorous, chlorophyll-*a* and turbidity for the Gulf of Mexico and those water bodies in the Mississippi River watershed. Jurisdictional considerations alone dictate that EPA must establish water quality standards to control nitrogen and phosphorus pollution in the mainstem of the Mississippi River and the northern Gulf of Mexico, but the evidence of what has happened over the last decade demonstrates the EPA must establish numeric criteria for all water bodies in the Basin.

As stated in the NRC Report:

Under Section 303(c)(4)(B), the EPA can establish a water quality standard “in any case where the Administrator determines that a revised or new standard is necessary to meet the requirements” of the Clean Water Act. Accordingly, the EPA can establish a more demanding standard than any of the states included within a significant national watershed as long as, in the EPA’s judgment, that standard is necessary “to restore and maintain the chemical, physical, and biological integrity of the Nation’s waters” or to achieve the fishable and swimmable goal of the Clean Water Act. Given Congress’ desire generally “to recognize, preserve, and protect the primary responsibilities and rights of the States to prevent, reduce and eliminate pollution” (CWA Section 101(b)), this supervening authority of EPA is most appropriately exercised only in limited circumstance. The Mississippi River, however, would seem clearly to qualify for special treatment, being the nation’s only waterbody with congressional recognition as “*a nationally significant ecosystem and a nationally significant commercial navigation system,*” as stated in the Upper Mississippi River Management Act of 1986. Moreover, most of the area in the northern Gulf of Mexico that experiences hypoxic conditions is subject to exclusive federal control and protection under the Clean Water Act.²⁰⁴

Petitioners believe firmly that given the facts presented above and the huge problem caused by nitrogen and phosphorus pollution in rivers, lakes, streams and estuaries across the country and in the territorial seas, that this is a case in which water quality standards should be established by EPA on a national basis. Even if EPA disagrees with that assessment, surely the

the achievement of downstream standards. For example, criteria in the northern areas of the Mississippi River Basin must be consistent with meeting nutrient, dissolved oxygen, and other criteria in the southern parts of the Basin and in the Gulf.

¹⁸⁸ NRC Report at 127.

scope of the problem and the history of the failure to control nutrient pollution in the Mississippi River Basin is irrefutable. Accordingly, EPA must at least establish standards to control nitrogen and phosphorus pollution within the Mississippi Basin.

In addition, petitioners request that EPA establish total maximum daily loads for nitrogen and for phosphorus for the following water bodies:

1. The mainstem of the Mississippi River and every segment thereof;
2. The tributaries of the Mississippi River that do not meet the criteria EPA establishes for nitrogen or phosphorus;
3. The portion of the contiguous zone within the Gulf of Mexico; and
4. The portion of the ocean that is within the coverage of the Clean Water Act in the Gulf of Mexico.

RESPECTFULLY SUBMITTED,

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Exhibit B

JoAnn M. Burkholder, Ph.D.

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December 9, 2020

Mr. Albert Ettinger
53 W. Jackson #1664
Chicago, Illinois

Dear Mr. Ettinger,

In response to your request made on behalf of the Sierra Club, the Mississippi River Collaborative, and Ohio River Waterkeeper. I am sending these comments about the status of the Ohio River with respect to nutrient pollution.

I am an aquatic scientist with more than 30 years of experience in the assessment of nutrient pollution impacts in freshwaters (curriculum vitae attached). In this writing I consider facts and data about the recent history of the mainstem Ohio River with respect to high nutrient pollution and its impacts, emphasizing available information from the major water quality database of the United States of the Interior – Geological Survey (USGS). This evaluation reflects my expert opinions, which I hold to a reasonable degree of scientific certainty. They are based on my application of professional judgment and expertise to sufficient facts and data which typically and reasonably are relied upon by experts in my field.

The comments below underscore statements from the Ohio Environmental Protection Agency (Ohio EPA 2020) to the effect that nearly half of Ohio surface waters have sustained/are sustaining so much nutrient pollution, with such major impacts, that the severe threats to human health and the environment have become a “critical” situation.

Background

Nutrient pollution (cultural eutrophication), especially concerning the nutrients nitrogen (N) and phosphorus (P), is among the most important sources of impairment to U.S. surface waters (U.S. EPA 2015, 2017). These two nutrients have major influence on aquatic ecosystems nationwide, especially through their high stimulation of noxious, often toxic outbreaks (“blooms”) of cyanobacteria, also referred to as blue-green algae (Figure 1). These organisms are known worldwide as major responders that commonly form massive, high-biomass outbreaks when fueled by high N and P pollution (Chorus and Bartram 1999, Gobler et al. 2016, and references therein).

During the day, cyanobacteria make oxygen from photosynthesis, but at night they need oxygen for respiration. Cyanobacteria are mostly very small in size (bacteria-sized or a little larger), and their cells have a high surface area-to-volume ratio. Their proliferation in response to nutrient pollution commonly is so great that their cell densities can exceed 1 billion per

conditions (Vermaire et al. 2017, Yang et al. 2017, and references therein). Other factors can contribute to regime shifts along with external nutrient loads. For instance, Great Lake Erie exemplifies situations wherein shifts to toxic cyanobacterial blooms (*Microcystis aeruginosa*) have been driven in part by exotic invasive grazers such as zebra mussels, both as a result of their selective grazing activity and their feces contributions to internal nutrient loading (Bierman et al. 2005, Juhel et al. 2006).

The second largest river in the U.S., the Ohio (Turner and Rabalais 2004), is a classic example of such a regime shift. This river has sustained major chronic pollution loading since European settlement, with ~75% of the land use in agriculture, numerous cities along the river, etc. (Thomas et al. 2005). Although forest gained in land use from conversion of agriculture during the past ~57 years (1957-2014), agriculture remains a major land use in the basin (Tayyebi et al. 2015). Among other sources, numerous municipal wastewater treatment plants along the river and its tributaries generally have no total N (TN) or total P (TP) limits and add substantial quantities of N and P (Bukaveckas et al. 2005; and cities add nutrient-laden stormwater runoff – Tayyebi et al. 2015, Pyron et al. 2019, and references therein). Watershed urbanization is escalating (Tayyebi et al. 2015). Zebra and quagga mussels invaded the Ohio River basin in the mid- to late 1980s, which likely helped to promote toxic cyanobacteria blooms through the same mechanisms as related above for Lake Erie, also through enhanced light availability in the turbid riverine conditions (Thorp et al. 1998) and climate change which is shifting surface waters toward higher temperatures more favorable to growth of many noxious cyanobacteria (Visser et al. 2016 and references therein).

Prior to the past decade, much smaller *Microcystis aeruginosa* outbreaks were reported in the mainstem Ohio River (the largest, a bloom covering about 30 miles of river length near Cincinnati, occurred in late summer of 2008, according to the Ohio River Valley Water Sanitation Commission). It is not surprising, given the major N and P pollution that has chronically affected this river for decades (Thomas et al. 2005, Tayyebi et al. 2015), that massive late summer-fall blooms (reported as mostly *Microcystis aeruginosa*) abruptly have come to characterize hundreds of miles of mainstem segments—up to two-thirds of the Ohio River—in moderate to low-precipitation years in the past decade (Arenschield 2015, Wines 2015, Kentucky Health News 2019). These wide-expanse toxic blooms of cyanobacteria known to thrive in nutrient-polluted waters (Dolman et al. 2012, Gobler et al. 2016) indicate that total phosphorus concentrations surely exceed the 130 µg/L concentration recently recommended for large rivers of Ohio by an Ohio EPA specialist as “a management target for presently over-enriched waters” (Miltner 2018).

USGS Data for the Mainstem Ohio River Upstream from the Markland Dam near Warsaw

The USGS sampling site near Warsaw, Kentucky (station #03277200) is about 50 river miles downstream from Cincinnati and about 70 river miles upstream from Louisville. That entire river segment is now seasonally affected by major toxic cyanobacteria outbreaks (e.g., Kentucky Health News 2019). The USGS sampled both above and below the Markland Dam near Warsaw on the Ohio River. Because of the slower water residence time and potential

accumulations of some N and P forms in back of the dam (Wehr and Thorpe 1997), my analysis focused on the above-dam site.

