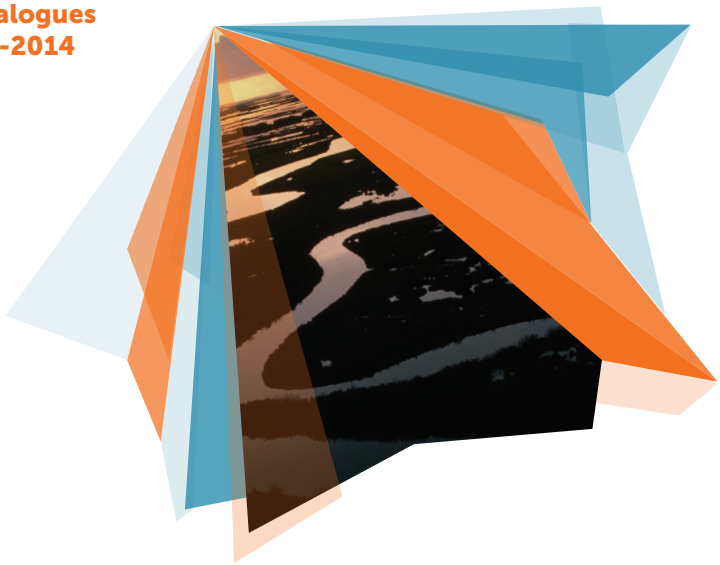
COMING TOGETHER TO PROTECT MISSISSIPPI RIVER WATERSHEDS

AGRICULTURE & WATER SECTOR COLLABORATION FOR NUTRIENT PROGRESS

Report of the Mississippi River Nutrient Dialogues
Convened by the U.S. Water Alliance, 2013-2014



Supported by the McKnight Foundation, The Johnson Foundation at Wingspread, and the Meridian Institute

U.S. Water Alliance

Uniting People & Policy for "One Water" Sustainability

August 2014

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FOREWORD

by Ben Grumbles, Lynn Broaddus, Alex Echols, Pat Sinicropi, & Roger Wolf[1]

Between March 2013 and February 2014, a group of committed leaders in agriculture and drinking water and wastewater utilities gathered four times in cities across the Mississippi River Basin to explore how their sectors might mutually benefit by working together to reduce excess nutrients in waterways within the Basin. Through dialogue, skepticism about the benefits of collaboration between the agriculture and water communities was transformed into optimism and a readiness to work together. The meetings, which comprised the Mississippi River Nutrient Dialogues (MRND), were sponsored by the U.S. Water Alliance with support from the McKnight Foundation, The Johnson Foundation at Wingspread, and Meridian Institute, and also included representatives of conservation and environmental organizations and state and federal government agencies.

The Dialogues were a productive exchange of views among diverse stakeholders and an opportunity to identify various solution strategies. Our intent with this report is to capture the enthusiasm within the two sectors that grew through the Dialogues, share those solution strategies that gained considerable traction among diverse stakeholders within the group, provide a "playbook" of sorts for discussions and collaborations elsewhere, and, more specifically, to highlight positive actions for moving forward in three critical areas in the near term: watershed-based leadership and decision-making; market mechanisms; and data monitoring and modeling. We also introduce the concept of a "Watershed Protection Utility," an ambitious longer-term endeavor that would integrate components from all three of these areas to advance a statewide or regional nutrient strategy. We have sought to provide useful tools and ideas about new approaches that can be helpful to those seeking collaborative approaches to managing excess nutrients on the ground. We also seek to bring the attention of policymakers to opportunities to enable and productively drive improvements in water quality by showcasing existing efforts and potential opportunities for collaboration between agriculture and water.

The Dialogues highlighted both opportunities and challenges to forging collaboration between agriculture and water and wastewater utilities. Drinking water participants, for example, emphasized the immediate health impacts, stringency of legal requirements, and public expectations related to their continual achievement of drinking water standards. Agricultural participants appreciated the need of drinking water utilities to meet stringent numeric standards for nitrate concentration at all times, and they identified the challenges agricultural operations face in keeping nutrient concentrations under a specific threshold given the impact of highly variable weather events on those concentrations. Though these issues have yet to be worked out in many places, the drinking water utilities of New York City and Bloomington, Illinois, provide clear evidence of opportunities for mutually beneficial voluntary collaboration on source water protection between agriculture and drinking water utilities. While most members of the group believe voluntary strategies have the potential to dramatically reduce nutrient pollution from agriculture, some members of the group believe that voluntary efforts, while important, must be complemented with stronger regulation of nonpoint sources to achieve nutrient pollution goals.

Participants in the MRND agree there is considerable opportunity for the agricultural community and water and wastewater utilities to partner and benefit. We hope this summary of the outcomes of the Dialogue series - and the recommendations it includes regarding the next important steps - will contribute both to specific mutually-beneficial actions being undertaken by the agriculture and water sectors to reduce nutrient pollution in the Mississippi River Basin and to continued and expanded dialogue among the sectors to identify and pursue collaborative solutions.

EXECUTIVE SUMMARY

There are unrealized economic gains to be made through collaboration between agriculture and water and wastewater utilities to reduce nutrient pollution in the Mississippi River Basin. Working together has the potential to create significant economic benefits for both partners in addition to promoting healthier landscapes and communities across the Basin and improving conditions in the Gulf of Mexico. Yet focused effort is needed to remove obstacles and leverage opportunities. These are the conclusions of a group of leaders in agriculture, water and wastewater utilities, government, environmental groups, and other organizations and associations who came together four times over the course of 2013-2014 in what was called the MRND. This group, and others who joined them, shared experiences and ideas, challenged one another, and identified areas of common interest and opportunity.

The starting place for the Dialogues was common recognition that current point source regulation and nonpoint source voluntary efforts to manage nutrient loading are not achieving the reductions needed for a healthy, vibrant River and Gulf. Though there were considerable differences of view within the group about the sources of excess nutrients and the extent of the impacts, there was agreement that both the agriculture and water sectors stand to benefit from efforts to reduce the amount of nutrients leaving agricultural lands. Building on previous efforts, participants in the MRND worked together to develop innovative strategies and identify opportunities for a future joint effort to advance solutions to the Mississippi River Basin's nutrient management challenges.

KEY STRATEGIES AND RECOMMENDATIONS

1. Expand Effective Watershed-Based Cooperative Leadership and Decision-Making

Locally led, watershed-scale initiatives should undertake watershed assessment, planning, monitoring, and projects to improve water quality that are supported by both the agriculture and water communities, as well as by other stakeholders. Key recommendations to advance this strategy are testing it through opportunities such as the USDA's new Regional Conservation Partnership Program, the EPA's new integrated planning initiative, and experimentation with watershed-based permitting.

2. Further Develop and Implement Market Mechanisms for Reducing Nutrients

Build on and expand existing efforts to provide cost-effective nutrient reductions to utilities and additional revenue streams to agriculture through market-based payments for ecosystem services. To help establish and expand markets, stakeholders should determine the magnitude and potential margin of water quality markets and identify opportunities to increase agriculture and water leaders' participation in creating such markets.