The Kentucky water quality standard for dissolved oxygen (DO) is 5 mg/L as a daily average and 4 mg/L as a minimum 401 KAR 10.031 (e); see also, Ohio Environmental Protection Agency (2014) / U.S. EPA (2018) and ORSANCO standards <http://www.orsanco.org/data/dissolved-oxygen/>. The DO minimum is based on documentation of physiological stress and related adverse impacts for life history stage(s) of some warmwater fish species (U.S. EPA 1986). In 7 of the most recent ~10 years (2012-2020), DO concentrations commonly were in violation of the state standard during warmer periods (Figure 2), and diel DO variation commonly exceeded 4 mg/L (maximum ~12 mg/L). There were also numerous instances of daytime supersaturation, based on the classic, widely used temperature-dissolved oxygen relationships in Kaill and Frey (1973: > 8.2 mg DO/L, > 25°C). These conditions indicate the presence of algal blooms in highly nutrient-polluted waters (Wetzel 2001, Heiskary et al. 2013). Unfortunately, data for algal biomass were not available except for a portion of the 2020 growing season, when a moderate algal bloom at ~34 µg/L was indicated by USGS chlorophyll fluorescence data. It coincided with a peak in cyanobacterial abundance as indicated by the pigment phycocyanin, suggesting that cyanobacteria were a major component of the total phytoplankton assemblage in that bloom.

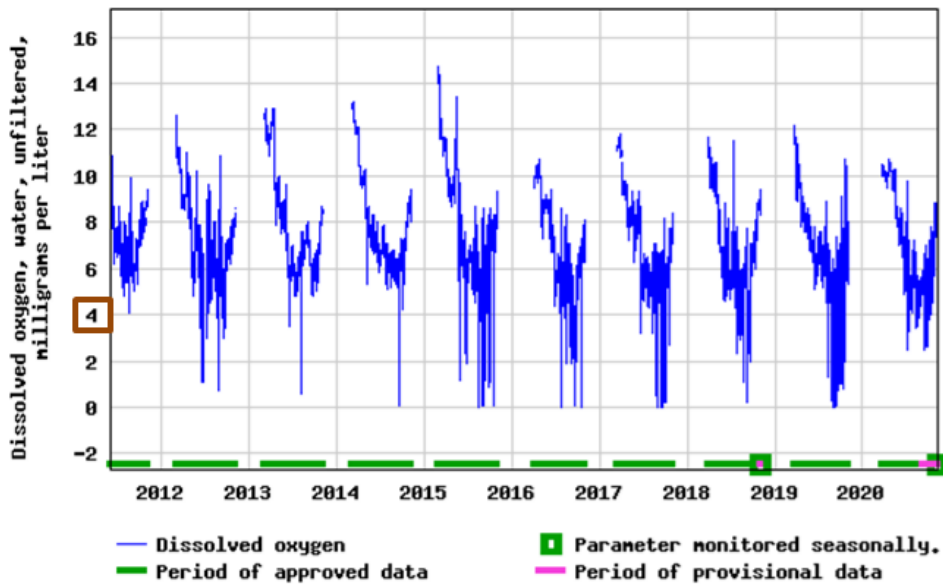


Figure 2. Dissolved oxygen concentrations from continuous monitoring during 2012-2020. From the USGS at station #03277200 (https://nwis.waterdata.usgs.gov/nwis/uv?cb_32316=on&format=gif_default&site_no=03277200&period=&begin_data=2012-05-15&end_date=2020-11-10).

Evaluation

The recent massive, recurring seasonal toxic cyanobacteria outbreaks, considered together with the USGS dissolved oxygen data above the Markland Dam near Warsaw, indicate that

much of the mainstem Ohio River is seriously degraded from nutrient pollution. The data clearly indicate that in most years since 2012, the river has been impaired due to nutrient pollution, which has fueled noxious algal blooms and caused or contributed to oxygen deficits and diel dissolved oxygen changes known to harm aquatic macroinvertebrates and fish.

My overall assessment is that this situation has reached a critical stage, characterized by conditions that—far from protecting the designated uses of this important waterbody—are now hazardous to public health as well as beneficial aquatic life.

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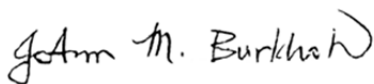
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JoAnn M. Burkholder, Ph.D.

Exhibit C

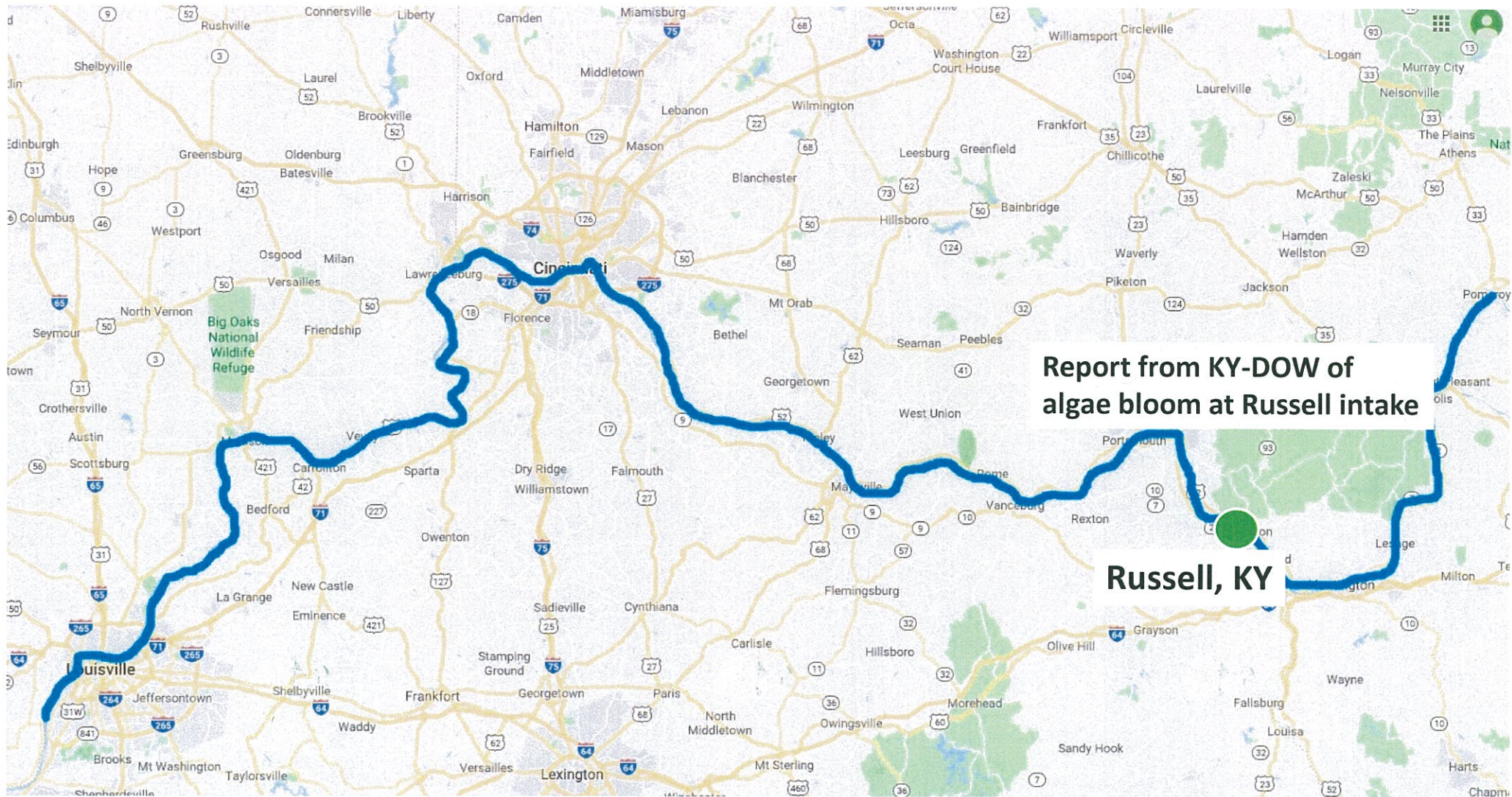


2019 HAB Event

Agenda Item 4c

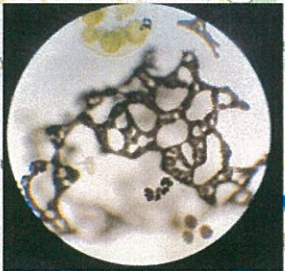
Anderson Ferry (ORM 477.5)