3. Improve Data, Monitoring, and Modeling to Support Decisions and Markets

Further data is needed both for producers to continually improve nutrient management and to inform potential water sector investments in and partnerships with agriculture aimed at reducing nutrient pollution, including through payments for ecosystem services projects. To strengthen baseline assessments, monitoring, and data aggregation, a wide range of partners should be engaged; monitoring should be linked to watershed-scale efforts; and improved, cheaper nutrient sensors should be developed.

4. Develop "Watershed Protection Utilities" — Institutions Focused on Cost-Effective Results

This new governing and financing organization would raise funds and invest them in the lowest cost opportunities to address nutrient loading and other issues on behalf of the general public. This concept, which integrates components from all three of the areas above to advance a statewide or regional strategy to reduce nutrient loading, deserves further consideration and development.

WATERSHED MOMENTUM

When a group of leading farmers from Minnesota, Iowa, Illinois, and Kentucky and representatives of large and small water and wastewater utilities around the Mississippi River Basin sat down together, they quickly discovered unrealized opportunities for agriculture and water to profit from working together. Over the course of 2013-2014, they forged a common vision of exciting and pragmatic solutions. Such solutions tap economically rewarding opportunities for agriculture and water and wastewater utilities to voluntarily work together to reduce nutrient pollution and increase resource recovery in the local and regional watersheds of the Mississippi River Basin. Through collaboration, both sectors can lower projected costs in comparison to continuing to do business as usual. Indeed, there already are concrete examples of such collaborations that provide tangible benefits to both agriculture and water/wastewater utility participants, as well as those further downstream.

BACKGROUND Nutrient pollution in the Mississippi River Basin endangers not only America's great river and the Gulf of Mexico, but also communities and watersheds throughout the Basin. Human health, animal and plant life, recreation, and livelihoods all are at risk. The Hypoxia Task Force has set a goal to shrink the dead zone in the Gulf of Mexico through significant reductions in nutrient loading across the Mississippi River Basin. To help achieve this goal, twelve states in the Basin have agreed to develop nutrient reduction strategies. One key to success in each state strategy will be greater collaboration and integration of efforts among agriculture, water, and wastewater sectors. Creative and courageous partnerships between agriculture and water at the local level will lead to local benefits, which will become regional and national benefits with state strategies leading the way.

And yet, in spite of these needs and drivers, hoped-for collaboration and environmental progress have been sporadic. More often than not, members of the agriculture and water sectors have been wary about getting together and sharing ideas about mutually-acceptable solutions. The needs for honest and cooperative communication between the water and agriculture sectors have grown clearer and more urgent every day, as lawsuits, labor-intensive total maximum daily loads for impaired waters, and finger-pointing confrontations have risen in number.

There remains a great deal of data collection and science needed in order to fully understand how nutrients flow through the system and to design, implement, and assess comprehensive solution strategies. At the same time, we already know enough to identify agricultural runoff and municipal wastewater and storm water as primary contributors to excess nutrients. Both the agricultural and water sectors have a strong stake in developing a solution to this problem. For both sectors, excess nutrients are a significant cost. To row crop agriculture, nutrients leaving fields represent lost dollars and time spent to build up nutrients in the soil, whether through chemical fertilizers, application of manure, or soil-building practices. To water and wastewater treatment utilities, removing nutrients requires the construction of costly treatment infrastructure.

In response, in 2013 and early 2014 the U.S. Water Alliance, in partnership with The Johnson Foundation at Wingspread and Meridian Institute (with significant support from the McKnight Foundation), brought together a diverse group of farmers and others in the agriculture sector, leaders of wastewater and drinking water utilities, regulatory and non-regulatory organizations, and representatives of environmental groups involved in water quality to explore opportunities for collaboration to reduce excess nutrients in the Mississippi River Basin. We recognized upfront that constructive actions and innovative solutions would spring forth only if we first engaged, understood, and respected differing stakeholders and decision-makers. Although these Mississippi River Nutrient Dialogues are one of many efforts to reduce nutrient pollution, this effort was distinctive in that it brought together players who have both an interest in and a capacity to develop and implement creative solutions that are not dependent on broad changes in federal law or policy but are possible within the current regulatory framework. This effort was distinctive in another sense: We asked Dialogue members to stay engaged throughout the entire series of dialogues as opposed to having new members at each of the locations. This was designed to build trust, continuity, and improved communication among core members while still allowing some new voices and local experts to participate at particular locations.

Through the course of four multiday meetings in locations across the Basin, the agriculture and wastewater participants discovered significant common ground and enthusiasm, laying the groundwork for the generation of actionable ideas to make real and lasting progress. Solving these challenges on the ground requires local leaders focused on bringing about tangible local watershed benefits as well as helping improve outcomes far downstream in the Gulf of Mexico.

A NEW FRAMEWORK A new framework is needed to broadly advance promising solutions – one that (a) promotes collaborative and adaptive management of watersheds by agriculture, water, and other relevant sectors, and (b) leverages market mechanisms to drive large-scale investments into projects that have demonstrated ongoing capacity to reduce nutrient flows. Key elements of this new framework must include:

- A systems-based approach to nutrient management and loss reduction;
- Agronomic practices proven to provide cost-effective reductions in nutrient loading, with an emphasis on edge-of-field practices (e.g., buffer strips and drainage water management practices), in-stream practices (e.g., two-staged ditches and grassed waterways), as well as in-field practices (e.g., cover crops and nutrient management);
- Ongoing monitoring and evaluation of practices, strategies, and programs;
- Localized solutions that have positive local as well as downstream impacts;
- Strategic targeting of available funds and the creation of new funding mechanisms to drive investment and innovation;
- Specific project-based opportunities with clear desired outcomes; and,
- Watershed-based multi-stakeholder decision-making on cooperative actions to improve water quality.[2]

A watershed-based approach is core—broadly collaborative, locally led, framed by the principles of adaptive management, voluntary, and sustained over time—to manage the complex and varied water quality concerns owing primarily to nonpoint source pollution. The biological, geographic, hydrologic, economic, and social factors affecting nonpoint source pollution cannot be managed effectively with the kind of top-down, command-and-control approach used to reduce point-source pollution for the past 40 years.

The regulatory system can, however, serve as a catalyst for additional voluntary action. Because of regulatory pressures and other important drivers, such as the 2008 Gulf Hypoxia Task Force National Strategy, states in the Mississippi River are developing state nutrient reduction strategies. The development of these strategies is energizing the point source and nonpoint source communities to work collaboratively and providing opportunities for the adoption of watershed-based approaches. The state nutrient reduction strategies developed by Iowa, Minnesota, and Ohio all include significant watershed-based approaches.[3]

Utilizing the framework identified above, participants in the MRND focused on developing specific solution strategies for bringing wastewater utility point sources and agricultural nonpoint sources into collaborative efforts to reduce nutrient loading in three critical areas:

1. Effective Watershed-Based Cooperative Leadership and Decision-Making

This includes approaches to decision-making and action through structured, organized bodies at the local level, informed by science and supported by the community at-large.