September 11



September 12

Identified as
Microcystis wessenbergii



8.2 ug/L
microcystin

Huntington WV – Greenup L&D
Approximately 35 miles



September 17



**Ripley, OH
Citizen report**

**Repeat of sampling in Greenup Pool
Reduced bloom conditions observed**

September 19-20

KY DOW issues cautionary statement – 9/23



September 24-26

Recreational advisory issued – 9/26



October 1-2



**Cincinnati, OH
Mile 462-477**

**835 ug/L
microcystin**

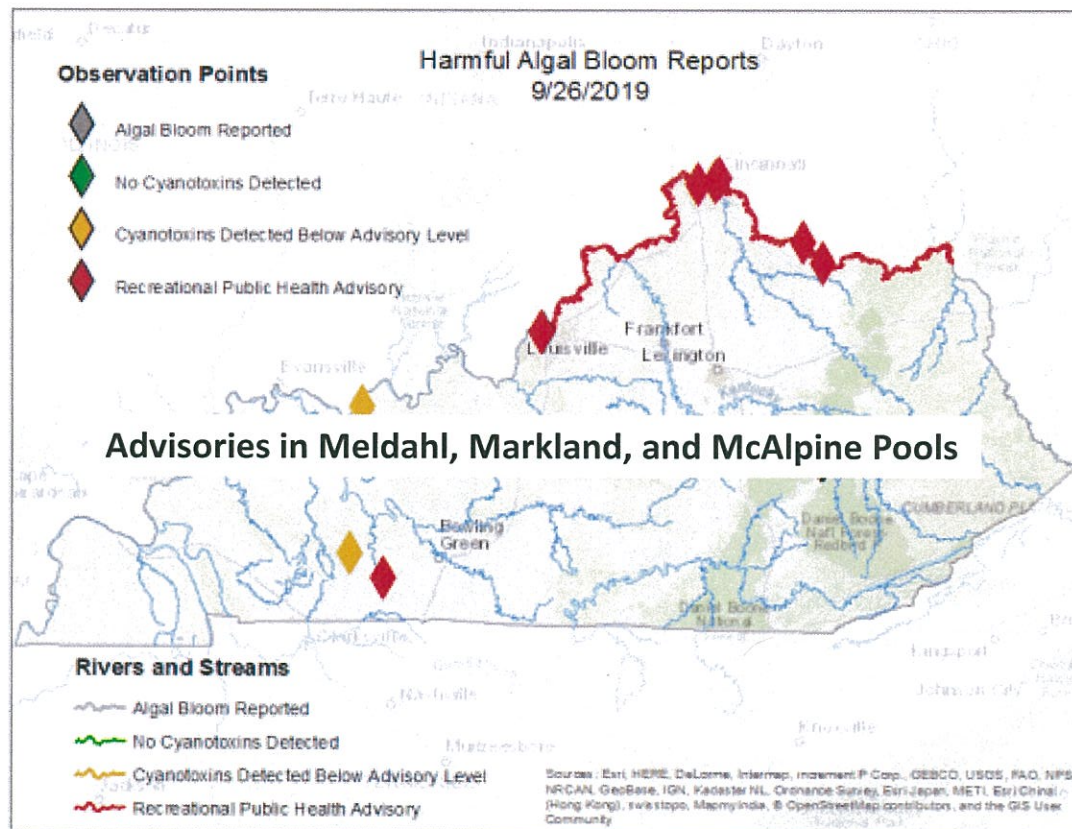
**Neville, OH
0.699 ug/L**

**Aberdeen, OH
6.34 ug/L**

Louisville/Beargrass Creek

**16 ug/L
microcystin**

Recreation Advisories



Week of October 7

- **KY-DOW sampling in Louisville area**
 - Ironman swim scheduled for October 13
- **US EPA – Cincinnati area (counts, toxin, nutrients)**
- **ORSANCO observe/sample**
 - Cincinnati area (462-477.5)
 - Ironton, OH – Meldahl L&D (327-436)
 - Markland L&D (531.5)
 - Carrolton, KY-Hanover, IN (545-562)
 - Newburgh L&D (776.1)
 - JT Myers L&D (846.0)

General Observations

- **Bloom is intermittent. Not continuous as it was in 2015**
- **Advisories/cautionary statements from KY, OH, IN**
- **Sampling/observations from Corps of Engineers, USEPA, PA, WV, KY, OH, IN, IL, ORSANCO**
- **Observations covered all of the Ohio River and major tributaries**
- **Weekly conference calls to coordinate sampling/laboratories**
- **Conference calls/sampling to continue until all advisories lifted**



ENERGY AND ENVIRONMENT CABINET

Matthew G. Bevin
Governor

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Charles G. Snaveley
Secretary

May 24, 2016

Annie Godfrey, Chief
Water Quality Standards Section
U.S. EPA Region 4
Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, Georgia 30303-8960

Re: Commonwealth of Kentucky's Nutrient Criteria Development Plan

Dear Ms. Godfrey:

The Kentucky Division of Water is pleased to submit a revision to the Commonwealth of Kentucky's 2016 Nutrient Criteria Development Plan for our mutual agreement on a procedure for the development of numeric nutrient criteria in Kentucky. This revision reflects changes to milestones based on feedback from EPA Region 4 Water Quality Standards Section personnel. I appreciate EPA's input on this document and Kentucky's efforts and look forward to working with EPA

If you have questions or concerns regarding this document, please contact Andrea Keatley, manager of the Water Quality Branch at (502) 564-3410 ext. 4978.

Sincerely,

A handwritten signature in black ink, appearing to read "Peter T. Goodmann".

Peter T. Goodmann, Director
Division of Water

c: Andrea Keatley

Macroinvertebrates, algae, TN and TP concentrations	55 stations in the Bluegrass region representing a wide range of nutrient conditions and source types (Completed)	2013-2015
Suspended Chlorophyll-a, TN and TP concentrations	34 large-order stream stations from statewide Ambient Water Quality Network (Completed)	2010-2012

Schedule and Milestones

The following is a schedule of activities and milestones describing the procedures that are anticipated to reach the establishment of nutrient criteria (Table 5). While every effort will be made by DOW staff to reach each milestone as outlined, unanticipated events and requirements could alter the accomplishment of milestones. Should conditions require a deviation in the timeline DOW and EPA staff will work together to document the reason(s) for a shift in the timeline and re-establish a revised schedule. In Table 5, milestone activities are identified from 2003 through 2021. Some milestones were not met or are in progress. A narrative has been provided for the milestone activities that were not met.

Table 5. Schedule and Milestones for Nutrient Criteria Development¹ (Past, Current and Future).

Year	Activities	Status
2003	Continue wadeable streams nutrient and biological sampling.	Complete
	Continue boatable waters methods development (summer activity).	
	Continue large and small reservoir sampling (May – October).	
	Continue work on nutrient criteria development grant to compile multi-agency reservoir data into a common database; resolve QA/QC issues and identify data gaps.	
	Participate in ORSANCO nutrient workgroup for Ohio River criteria.	