2. Market Mechanisms

Those taking part in the Dialogues pushed for opportunities to create market-based mechanisms for water/wastewater utilities to reduce costs by paying for ecosystem services provided by agriculture, which benefits from an additional revenue stream, and to foster innovation through entrepreneurial efforts to reduce nutrient losses.

3. Data, Monitoring, and Modeling

Dialogue participants stressed the need for data to guide the investment of the water sector in effective actions to reduce nutrients (such as payment for ecosystem services provided by agriculture) by harnessing the increasing capacity of monitoring and information technologies.

The concept of a **"Watershed Protection Utility"** also emerged through and gained considerable traction within the Dialogue. This new governing and funding organization would raise funds and invest them in the lowest-cost opportunities to address nutrient loading and other issues on behalf of the general public. This concept integrates components from all three of the areas above to advance a statewide or regional strategy to reduce nutrient loading.

A fundamental recognition that we are all in this together is the foundation of the ideas put forward by the Dialogue. It is in the interest of us all to be proactive in solving excess nutrients in a manner that promotes the success of agriculture in its critical mission to produce food and other agricultural products for consumers in the United States and around the world. Safe drinking water, clean water for recreation and aquatic life, and production of food all are core values and interests of everyone. A focus on collaborative efforts provides a better opportunity for more cost-effective and innovative solutions.

THE CHALLENGE OF NUTRIENT LOADING IN THE MISSISSIPPI RIVER BASIN

Effects on plants and animals in the Mississippi River Basin can also be severe: When algal blooms decompose, the process consumes large amounts of oxygen, creating hypoxic "dead zones" in which aquatic organisms cannot survive.

High levels of nitrogen and phosphorous threaten human health, wildlife and plant populations, recreation opportunities, and livelihoods in communities and watersheds throughout the Mississippi River Basin.

In the most severe cases, excess nutrients can create algal blooms that produce toxins and elevated bacteria levels, sickening people and animals exposed to the water.[4] Nitrogen levels in drinking water as well as in contaminated fish and shellfish can rise above safety standards, putting human health at risk.[5] Effects on plants and animals in the Mississippi River Basin can also be severe: When algal blooms decompose, the process consumes large amounts of oxygen, creating hypoxic "dead zones" in which aquatic organisms cannot survive.[6] In 2013, the dead zone in the Gulf of Mexico caused by excess nutrients in the Mississippi River Basin covered 5,840 square miles, an area the size of Connecticut.[7] These diminished recreational opportunities and animal and plant life negatively impact livelihoods. The U.S. tourism industry loses nearly $1 billion and commercial fishing loses tens of millions of dollars each year due to excess nutrients.[8] Though much more study of nutrient flows through the system will be needed to fully understand causes and effects of nutrient pollution, agricultural runoff and municipal wastewater and storm water have been definitively identified as primary contributors.[9]

The current approach to reducing nutrient pollution involves regulation of point sources (such as wastewater treatment plants and concentrated animal feeding operations) and voluntary action by nonpoint sources (such as agriculture and unregulated storm water outflow).

Though it is difficult to estimate the total amount of money that is spent to reduce nutrient loss, we know that, cumulatively, the United States has spent $1.4 trillion on municipal wastewater treatment facilities (to treat all contaminants, including nutrients) since the implementation of the Clean Water Act in 1972, 90% of which came directly from ratepayers.[10] Agricultural water quality conservation has been funded through $2 billion to $3 billion annually in Farm Bill conservation programs since 1985, about 10-15% of which is used to directly manage nutrients.[11] Despite these considerable investments, evidence regarding the number of rivers (44% of miles assessed), lakes (64% of acres assessed), and estuaries (30% of square miles assessed) that are listed as impaired[12] clearly indicates that the current approach is not meeting the goals of the Clean Water Act for many pollutants in many places, with particularly obvious failures to reduce excess nutrients across the Mississippi River Basin.

There are challenges specific to both point and nonpoint sources of nutrient discharge.

Point sources currently are required to meet stringent permit limits to help achieve water quality outcomes. The expense of relying on end-of-pipe technology to achieve permit limits will be very high for many water treatment plants, and the investment in many cases will not result in a meaningful reduction in overall nutrient loadings – thus producing few benefits locally or downstream. In addition, discharge permits are generally facility specific rather than watershed specific and therefore are not directly tied to outcomes at the scale that matters. Nor does a focus on individual point sources distribute benefits throughout a watershed, as all benefits from such investments accrue downstream.

Nonpoint sources, including agriculture other than concentrated animal feeding operations, operate under a voluntary approach under the federal Clean Water Act.

Though some states do require specific best management practices related to water quality, there is no simple mechanism in place to ensure that best practices and technology to reduce nutrient loss are being widely used by nonpoint sources. Even with such a mechanism in place, the impact of agronomic practices on nutrient flows are variable and difficult to predict, as landscapes are highly diverse in terms of soil properties, hydrology, and cropping pattern. Practice effectiveness is weather-dependent, and the episodic nature of rainfall events can lead to episodic excess nutrient loading even with the very best of practices in place. Natural mineralization of nitrogen in the soil profile also adds to variability in the performance of agricultural practices. In addition, the effects of changes in agronomic practices on water quality any significant distance downstream may not be discernible for long periods of time (decades, in some cases). For these and other reasons, farmers may lack confidence in the agronomic, economic, and/or environmental performance of practices recommended to reduce nutrient loading and may lack appreciation of the impact of upstream practices on downstream conditions. It is important to note that some agricultural practices, including the more precise application of nitrogen (e.g., right source, rate, time, and place) as well as management of water that drains from agricultural production (e.g., retention, natural filtration), can have highly reliable and easily quantifiable nutrient reduction potential.[13] These practices are particularly effective in fields with pattern tile drainage – an area of over 100 million acres in the United States concentrated in the Upper Mississippi Basin.[14]

“The expense of relying on end-of-pipe technology to achieve permit limits will be very high for many water treatment plants, and the investment in many cases will not result in a meaningful reduction in overall nutrient loadings – thus producing few benefits locally or downstream.”

Though there is widespread recognition that the voluntary approach has not to date worked adequately to reduce nutrient discharge from agricultural lands, there are considerable differences in view about why this is the case.

Some believe investments in the voluntary approach have not been sufficiently targeted and/or the overall level of investment has not been sufficient, and that outcome-focused efforts that leverage resources to address priority issues hold significant promise but are really just beginning. Others believe that given continuing nutrient loading after many years of a voluntary approach, regulation of nonpoint sources is needed to compel necessary action. There also are differences of view regarding the alignment between reducing nutrient loading from agriculture and producers' bottom line. Some believe that there is sufficient alignment between good land stewardship practices, long-term profitability of farm operations, and reducing nutrient loading that the challenge is primarily one of demonstrating this alignment to producers and landowners. Others believe that in order to adequately reduce nutrient loading, significant investment will need to be made in in-stream structural practices to capture nutrients from an inherently "leaky" system (i.e., no matter how well fields are managed, nutrients will still leach into water) and that landowners cannot be expected to pay the full cost of these structures. Finally, there are diverse points of view regarding the extent to which available data regarding the impact of agronomic practices on nutrient loading in the complex hydrology of the Mississippi River Basin is sufficiently robust to serve as a foundation for prescribing reductions in nutrient loading from agricultural sources.

Despite these significant differences in viewpoint, there was general agreement among MRND participants that current incentives are not properly aligned to mobilize investments of the scope and at the scale necessary to meet the kind of nutrient reduction targets that are driving the development of state nutrient reduction strategies. Regardless of viewpoint about the success of the voluntary approach to date, or the need to add a regulatory backstop, it seems increasingly clear that continued support for voluntary approaches likely will require a robust demonstration of their ability to achieve significant nutrient reductions from agriculture.

WATERSHED-BASED COOPERATIVE LEADERSHIP AND DECISION-MAKING[15]

THE CONCEPT Watershed leadership and decision-making (at multiple watershed scales) that brings together diverse stakeholders, including agriculture and water/wastewater utilities, is vital to reducing nutrient loading in an effective manner. Watershed cooperatives or collaboratives can create linkages between locally-led watershed-based decision-making and state and federal water quality standards as they seek cost-effective, efficient, and equitable reductions in nutrient loading. New structures for cooperative decision-making as well as "buffers from regulation" are needed to enable innovation to achieve results over time through an adaptive approach to management that allows for adjustments along the way based on engagement and trust. Such an approach is likely much more effective at reducing nutrient loading than enforcement through regulation, especially when regulations are only directed at a portion of nutrient sources.

The MRND group identified key characteristics of successful watershed-based efforts to improve water quality, including: broad engagement among key stakeholders; accountability for setting and achieving specific performance goals (e.g., water quality) that align with state and federal water quality standards; financial capability to generate funds and distribute them to support a systems approach for practices and projects that have the greatest benefit-cost ratio for achieving water quality goals; and, appropriate scale of implementation, at which individuals feel a part of a community and aligned with planning that takes place at a larger scale. (See Endnotes for greater detail on design criteria.[16])

Ideally, effective watershed governance (leadership + decision-making) fully integrates the entire water system – drainage systems and districts, drinking water systems, wastewater systems, storm water systems, and floodwater control – in what is described as the **"one water"** approach. A long-term and enduring project, the "one water" approach advances integrated watershed management and a more holistic approach to all stages of the hydrologic cycle.

The promise of watershed-based approaches is bringing together stakeholders who often have been at odds - farm groups and agribusinesses, drinking water and wastewater utilities, environmental non-profits, industrial point source dischargers, the EPA and its partner state agencies, and state and federal agriculture agencies . These stakeholders must undertake a process of aligning on principles of a watershed approach to water quality and collaborating to sort out the challenges of implementation (see below for examples).

SCALING WATERSHED LEADERSHIP AND DECISION-MAKING The concept of collaborative watershed-based approaches to improving water quality is not new; indeed, there have been a wide range of such efforts over the past couple of decades, few of which have persisted and led to measurable improvements in water quality. There are a number of critical challenges that must be addressed before this approach can be expanded on a broader scale and become more lasting and effective. First, communities and states must determine how water quality targets will be set and who will be responsible for setting them. There are a wide range of models showing desirable approaches, and there is a diversity of opinions among Dialogue participants about those approaches. These models have different relationships to federal and state water quality standards and governance regimes. States in most cases hold federally-delegated responsibility for implementation of the Clean Water Act, and they have somewhat different approaches to implementing the Act. States are also taking a rather wide range of approaches in their state nutrient reduction strategies. Moving forward, efforts to create new and scale-up existing watershed-based leadership and decision-making efforts should be organized in a manner that aligns with state nutrient reduction strategies and leverages resources appropriated to implement those strategies. A nested set of watershed governance mechanisms at various scales will be needed to effectively and efficiently achieve water quality improvements across the Mississippi River watershed.

Providing greater space for innovation within the current regulatory framework is needed in order to scale a collaborative watershed-based approach. Widespread investment of time and money by utilities, farmers, and landowners in watershed-based collaboration likely will require provision of regulatory certainty that they will not be penalized for experimenting with new approaches if they do so in coordination with regulatory agencies.[17] The USDA and the EPA have begun to collaborate on regulatory certainty programs, such as the initiative being piloted in Minnesota.[18] The EPA has also recognized that there are restoration approaches that may be more immediately beneficial than TMDLs in achieving water quality standards. An alternative restoration approach is a plan and/or a set of actions pursued in the near-term (other than a TMDL) that in their totality are designed to attain water quality standards.[19] In addition, the new U.S. EPA-integrated planning initiative[20] indicates that the agency is open to allowing utilities to develop long-term plans that incorporate new approaches to implementing the CWA.

A number of existing agricultural conservation and extension systems and programs provide resources and opportunities to support collaborative watershed management. These include the Regional Conservation Partnership Program (RCPP) established by the 2014 Farm Bill.[21] These kinds of programs target durable environmental improvements at a landscape scale and provide much needed resources to develop local institutional and technical capacity. They support collaboration with skilled partners who can engage landowners and producers at a grassroots level and have strong potential to support collaborative watershed-scale approaches to nutrient management. Other strategies to scale a watershed approach may include, depending on location, increasing capacity of the conservation and extension system to support watershed projects; aligning conservation authorities and governance with watersheds or other ecologically relevant landscapes; investing in further training, leadership skills, and professional development capacity; and developing measurement, monitoring, and data infrastructure to establish quantitative baselines, assess progress over time, and support adaptive management.

RECOMMENDATIONS FOR THE AGRICULTURE AND WATER COMMUNITIES

- Replicate and expand successful "integrated watershed management" projects that incorporate watershed-based assessment, planning, monitoring, decision-making, implementation, adaptive management, shared governance, and mutual accountability.

- Experiment and test models by utilizing new programs, such as the USDA's new Regional Conservation Partnership Program and the EPA's alternative restoration approaches and its new integrated planning initiative that allows utilities to provide long term plans.

IMPLICATIONS FOR POLICYMAKERS

- Enable collective watershed-based permitting through which all regulated point sources (including wastewater, storm water, and industry) would function under a single permit and collaborate among themselves as well as engage nonpoint source participation in implementation strategies (e.g., water quality credit trading, payment of landowners for ecosystem services, joint funding of in-stream structures, etc.). Such mechanisms should be open and competitive to spur innovation and least-cost nutrient reductions.