2004	Continue wadeable streams nutrient and biological sampling and analysis.	Complete
	Continue boatable waters methods development. Chlorophyll a sampling planned to be expanded.	
	Continue large and small reservoir sampling and add sampling to fill identified data gaps.	
	Continue work on nutrient criteria development grant to add new data to compiled database and begin analysis for reservoir criteria development.	
	Continue to participate in ORSANCO Nutrient Workgroup activities.	
2005	Continue wadeable streams nutrient and biological sampling and analysis.	Complete
	Continue large and small reservoir sampling (expanded sampling if required to fill data gaps).	
	Continue work on nutrient criteria development grant in support of reservoir criteria development.	
	Continue to participate in ORSANCO Nutrient Workgroup activities with goal of establishing criteria for Ohio River in 2006.	
	Finalize boatable waters methods and begin biotic index development for association with nutrients; continue expanded Chlorophyll-a sampling and evaluate relationships between Chlorophyll-a, nutrients and taste and odor complaints from domestic water suppliers.	<p>Milestone Not Met</p> <p>Boatable water biotic index development not possible given insufficient dataset. Chlorophyll-a monitoring expansion was limited due to the dominant role of suspended inorganic material relative to organic suspended material in this class of waterbody.</p>

	Finalize criteria goals for wadeable streams and reservoirs for 2006 triennial review of water quality standards.	<p>Milestone Not Met</p> <p>Initial analysis of wadeable streams data revealed numerous data gaps. Associations between biological response indicators and nutrients were insufficient to identify thresholds for impairment. Reservoir data analysis was deferred due to resources being directed to increased wadeable streams efforts. However, data collection continued for response variables as part of ambient reservoir monitoring.</p>
2006	Complete all elements of nutrient criteria development grant to complete multi-agency reservoir dataset.	<p>Complete</p>
	Adopt criteria for wadeable streams in each bioregion.	<p>Milestone Not Met</p> <p>Finalized criteria were not available for adoption (see above)</p>
	Adopt criteria for intrastate reservoirs.	<p>Milestone Not Met</p> <p>Finalized criteria were not available for adoption (see above)</p>
	Adopt nutrient criteria for the Ohio River into ORSANCO standards.	<p>Milestone Not Met</p> <p>Initial ORSANCO analyses did not identify response indicators sensitive to nutrients. Additional data needs for Ohio River criteria development were explored and additional approaches considered, including development of response indicators using another biotic community.</p>
	Continue pursuing effects-based approach in boatable waters by testing ORSANCO's Ohio River criteria approach. Set goal of establishing criteria in 2009 (next triennial review period).	<p>Milestone Not Met</p> <p>see above</p>

2007	Continue analysis of wadeable streams biological and nutrient data with goal of proposing and adopting criteria for wadeable streams in each bioregion.	<p>Milestone Not Met</p> <p>Further analyses of existing DOW biological and nutrient data were conducted, including analysis of stressor-response thresholds in multiple biological communities and examination of nutrient data distributions in reference/fully supporting streams. Additional data needs were identified, including increased seasonal nutrient data and more complete biological sampling in specific regions where associations were weak. Postponed proposing wadeable streams criteria due to these gaps.</p>
	Continue analysis of data and methods for proposing and adopting criteria for intrastate reservoirs. Obtain EPA grant for contractor to assist in this effort.	<p>Milestone Not Met</p> <p>EPA grant was not available during this timeframe for analyses. Postponed proposing reservoir criteria in this triennial review.</p>
2008	Complete wadeable reference stream nutrient study to better characterize high and low flow nutrient conditions. This study was an EPA 104(3)(b) funded project.	<p>Complete</p>
	Continue focused nutrient and biological data collection projects in several bioregions for the purpose of refining stressor-response relationships: a. Mountains Bioregion; b. Pennyroyal Bioregion; and	<p>Complete</p>

	c. Bluegrass Bioregion.	Milestone Not Met A Bluegrass study was proposed as a 104(3)b project but was not selected for funding by EPA. Resources, particularly available staff, prevented expansion of data collection in the Bluegrass Bioregion.
	Continue analyzing wadeable streams data to establish nutrient levels resulting in significant biological effects.	Milestone Not Met Ongoing challenges continued in identifying clear effects thresholds, particularly in the Pennyroyal and Bluegrass bioregions. Relationships in the Mississippi Valley - Interior Rivers bioregion were identified as being the strongest.
	Begin incorporating candidate nutrient criteria into NPDES permit renewals for POTWs discharging to nutrient-impaired 303(d) listed waters in the Bluegrass and Pennyroyal Bioregions. These target numbers are derived from ongoing data analysis for the Bluegrass and Pennyroyal Bioregions.	Milestone Not Met Permit implementation of targets not fully realized due to lack of clear stressor-response thresholds. Some limits of 1.0 mg/L TP were placed on POTWs on nutrient-impaired surface waters with identified reasonable potential.
2009	Continue data analysis of wadeable streams, with particular effort given to the three bioregions where data were collected in 2007-8.	Complete
	Anticipate completion of data collection for wadeable streams.	Milestone Not Met Ongoing challenges continue in defining strong biological effects thresholds across all bioregions. Increased nutrient sampling at reference reaches implemented to improve applicability of distribution-based approaches. Additional biological collection studies in Pennyroyal and Bluegrass regions planned.

	Continue boatable water biological methods development to support effects-based approach to criteria development. Progress dependent on finalized methods and response metrics that will come from the EPA studies with DOW cooperating. Explore distribution-based approaches as a possible alternative.	Milestone In Progress
	Work on further data analysis for reservoirs nutrient criteria development. This is dependent on EPA awarding a second grant to Tetra Tech for further data analysis.	Complete
2010	Complete data analysis for wadeable streams numeric criteria.	Milestone Not Met Approaches continue to be examined to resolve poor resolution of biological thresholds in some regions.
	Completion of reservoir data analysis deferred due to continued emphasis on wadeable streams data collection and analysis.	Milestone Not Met Grant work product for cooperative assistance in data analyses based on cause-response relationships across additional biotic and abiotic classifications was not complete at this date.
	Meet with stakeholders presenting proposed criteria.	Milestone Not Met Draft criteria were not available.
	Continue work with EPA and other parties on boatable methods and data collection.	Milestone In Progress
	Continue work with EPA and other parties on wetlands methods and data collection.	Milestone In Progress
2011	Complete focused biological and nutrient data collection in Western Pennyroyal Karst Plain and Eastern Highland Rim Ecoregions.	Complete
	Continue to explore data analysis in bioregions and ecoregions where effects based relationships may be weak.	Milestone In Progress

	Continue collecting nutrient and chlorophyll data from boatable waters.	
	Begin formulating a statewide nutrient reduction strategy.	
	Begin stakeholder development for Nutrient Reduction Strategy to facilitate implementation once finalized.	
	Data collection for wetlands incorporating test protocol for these waters.	
2012-13	Continue boatable waters nutrient study data collection.	Milestone In Progress
	Continue wadeable streams criteria refinement, including focused biological and nutrient data collection in Bluegrass bioregion.	
	Work on development of intrastate reservoir nutrient criteria.	Milestone In Progress
	Assess the progress of wetlands monitoring methods and the potential for development of relational cause – response variables for nutrient criteria development.	Milestone In Progress Effort continues with development of habitat characteristics and functional qualities field assessment methodology; these procedures are in the final phase of testing.
2014-17	Finalize the statewide nutrient reduction strategy (2016).	Milestone In Progress
	Begin implementation of the nutrient reduction strategy based on the appropriate HUC scale.	
	Continue wadeable stream and reservoir studies to fill information gaps and analyze data for ongoing development.	
	Continue the assessment of the 2015 lakes and reservoir data for gaps and criteria development.	

	Begin stakeholder outreach to prepare for nutrient criteria adoption.	
	Evaluate potential cause-response relationships through ambient water quality network data analysis for boatable (large, non-wadeable) waters.	
	Continue wetland monitoring, classification, and functionality studies.	
2018-21	Enter the triennial review with wadeable stream and intrastate reservoir nutrient criteria adoption planned, but contingent on technical variables.	
	Evaluate boatable waters strategy relative to any additional data or technical considerations toward numeric nutrient criteria development.	
	Evaluate progress made on wetland monitoring and assessment methodology.	
	Participate in, review, and consider results from National Wetlands Studies relative to potential nutrient management needs.	

¹Adjustments to this schedule will be determined on an annual basis (December of each year) as progress or delays are encountered. EPA Region 4 will be provided with an annual progress report by the end of each January.

Numeric Nutrient Criteria Regulation Development

DOW solicits input from the public, stakeholders, and the regulated community during the development and triennial review of Kentucky's water quality standards. All amendments made to Kentucky's water quality standards regulation must go through the state's administrative regulation promulgation procedures as identified in KRS Chapter 13A. Included in this process is

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May 1, 2020

VIA EMAIL: orsanco@usace.army.mil

United States Army Corps of Engineers

Re: ORBA: <http://www.orsanco.org/ohio-river-basin-alliance-orba/>

ORSANCO,

5735 Kellogg Avenue,

Cincinnati, OH 45230,

Re: Sierra Club Call to Action: Protect the Ohio River and Drinking Water for 5 Million People.

Re: Kentucky Sierra Club comments on the U.S. Army Corps of Engineers/ ORBA Ohio River Plan for 2020 -2025

Dear ORBA:

I am Hank Graddy, Chair of the Sierra Club, Kentucky Chapter Water Committee. I have served on the ORSANCO Watershed Organization Advisory Committee (WOAC) in that capacity since that advisory committee was established.

These comments have been adopted by the Kentucky Chapter of the Sierra Club and are intended to be generally consistent with comments from the other Sierra Club Chapters along the Ohio River.

As per the ORBA web page,

ORBA is a voluntary collaborative that provides a forum for addressing water resource issues in the Ohio River Basin in today's changing environment. ORBA began in 2009 as an outgrowth of the Ohio River Basin Summit co-led by ORSANCO, the US Army Corps of Engineers, and the US Environmental Protection Agency.

As per the ORBA web page,

ORBA is currently executing a US Army Corps of Engineers Planning Assistance to States (PAS) Initiative that will result in the development of an Ohio River Basin Strategic Plan in March of 2020. This document will provide clear strategies and an action plan for ORBA to achieve eight [Ohio River Basin Goals](#).

We have reviewed the draft strategy. We support much of what we find in the strategy. We support this vision for the Ohio River:

***Vision:** Through collaboration of a diverse mix of organizations working in the Ohio River Basin, we envision a watershed that is a healthy, clean, and productive system that sustains ecosystems and provides valuable services for all, now and in the future.*

We support these "Ideals" for the Ohio River:

- *The public and governments have pride of place in the Ohio River watershed that inspires a broad stewardship ethic and support for the natural resources of the Basin that, in turn, helps attract and retain a talented workforce.*
- *The high quality of waters of the Ohio River Basin provide safe drinking water after reasonable treatment, accessible recreational waters, and productive fisheries free of consumption advisories.*
- *The diversity of aquatic and riparian ecosystems are healthy and sustainable.*
- *The establishment and spread of invasive species and recurrent/persistent harmful algal blooms are prevented.*

We support the Goals identified with the qualification that certain goals may invite implementation actions that we will oppose. We support these as stated:

- **Healthy and Productive Ecosystems:** Conserve, enhance, and restore ecosystems within the Ohio River Basin to support natural habitats and the fish and wildlife resources that depend upon them.
- **Abundant Clean Water:** Ensure the quality and quantity of water in the Ohio River Basin is adequate to support the economic, social, and environmental functions that are dependent on it.
- **World-class Nature-based Recreation Opportunities:** Enrich the quality of life for people and recreation-based economies by maintaining and enhancing riverine, lake, and wetland-associated recreation within the Basin.

However, we are very disappointed in the entire discussion of Goal 3, Abundant Clean Water, starting at page 10. Bluntly, this strategic plan discussion understates the problem and proposes such limited steps that we can anticipate little or no progress to improve water quality in the Ohio River during this planning period.

First, the section presents a misleading description of the magnitude of the water quality problems that threaten the Ohio River. See these sentences: *“Harmful Algal Blooms (HABs) are a routine and documented item of concern in USACE reservoirs..... . Of late, two bloom events have occurred in the Ohio River (2015, 2019).”*

The 700 mile 2015 Harmful Algae Bloom was an unprecedented event, as was the 300 mile 2019 event. The Strategic Plan must describe these events more accurately, including the economic injury and the risk of health impacts caused by these events.

Second, this section of the strategic plan is unacceptable weak and vague, and therefore doomed to be ineffective.

Objective 1 and the Strategic Actions thereunder relate to “measurable improvement” toward meeting the Clean Water Act interim goals of “fishable and swimmable” by 2030, make no mention of the Clean Water Act final goal of “zero discharge” of pollutants, and set the date to show such unspecified “measured improvement at 2030 – five years after the planning period. This aspect of the strategic plan is nothing more than repeating for the next five years what has been happening in the past.

Objective 2 and the Strategic Actions thereunder relate to Source Water Protection Plans, calling for developing strategies to support such programs where they exist and seeking to use best management (meaning “voluntary”) practices to protect drinking water sources that do not have Source Water Programs. This objective and the identified actions are vague, unmeasurable and virtually meaningless.

Objective 3 and the Strategic Actions thereunder appear to seek to address the problem of Harmful Algae Blooms. Nowhere does the Strategic Plan even mention reduction of nutrient loading from Point Sources by adopting Numeric Nutrient Water Quality Standards, so states will issue NPDES permits that actually cause a nutrient loading reduction. There is a brief reference to nutrient reduction strategies – renamed, “nutrient reduction best management practices strategies” – apparently to make sure that these strategies are only voluntary.

The Strategic Plan notes the consultations with representatives from other large waterbodies – including the Chesapeake Bay. Perhaps it is time for the Ohio River to follow the initiative of the Chesapeake Bay and adopt a Total Maximum Daily Load (TMDL) for nutrients in the Ohio River.

In 2009, the EPA promulgated a TMDL for nutrients for the Chesapeake Bay:

<https://www.epa.gov/chesapeake-bay-tmdl>

We repeat here below our prior comments to ORSANCO about the urgent need for Numeric Nutrient Standards for the Ohio River, from our correspondence to ORSANCO on April 15, 2019:

*ORSANCO Must Set Numeric Nutrient Standards for the Ohio River:
The river and watershed need nutrient criteria and standards. By revising the PCS to only apply to “entity discharging sewage or industrial waste” ORSANCO may seek to avoid this responsibility. ORSANCO should be working with*

watershed states to create such parameters, similar to efforts on the Great Lakes and Chesapeake Bay.

ORSANCO should take the lead in setting numeric nutrient standards for the Ohio River. This need is longstanding and ORSANCO is in the best position to lead. In fact, this is exactly what ORSANCO reported that it was working on in the most recent 2018 ORSANCO Annual Report, at page15:

Nutrient Criteria Development

Excessive nutrients have long been an issue in our nation's waterways, and the Ohio River is no exception. To resolve this issue, ORSANCO staff have been working towards defensible nutrient criteria for the Ohio River for over a decade using nutrient, planktonic algae, and chlorophyll-a....

In 2014, ORSANCO purchased 60 continuous dissolved oxygen loggers to obtain this information that was previously unavailable. Since then, these loggers have been placed alongside the macroinvertebrate samplers in the Belleville, Markland, McAlpine, Olmstead/Open Water, Montgomery, Racine, JT Myers, Willow island, Greenup, and Cannelton pools in the Ohio River. Additionally, water samples were obtained for nutrient and chlorophyll-a analysis at each of these sites.

ORSANCO staff are currently analyzing the data from this paired study, and early indications are promising that defensible nutrient criteria can be developed from this approach. This study is scheduled to continue during the 2018 field season.

The need is compelling. The 2018 Annual Report discusses current eutrophication problems in the Ohio River at page 15 and 16:

Harmful Algal Blooms

Algae are present in the Ohio River throughout the year.....

Cyanobacteria can produce toxins which can be harmful if ingested. For this reason, an algal bloom which consists primarily of cyanobacteria is considered a Harmful Algal Bloom (HAB)...

On August 19, 2015, ORSANCO received an NRC report of a paint-like green material on the Ohio River at Pike Island Locks and Dam (ORM 84.2), which covered 100 X 200 feet. This was quickly identified as the blue-green algae *Microcystis aeruginosa*. Over the next month, this bloom expanded to cover the Ohio River from Pike Island L&D to Cannelton L&D (ORM 84.2 to 720.7).....

Thank you for this opportunity to comment.