FARMERS AND THE CITY OF BLOOMINGTON, ILLINOIS, PARTNER TO PROTECT DRINKING WATER

Drinking water for Bloomington, Illinois, is drawn from Lakes Bloomington and Evergreen. Both are nutrient impaired. In 2005, Sand County Foundation established a pilot program in the Lake Bloomington watershed with the City, Council on Best Management Practices, University of Illinois, Illinois Department of Agriculture, NRCS and others to implement conservation practices to see if (1) water quality could be significantly affected, (2) farmers would participate on a broad basis, and (3) lessons could be learned from this site that could be utilized elsewhere. Key to the strategy was to give farmers a variety of choices on conservation practices to implement, including enhanced conservation planning, cover crops, bioreactors, drainage management, nutrient inhibitors, split and spring application, etc. The incentives were carefully structured to encourage producer implementation and assessment of economic viability on their operation to foster long-term adoption. Over time, approximately 15,500 acres, or approximately 50% of the eligible land, were enrolled in one or more conservation practices. Significant reductions in nitrogen and phosphorus discharge were achieved, and farmers adopted systems that strengthened the economic viability of their operations. The demonstration was so successful that the City of Bloomington expanded this program to Lake Evergreen and granted it its own funding mechanism.

FARMERS AND THE SEWERAGE DISTRICT IN WISCONSIN'S YEHARA WATERSHED COLLABORATE TO REDUCE PHOSPHORUS LOADING

In 2010, Wisconsin codified an innovative regulatory compliance strategy for phosphorus called "watershed adaptive management." In adaptive management, a wastewater treatment plant can meet its permit requirement for phosphorus and achieve water quality goals within a watershed by working in collaboration with other sources of phosphorus to reduce phosphorus loads.

The Madison Metropolitan Sewerage District (MMSD) in Wisconsin is pioneering this new strategy by implementing an adaptive management pilot project in the Yahara watershed called Yahara WINs (Watershed Improvement Network).[22] The MMSD is working with multiple partners including cities, villages, towns, agricultural producers, county government, environmental/conservation groups and others in this effort. The pilot project began in 2012 and ends in 2015, and is located in an approximately 19-square-mile subwatershed.

A key partner is the Yahara Pride Farms Conservation Board, founded in early 2011 by "area producers, agronomists, and businessmen to develop a self-regulated, self-recognized, and self-incentivized organization to improve and protect our land and waterways in Dane County." [23] This group, which supports its members in identifying and adopting conservation practices that help reduce phosphorus loading, focused its initial membership efforts in the Yahara WINs pilot project area, as they will play a significant role in the MMSD adaptive management project.

All partners are making financial contributions to support the pilot project. Funds are used to support research, water quality monitoring, baseline inventories of agricultural land, and implementation of phosphorus-reducing practices (both urban and rural) within the watershed.

The pilot project has succeeded in overcoming several challenges that are likely to face any such collaborative effort across diverse stakeholders:

- Working across multiple regulatory programs;
- Moving from "them" to "us;"
- Working together — building trust; and,
- Learning new "languages" to improve communication among partners.

If Yahara WINs is successful in demonstrating cost-effective reductions in phosphorus loading in the watershed, the project will expand to the entire 315-square-mile Yahara watershed as early as 2016.

MARKET MECHANISMS

THE CONCEPT A key to improving performance of conservation strategies is to get the incentives right. Today there are inadequate incentives for agricultural producers to invest time, money, and land resources to deliver conservation benefits that only accrue off farm. Incentives for wastewater utilities to look outside their operations for water quality improvement solutions are also limited in many cases because of regulatory uncertainty, lack of practicability, or consistency among nontraditional alternatives. Markets[24] offer an opportunity to align the incentives with desired outcomes and can include a wide variety of mechanisms, such as water quality trading, social investment strategies, community engagement, ecosystem service markets, and other market-based approaches.

Ecosystem service markets, if structured correctly, have significant potential to reduce nutrients in the Mississippi River and deliver a variety of valuable environmental goods and services. Creating functioning private (or public-private) markets to advance public goods requires aligning the incentives for sellers and buyers with the public interest (e.g., as expressed in policy objectives), and by so doing, advancing the delivery of value to entities or individuals willing to pay for it. Such value, and the capital for investment in markets, could be in a variety of forms, such as:

- **Cost avoidance** (e.g., lowering costs for wastewater utilities, drinking water utilities, sewerage treatment, and commercial point sources by making payments for lower-cost water quality credits rather than building or upgrading treatment plants);
- **Company/brand reputation enhancement** (e.g., a company that wants to associate its reputation with water quality or habitat voluntarily contributing to actions that remove nutrients from the waterways)[25];
- **Risk reduction or liability management** (e.g., storing water from storm peaks on agricultural lands to reduce flooding in more intensively used urban land);
- **Watershed or ecosystem restoration/enhancement for recreation** (e.g., voluntary contributions from NGOs or citizen groups to promote healthy ecosystems that support recreation);
- **Advancing property values of landowners** (e.g., downstream landowners who want to preserve or increase property values by improving quality of water entering, adjacent to, or nearby their land, such as lakefront owners who want cleaner water); and,
- **Meeting community needs** (e.g., finding lower-cost or less disruptive strategies to improve water quality or provide other ecosystem services like habitat improvement or flooding reduction).

Some water utilities are already paying for ecosystem services by investing in conservation upstream rather than building additional filtration facilities, but are not doing so in a trading framework of buying and selling credits. Examples include New York City's Watershed Protection Program[26] and the Source Water Protection, Lake and Watershed Management Program for the City of Bloomington, Illinois, Water Supply Reservoirs[27] (see page 13). While some participants in the MRND believe market mechanisms are a significant, desirable, effective, and efficient mechanism for directing investments to improve water quality (including some who have personal business interests in such markets), others remain skeptical.

Water quality trading refers to actions within a regulated environment sufficient to meet those regulatory requirements, but using exchanges among multiple sources or entities to achieve more cost-effective results.

Water quality trading programs and collaborations are gaining momentum around the United States, often in response to nutrient and sediment pollution in large river basins and estuaries (but also in temperature-impaired watersheds).[28]

Developing functioning trading markets usually requires establishing a clear standard that entities are seeking to meet, such as a definition of the "commodity" to be traded and the standards that are expected. Currently, the Clean Water Act NPDES[29] permitting water quality standards regulations require permit holders to meet regulatory requirements for publically owned treatment works (POTWs) and other municipal, industrial, and commercial dischargers. If a permit holder can meet regulatory requirements – deliver the water quality requirements at the standard specified – by investing in alternative compliance strategies such as green infrastructure, a mechanism is created that drives interest in payment for the ecosystem services that support water quality.

In a large portion of the Mississippi River Basin, it may be more cost effective to reduce nutrient loading to a waterway by investing in nutrient retention practices in the agricultural sector than by expanding investment in wastewater treatment plants. However, the party responsible for the wastewater (or other) operation needs to have confidence that this compliance strategy is acceptable to regulators and that investments they make in reducing nonpoint sources of nutrient discharge will reliably deliver the needed environmental outcomes.