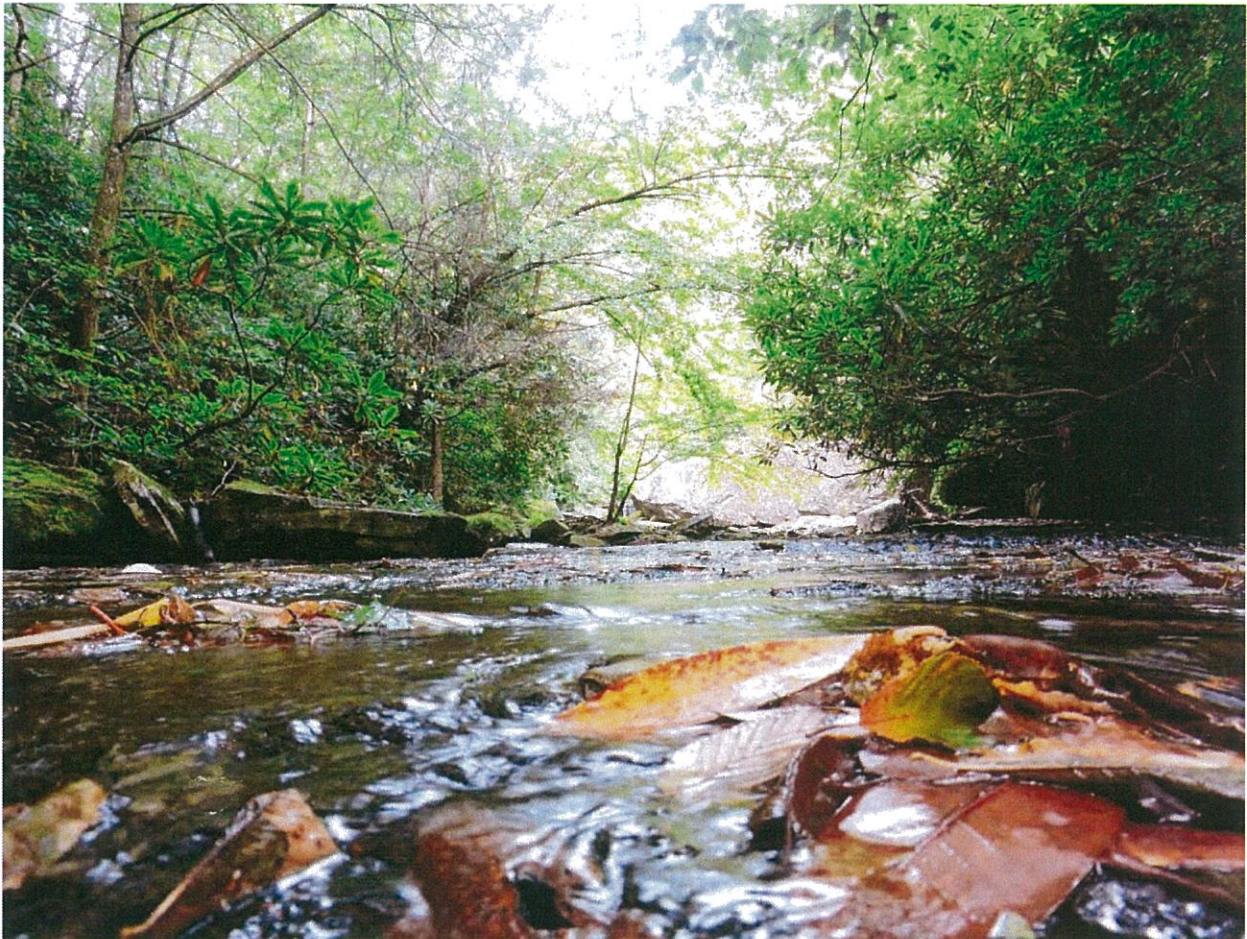
Kentucky Chapter of Sierra Club

Hank Graddy

Cc: Betsy Bennett, Conservation Chair, Kentucky Chapter

Integrated Report to Congress on the Condition of Water Resources in Kentucky, 2016

Assessment Results with Emphasis on the Big Sandy, Little Sandy,
Tygarts River and Kentucky River Basin Management Units and a
Statewide Update



Kentucky Energy and Environment Cabinet
Department for Environmental Protection
Division of Water
Water Quality Branch
February 28th, 2018

For programs that do not follow the BMU rotation, such as the TMDL program and the Nonpoint Source Program (NPS), results from the program's monitoring that contributed assessments to the 2016 305(b) are presented.

For the two designated uses that relate to public health, fish consumption and DWS, all assessment results for any waterbody that has been assessed for those designated uses are presented on a statewide scale.

Assessment Results

This IR utilized data from approximately 530 stations. Assessment results are presented only for waterbodies where data has been collected and an assessment has been completed. For streams, this equates to ~14% of Kentucky's stream miles. Presented below are the most pertinent results from this IR. For all assessment results, refer to the main document.

Statewide Results

The 2016 305(b) has 2,751 assessed waterbodies, totaling 12,753 stream miles, 180,366 lake, reservoir, or pond acres, and 12.2 spring miles (see 305(b) Table). The 2016 303(d), which is a subset of the 305(b) and only includes those waterbodies in category 5, has 2,788 pollutant waterbody combinations (PWC). Kentucky has requested to delist 68 PWCs (see 303(d) Table). PWCs count the number of pollutants affecting a waterbody.

Streams and Rivers – Statewide – Aquatic Life

Of the streams and rivers assessed for the aquatic life designated use, statewide, 42% fully support this designated use, while 31% partially support and 27% do not support the aquatic life designated use, meaning 58% are impaired (Figures 1 and 2). Looking at only the streams and rivers impaired for the aquatic life designated use statewide, 31 causes are associated with the impairments; the 10 most common causes of impairment for the aquatic life designated use for streams and rivers are outlined in Table 2.

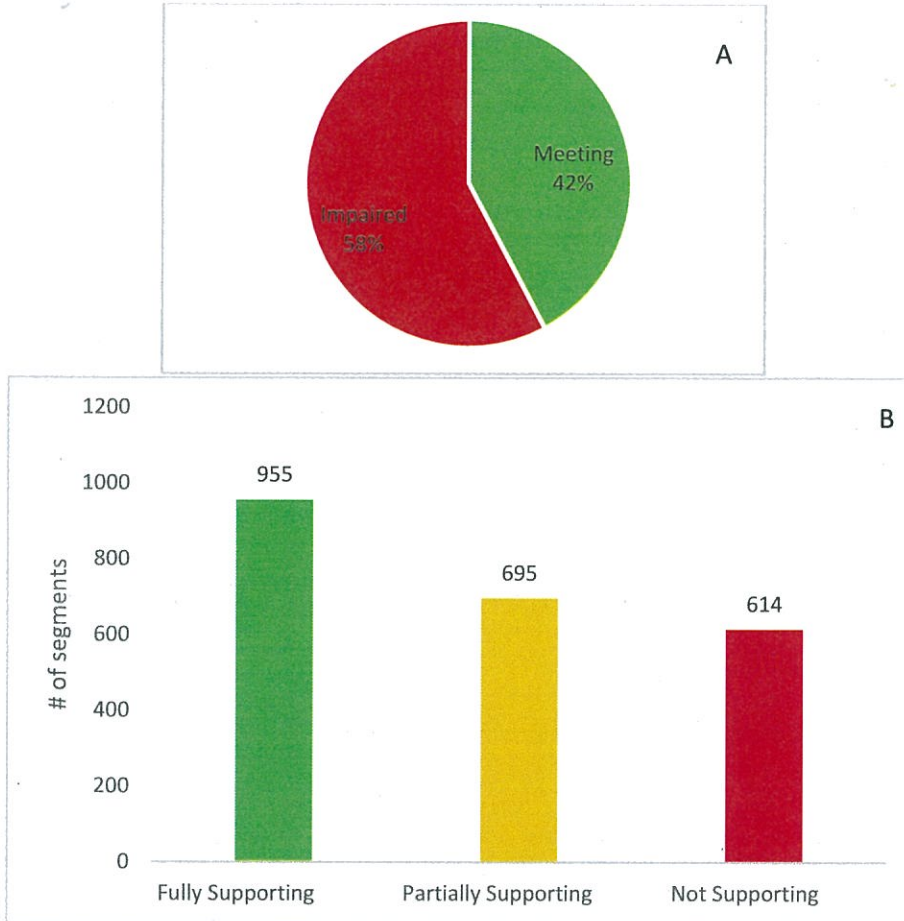


Figure 1. Statewide - A) Percent impaired (partial and nonsupport) and percent meeting and B) attainment of all **streams and rivers** assessed for the **aquatic life** designated use.

Table 2. Top 10 causes impairing **streams and rivers** statewide for the **aquatic life** designated use.

Cause	Total # of Segments	Total Stream or River Miles
Sedimentation/Siltation	722	3419
Nutrient/Eutrophication Biological Indicators	350	1753
Specific Conductance	221	1042
Cause Unknown	208	821
Total Dissolved Solids	153	747
Organic Enrichment (Sewage) Biological Indicators	141	757
Iron	67	475
pH	57	226
Oxygen, Dissolved	51	297
Lead	42	366

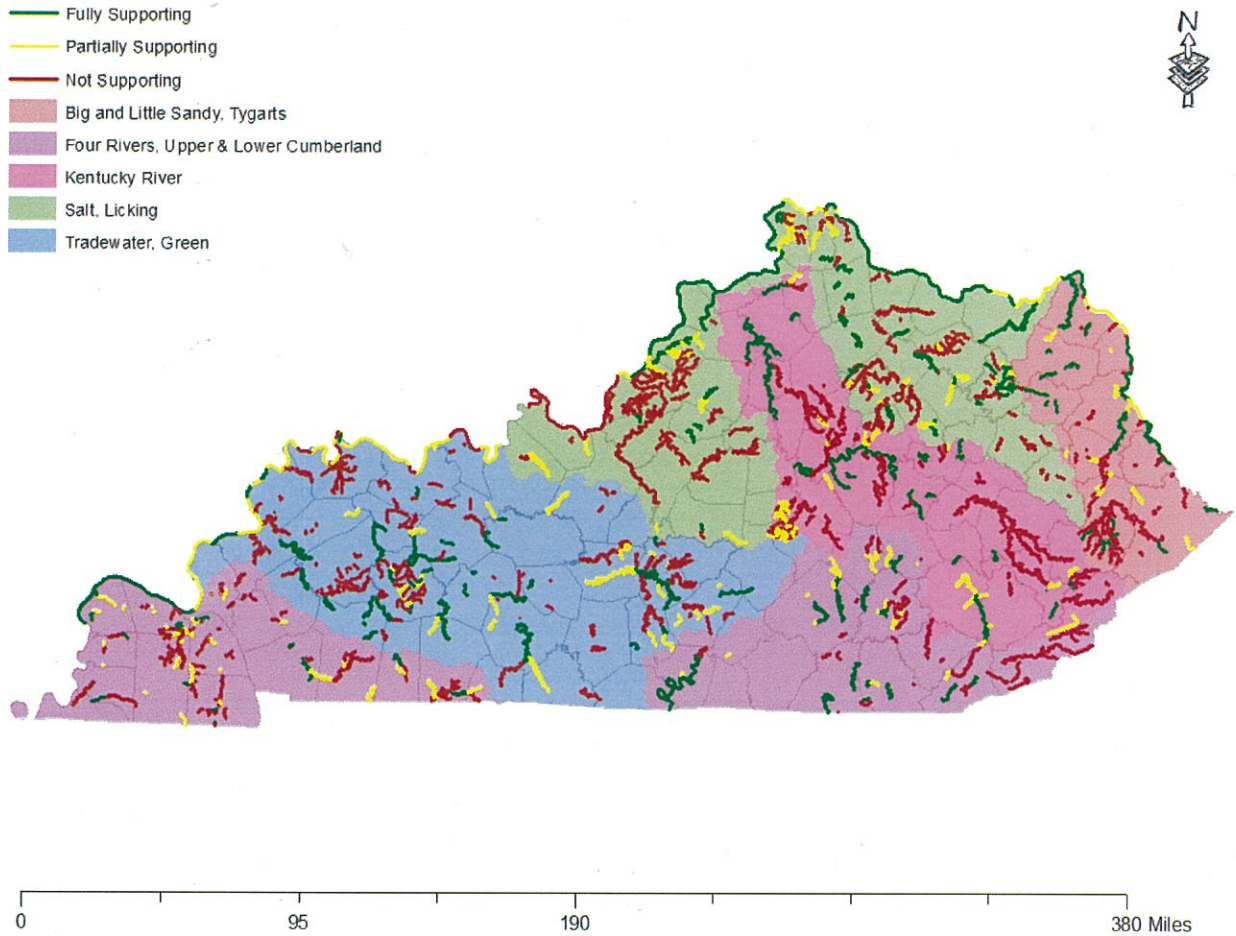


Figure 4. Statewide attainment of the **primary contact recreation** designated use for **streams and rivers**.

Lakes and Reservoirs – Statewide – Aquatic Life

Of the lakes and reservoirs assessed for the aquatic life designated use, statewide, 75% fully support this designated use, while 18% partially support and 7% do not support the aquatic life designated use, meaning 25% are impaired (Figures 5 and 6). Looking at only the lakes and reservoirs impaired for the aquatic life designated use statewide, 4 causes are associated with the impairments (Table 4).

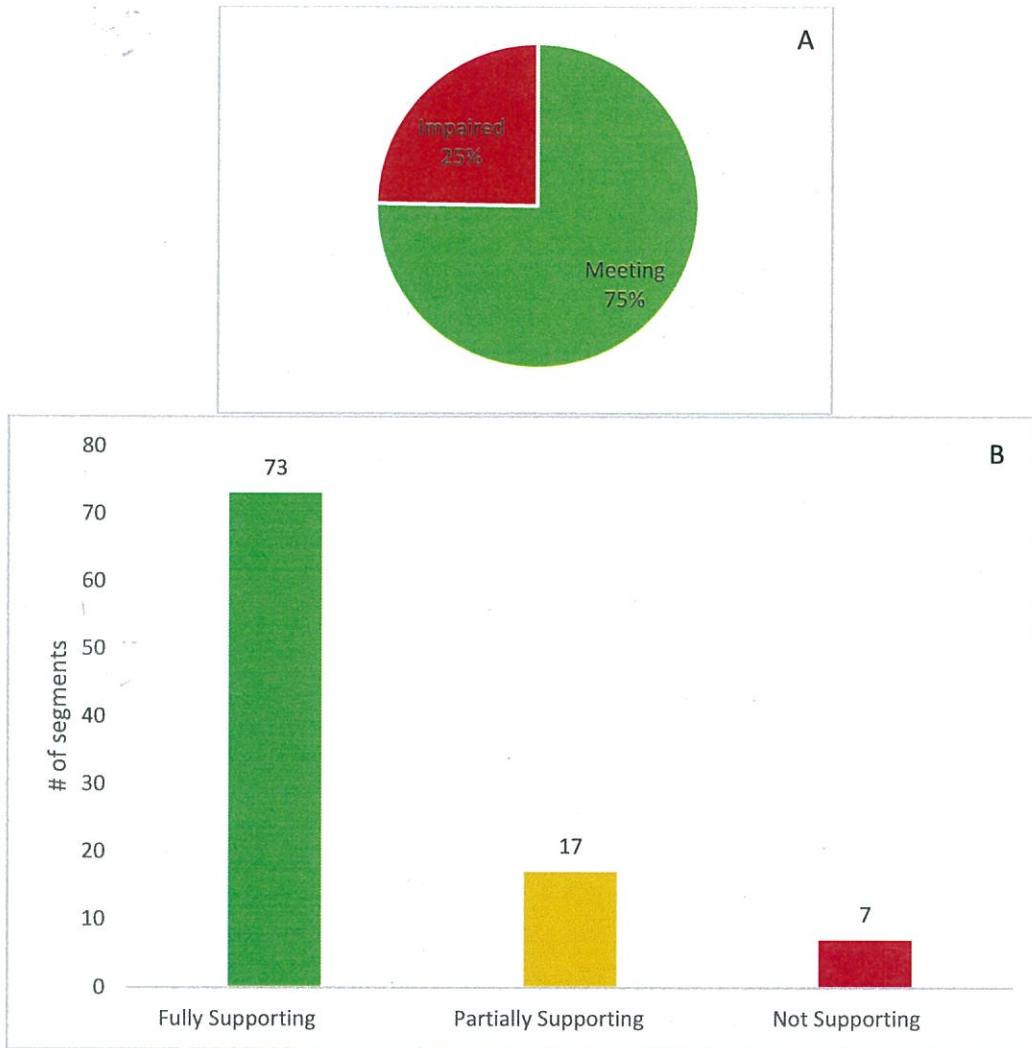
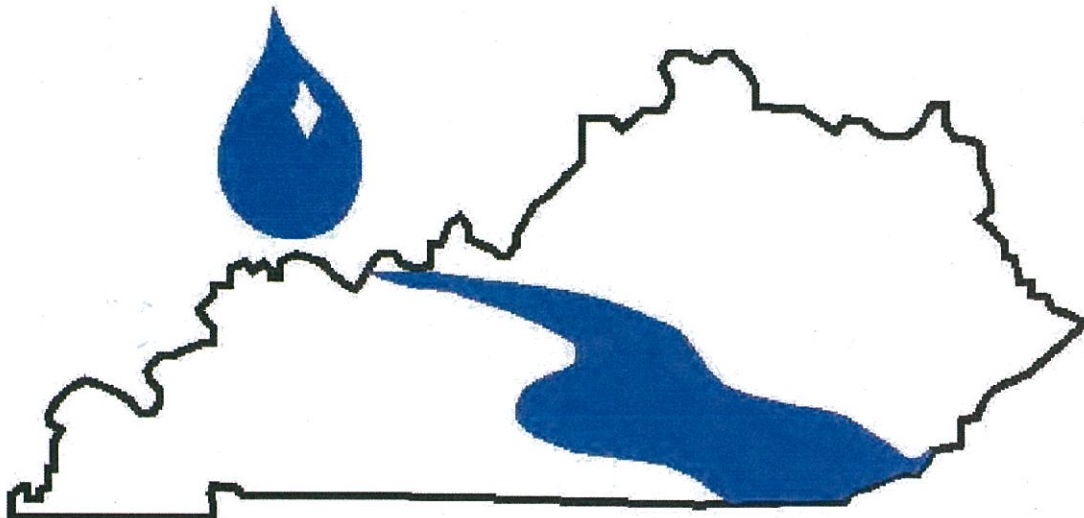