Water quality credit trading has been discussed for at least 20 years, including recognition of its potential benefits by the U.S. EPA, and there have been a variety of pilot programs in operation. Yet potential "buyers" of nutrient credits are still reluctant to act because of uncertainties and risk, and potential credit generators are unsure of the cost, commitment, and liability involved in generating credits.[30] For trading to meet regulatory requirements (such as water quality trading), the structure needs to be in place to approve these actions as fulfilling regulatory requirements. Challenges around baselines, variability, accountability and transparency must be met.[31]

There are some agricultural practices – such as the management of agricultural discharge waters from drainage or confinement facilities – that do not face these challenges. The Natural Resources Conservation Services has sanctioned a variety of Drainage Water Management Practices[32] that can capture, hold, or treat nutrients from agricultural production. These practices overcome many of the most important of the structural challenges facing certification of credits generated from agriculture - including quantification, replicability, and verifiability - and make the full suite of drainage management practices a particularly promising candidate for commerce with the regulated community.[33]

Additional challenges facing investment in this sector include:

- Lack of capital (e.g., trading in the Chesapeake Bay region suffers from insufficient capital being mobilized by compliance with the Clean Water Act [CWA]);
- Lack of clarity about the size of the market (it is necessary to quantify and document the economic size of a market to allow potential players to evaluate their level of interest and ability to enter it); and,
- Lack of clear, consistent, and stakeholder-supported action by regulators that advance markets.

To address these challenges in the context of water quality market mechanisms involving agriculture and water and wastewater utilities, MRND participants identified four overarching design principles:

- Data must be secure, verifiable, and inexpensive;
- Buyers, sellers, and regulators must be accountable;
- Markets must be properly structured to meet the needs of anticipated participants; and,
- Regulatory drivers, while often necessary to create water quality and broader ecosystem service markets, should stimulate efficiency and innovation rather than only compliance.[34]

Despite the challenges, many states have policies supporting water quality trading and 14 have operating trading programs.[35]

RECOMMENDATIONS FOR THE AGRICULTURE AND WATER COMMUNITIES

- Engage together in existing and emerging pilot projects that are consistent with the above design principles.
- Learn about the needs of agricultural or water and wastewater utility partners, draw lessons from what has been done or discussed before, clearly identify impediments that need to be overcome, and take action to address the impediments.
- Facilitate adaptation of successful efforts across multiple geographic scales to achieve greater results.

RECOMMENDATIONS FOR POLICYMAKERS AND MARKET DEVELOPERS[36]

- Establish the magnitude and potential margin of markets.
- Identify and pursue additional opportunities to gain experience.
- Explicitly sanction trading as a compliance option for NPDES permit holders.
- Establish provisions for allowing multiple forms of credit generation within single projects.
- Explore specific opportunities such as:
  - Trading across state lines in the Mississippi River Basin.
  - Harnessing growing interest among potential buyers and sellers for trading and adaptive management in the Upper and Middle Mississippi River watersheds.
  - Voluntary market mechanisms.

DATA, MONITORING, & MODELING

THE CONCEPT The technical assets of water and wastewater utilities can be leveraged to provide an essential and often missing ingredient for the creation and implementation of any solution strategy or initiative to reduce excess nutrients in the Mississippi River Basin (or elsewhere): data that farmers and water quality experts and officials all can trust and use to establish baselines, measure and monitor change over time, and link changes in land management to changes in water quality outcomes. There is also a need for increasing available data to improve the accuracy and geographic specificity of water quality models and thereby increase their usefulness by diverse stakeholders at multiple scales. For farmers, creation of trusted, useful water quality information can be best achieved by their participation in the design and execution of data collection systems, and undertaking or overseeing samples that are taken on their land or in nearby water bodies.

Municipal water and wastewater facilities can do more to help farmers collect data and understand impacts of agricultural operations, and can help facilitate trusted relationships between the water and agricultural sectors through joint efforts to collect data about water quality. There are opportunities to establish new relationships and programs, as well as leverage existing initiatives and programs of groups in the agricultural sector, such as those of Agriculture's Clean Water Alliance[37], the Iowa Soybean Association[38], the Sand County Foundation[39], and others.

The range of possible water quality monitoring services that could be provided to farmers by water and wastewater utilities at relatively low cost include:

- Supplying monitoring equipment;
- Providing training and technical assistance in data collection;
- Establishing and/or maintaining sampling stations;
- Collecting and analyzing samples and reporting outcomes;
- Designing new water quality monitoring systems; and,
- Developing nutrient management plans.

CONSIDERATIONS IN EFFECTIVE COLLABORATION

Dialogue participants identified the following as important considerations in designing and implementing a collaborative data collection effort.[40]

- Involve a local partnering organization that producers trust.
- Establish a clear purpose for collection and use of the data that all participants support and benefit from.
- Identify clear responsibilities of each participating entity.
- Consider carefully the potential risks to entities and individuals in each sector.
- Secure at the outset adequate funding to implement a data collection initiative over sufficient time to ensure that producers and others derive value from the effort by being able to establish relationships between land management practices and changes in outcomes.[41]

Recommendations for the Water Community

- Leverage the water quality data collection and monitoring capabilities of municipal water and wastewater facilities to build trusted relationships between the water and agricultural sectors based on the above considerations.
- Engage a wide range of partners, including a variety of agricultural partners as well as agriculture retailers, fertilizer companies, and information and communication technology firms.[42]
- Link monitoring activities to watershed-scale initiatives to mobilize participation and investments to improve water quality outcomes.
- Engage community colleges, land grant universities, and other academic and research institutions to boost the science of nutrients and watershed health, including by integrating students and other volunteers in data collection and monitoring efforts and advancement of modeling.
- Leverage the capabilities of the Great Rivers Ecological Observation Network (GREON)[43], which seeks to establish a network of real-time water quality monitoring platforms on great rivers around the world and has launched a pontoon for real-time, continuous water quality monitoring of the Upper Mississippi River System.
- Promote investment in the development of affordable nutrient sensors.

WATERSHED PROTECTION UTILITY (WPU)

THE CONCEPT One of the critical overarching challenges in reducing excess nutrients in the Mississippi River Basin is that, despite the fact that a healthy environment is a widely shared value, no entity currently fully owns the challenge of excess nutrients specifically or watershed protection more broadly and has mission, authority, and resources to design and/or implement a comprehensive solution strategy (such as a state nutrient reduction strategy). A mechanism is needed that can supplement existing governance and funding structures by tapping into the support of broader constituencies and stakeholder groups for clean water. Such a mechanism might be modeled after a private or quasi-private utility and achieve the advantages and efficiencies of such utilities to mobilize and utilize public funds to tackle local and regional problems using economies of scale to restore and protect ecosystem services and achieve local, state, and regional water quality improvements.

A "watershed protection utility" (WPU) would be designed as a new finance and governance entity within each state (or perhaps sub-state region) to advance state nutrient strategies with the support of agriculture, water, soil, environmental, and business interests. It would integrate at the state level the three solution strategies identified above (watershed-based leadership and decision-making; market mechanisms; and data, monitoring, and modeling) to improve water quality and watershed health. The WPU would provide for ecosystem services by financing priority projects that effectively provide protection of water quality and watershed health for the least possible cost. Projects might involve agriculture and other nonpoint sources of pollution as well as traditional point source projects. In most states within the Mississippi River Basin, many of the low-cost opportunities are likely to be in agricultural landscapes, creating opportunities for producers and landowners.

THE WPU WOULD BE CHARGED WITH:

Monitoring and providing regular and reliable data on water quality;

Setting priorities to manage water quality issues;

Leveraging funds from multiple sources;

Investing strategically, based on sophisticated science and ongoing measurement and monitoring, to spur innovation and maximize return on investment across a geographic region, including but not limited to employing market-based mechanisms; and,

Accounting for performance and ensuring achievement of results and return on investment

Excess nutrients cannot be solved without agriculture, and the practices that are most effective are those that manage water, which moves nitrogen and phosphorus through the system. Implementation of these practices at a large enough geographic scale to solve the problem is a major challenge. The WPU would create a mechanism for financing Edge of Field and off-field/in-stream practices that reduce nutrient loading in what is a highly productive, though "inherently leaky," agricultural landscape. The WPU would provide a mechanism to reward landowners/producers who take action in addition to the in-field practices known to reduce nutrient loading that might be expected as baseline agricultural conservation practices.

In addition to agriculture, many other stakeholders also stand to benefit from a WPU, such as water treatment plants, business and industry, the environmental community, regulators, municipalities, and citizens at large.[44] The WPU has the potential to change watershed protection from an economic liability to an economic opportunity by creating a system that incentivizes and invests in innovative technology and human resource development to address water quality concerns. Leaders in this field will have an opportunity to sell technology and skills to other states and countries.

Establishment of a new WPU will require careful consideration of the needs and interests of a wide range of entities and stakeholders, as well as a range of structural and funding options. There is a wide range of approaches to governance of the WPU, and Dialogue members have differences of view regarding the desirability of various options. The WPU might be governed like a private or quasi-private utility, with an appointed policy board of stakeholders and constituents who are accountable to the public and subject to public utility commission oversight or accountable to some other state entity. Regardless of governance structure, the WPU would need to be integrated as much as possible with existing boards, commissions, and districts (e.g., soil and water commissions, drainage districts, conservation districts, watershed organizations, etc.), as well as relevant state regulatory and statutory environmental and agricultural organizations. The WPU would need to be designed to not duplicate the responsibilities of other agencies, though some existing vehicles and resources (e.g., watershed authorities, funding sources, etc.) might be integrated together and expanded through creation of a WPU.

Dialogue members identified a range of potential funding sources for the WPU. Some of these funds could be secured and directed to projects directly by the WPU; other funds, such as those that have their own allocation and governance mechanisms, could be used to advance a joint strategy between the WPU and the entity that governs and allocates these funds. Potential funding mechanisms include assessments of landowners/residents, input taxes, state sales tax, government grants, interest incomes, and natural resource damage settlements.[45]

The WPU would create a new mechanism to leverage the potential of the voluntary approach under current CWA authority without undermining what has been achieved to date through the CWA. As mentioned above, the new U.S. EPA-integrated planning initiative indicates that the U.S. EPA is open to allowing utilities to develop long-term plans with new approaches to implementing the CWA. Nevertheless, a WPU might require additional federal flexibility in implementation of the CWA with regard to water and wastewater utilities.[46]

NEXT STEPS FOR DEVELOPMENT OF THE WPU CONCEPT

Dialogue participants think the WPU concept is worthy of further development and have identified a range of questions that need to be considered.[47] Dialogue participants encourage those concerned about and working to reduce excess nutrients in the Mississippi River Basin to develop and pursue opportunities to further develop the concept of a utility focused on reducing excessive nutrients through green infrastructure at a state or large watershed scale within a state (crossing state lines creates obvious complications that might be avoided when first testing the concept). The scale of the opportunity must be assessed for a given place and the anticipated benefit/cost analysis undertaken before the idea is presented to the public. It will be important to determine what the public is willing to invest in this type of effort.

Advancing the concept likely will require building support from both the "bottom up" and "top down" to initiate pilots, build confidence through them, and fine-tune the business model. As experience, knowledge, and trust accumulate over time, the WPU might address a wider range of water quality and other environmental issues. Agricultural organizations and leaders could play an important role by supporting the establishment of the entity and facilitating its relationships with agricultural organizations and agencies; identifying and prioritizing critical needs; guiding project implementation and monitoring; and, serving as an interface with the local community.

MOVING FORWARD

Intensive effort is needed to advance solution strategies and realize opportunities at the scale necessary to meet the challenge of excess nutrients in the Mississippi River Basin. There is a need – and opportunity— for integrating, leveraging, and adding to the many activities already underway.

SUMMARY OF KEY RECOMMENDATIONS

- Replicate and expand "integrated watershed management" projects.
- Experiment and test models by utilizing new programs, such as the USDA's new Regional Conservation Partnership Program and the EPA's new integrated planning initiative.
- Support and participate in existing and emerging pilot projects.
- Leverage the water quality data collection and monitoring capabilities of municipal water and wastewater facilities to build trusted relationships between the water and agricultural sectors based on the above considerations.
- Engage a wide range of partners, including a variety of agricultural partners (producers, landowners, commodity groups, agriculture retailers, fertilizer companies, etc.) and information and communication technology firms.
- Link monitoring activities to watershed-scale initiatives to mobilize participation and investments to improve water quality outcomes.
- Engage community colleges, land grant universities, and other academic and research institutions to boost the science of nutrients and watershed health, including GREON.
- Promote investment in the development of affordable nutrient sensors.
- Establish the magnitude and potential margin of water quality trading markets.
- Identify and pursue additional opportunities to gain experience in market mechanisms.
- Enable collective watershed-based permitting.

NEXT STEPS

- Focus on state-based strategies: State-based dialogues between point sources and farmers might be initiated by a small group of leaders in each sector and convened by a neutral, non-threatening host to assess the feasibility of ideas in this report, develop additional ideas, and identify opportunities to apply the ideas.
- Create an ongoing interstate platform to support actionable strategies and connect the many interrelated efforts underway: An interstate working group might be formed to share information and coordinate communication among state-based and multi-state nutrient reduction efforts that involve both the water, agriculture, and other stakeholder communities; connect with state and federal strategies/projects; and track progress and communicate successes and challenges of pilot projects and strategies that specifically promote collaborative water industry/agricultural projects.

APPENDICES

The following individuals participated in one or more of the meetings of the MRND. Organizational affiliations are for identification purposes only and do not convey any organizational endorsement of the content of this report. Core Dialogue members and observers (the people who participated in the series of dialogues, not just one of them) are noted with an * after their names.