Figure 5. Statewide - A) Percent impaired (partial and nonsupport) and percent meeting and B) attainment of all lakes and reservoirs assessed for the aquatic life designated use.

Table 4. Causes impairing lakes and reservoirs statewide for the aquatic life designated use.

Cause	Total # of Segments	Total Lake or Reservoir Acres
Nutrient/Eutrophication Biological Indicators	21	8217
Oxygen, Dissolved	18	7705
Organic Enrichment (Sewage) Biological Indicators	7	3883
pH	3	123

Kentucky Nutrient Reduction Strategy



Kentucky Division of Water

March 2014

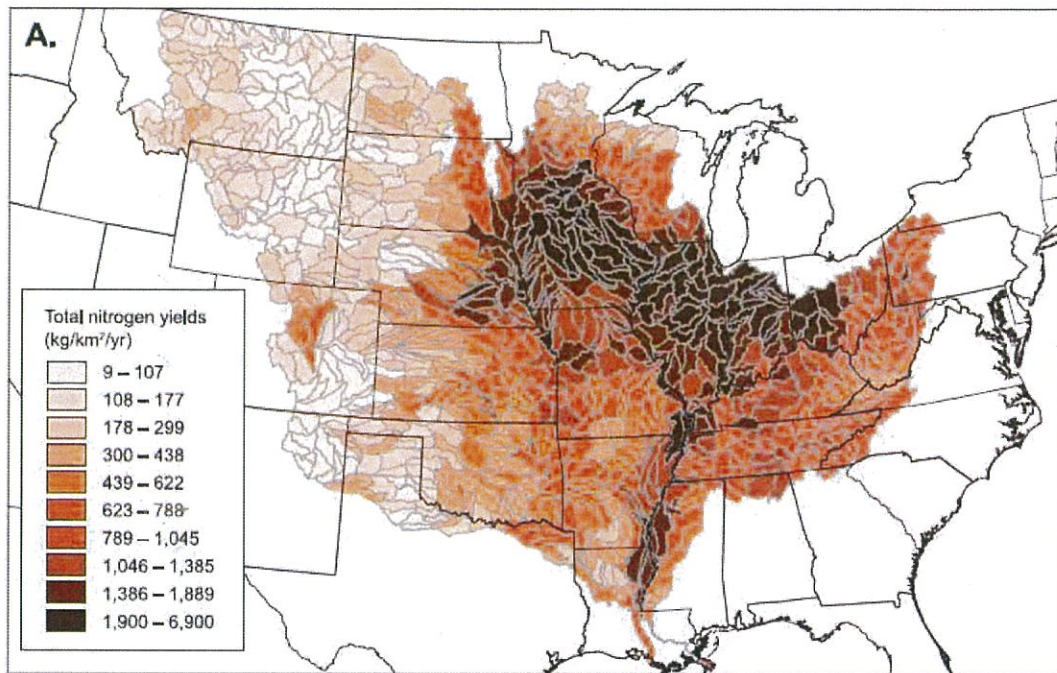


Figure 4.1 Distributions of incremental yields of total nitrogen for HUC8 watersheds in the Mississippi/Atchafalaya River Basin for conditions similar to 2002 (Robertson et al 2009)

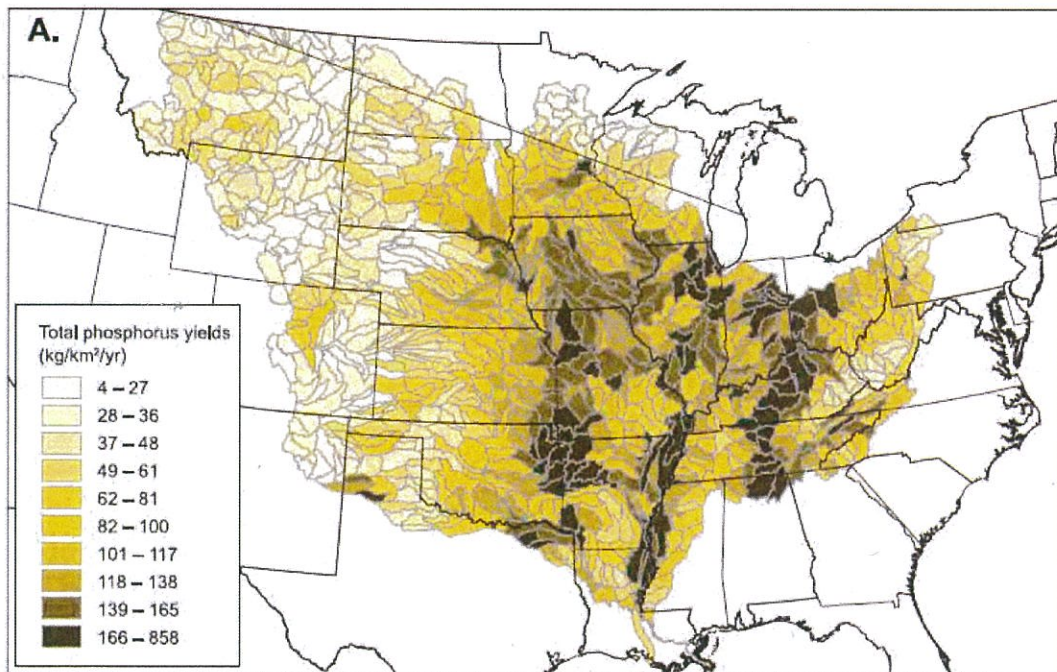


Figure 4.2 Distributions of incremental yields of total phosphorus for HUC8 watersheds in the Mississippi/Atchafalaya River Basin for conditions similar to 2002 (Robertson et al 2009)

Nutrient Loads and Yields in Kentucky 2005-2017



Prepared by Caroline Chan, PhD

KENTUCKY DIVISION OF WATER Watershed Management Branch

Figure 4. Loads and yields by simplified physiographic region.