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MEETINGS OF THE DIALOGUE GROUP

Planning Meeting
The Johnson Foundation at Wingspread
Racine, Wisconsin
November 28-29, 2012

First Meeting
McKnight Foundation Headquarters
Minneapolis, Minnesota
March 27-28, 2013

Second Meeting
NACWA conference
Cincinnati, Ohio
July 16-17, 2013

Third Meeting
National Great Rivers Research and Education Center (NGRREC)
Alton, Illinois
November 14-15, 2013

Capstone Meeting
The Johnson Foundation at Wingspread
Racine, Wisconsin
February 11-13, 2014

ENDNOTES

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[2] Multi-stakeholder watershed-based decision-making is not a panacea; it has inherent challenges. However, it is an underutilized approach with significant unrealized potential. In addition, new technologies allow for multi-stakeholder input in increasingly economical ways.

[3] See pages 20-22, Iowa Nutrient Reduction Strategy: A science and technology-based framework to assess and reduce nutrients to Iowa waters and the Gulf of Mexico. May 2013. Iowa Department of Agriculture and Land Stewardship, Iowa Department of Natural Resources, and the Iowa State University College of Agriculture and Life Sciences. http://www.nutrientstrategy.iastate.edu/sites/default/files/documents/NRSfull-130529.pdf; pages 33-37, The Minnesota Nutrient Reduction Strategy. 7 October 2013. Minnesota Pollution Control Agency and partners. http://www.pca.state.mn.us/index.php/view-document.html?gid=20213; and, pages 14-16 and 22, Ohio Nutrient Reduction Strategy. 28 June 2013. Prepared by Ohio EPA, Division of Surface Water with contributions from Ohio Department of Agriculture, Livestock Environmental Permitting Program and Ohio Department of Natural Resources, Division of Soil and Water Resources. http://epa.ohio.gov/Portals/35/wqs/ONRS_final_jun13.pdf.

[4] Heisler et al. "Eutrophication and harmful algal blooms: A scientific consensus." December 2008. Harmful Algae 8 (1): 3-13.

[5] Ward et al. "Workgroup Report: Drinking-Water Nitrate and Health- Recent Findings and Research Needs." Environ Health Perspectives. Nov 2005; 113(11): 1607–1614.

[6] Rabalais et al. "Gulf of Mexico Hypoxia, A.K.A. 'The Dead Zone.'" November 2002. Annual Review of Ecology and Systematics 33: 235-263.

[7] National Oceanic and Atmospheric Administration. "NOAA-supported scientists find large Gulf dead zone, but smaller than predicted." 29 June 2013. http://www.noaanews.noaa.gov/stories2013/2013029_deadzone.html.

[8] United States Environmental Protection Agency. "Nutrient Pollution: The Effects- Economy." 16 March 2014. http://www2.epa.gov/nutrientpollution/effects-economy.

[9] "The National Water Quality Inventory Report to Congress: 2004 Reporting Cycle." January 2009. http://water.epa.gov/lawsregs/guidance/cwa/305b/upload/2009_01_22_305b_2004report_2004_305Breport.pdf.

[10] "Controlling Nutrient Loadings to U.S. Waterways: An Urban Perspective." October 2011. NACWA.

[11] "Controlling Nutrient Loadings to U.S. Waterways: An Urban Perspective." October 2011. NACWA.

[12] United States Environmental Protection Agency. "The National Water Quality Inventory Report to Congress: 2004 Reporting Cycle." January 2009. http://water.epa.gov/lawsregs/guidance/cwa/305b/upload/2009_01_22_305b_2004report_2004_305Breport.pdf.

[13] Because management of agricultural hydrology has a high environmental return on investment, the USDA has recently initiated a priority on investment in drainage water management. Practices such as 1) Drainage Water Management, 2) bio reactors, 3) saturated buffers and 4) nutrient treatment wetlands have the potential to reliably hold, capture, or treat nitrates dissolved in water being discharged from agricultural fields.

[14] See Kieser and Associates "Drainage Water Management Implementation Cost."

[15] The Dialogue group wrestled with the best terminology for what many might call watershed governance. The group determined that the two key components of a watershed-based approach are leadership (individual farmers/landowners as well as others taking responsibility for mobilizing their communities to collaborate to improve water quality) and decision-making (the empowerment of some representative group to make decisions about how best to achieve water quality improvements through investments, practice requirements, etc.).

[16] Design Criteria for Effective Watershed Efforts:

Broader engagement among key stakeholders (landowners, farmers, water/wastewater utilities, environmental organizations, private industry, etc.) to advance cooperative conservation actions that link land management with conservation outcomes at the watershed scale and align incentives to advance improvements in water outcomes. Stakeholders all must be well-represented by individuals who are broadly trusted both inside and outside of their own sector. There must be:

Accountability for setting and achieving specific performance goals (e.g., water quality) that align with state and federal water quality standards. A watershed group as a whole and/or individual landowners/farmers might enter into contractual agreements (including remedies for non-performance) for implementing specific practices that are predicted to lead to specific water quality improvements. Such contracts might be with water or wastewater utilities for payment; or with state or federal government for payment and/or safe harbor from regulation related to water quality for a specified period of time (i.e., regulatory certainty). Such contracts would be different than current contracts with the U.S. Department of Agriculture (USDA) regarding conservation practices, as the contracts would be part of a targeted effort over time to achieve specific water quality outcomes in a watershed.

- Financial capability to generate funds (via levies of landowners; state and federal grants such as USDA conservation grants and U.S. EPA section 319 Clean Water Act grants; payments for ecosystem services by utilities, corporations, and/or conservation organizations; etc.) and distribute them to support a systems approach for practices and projects that have the greatest benefit/cost ratio to achieving water quality goals (based on technical evaluation using the best available information).
- Appropriate scale of implementation, at which individuals feel a part of a community (e.g., HUC 16), aligned with planning that takes place at a larger scale (e.g., HUC 10 or HUC 8).

While in some cases it may be necessary to establish a new organization to serve as vehicle for watershed leadership and decision-making, there are many existing organizations that could incorporate the necessary functions robustly, including drainage districts, aggregators, farmer cooperatives, watershed clubs, joint powers agreements, non-profit foundations, conservation districts, and agricultural associations and alliances. To succeed in this role, an entity must be invested in the process and the notion that collaboration can work; inclusive rather than exclusive; flexible and adaptive rather than rigid; willing to take risks; able to effectively manage funds and projects and access first-rate technical assistance; and, willing to allow for sufficient time to prove success.

[17] "Certainty," "Assurance," and "Certification" programs provide states with a tool to accelerate the voluntary adoption of systems of conservation practices that improve and protect water quality, reducing the pressure for additional state water quality regulations. These programs also recognize the environmental stewardship of farmers and ranchers and help lay the groundwork for establishment of markets for ecosystem services. Agricultural producers participate in Certainty programs by voluntarily implementing systems of conservation practices to reduce soil erosion and sediment/nutrient runoff. In turn, these producers receive assurance from the state that they have put into place all appropriate and practicable measures for addressing water quality concerns over a defined period of time. Some states with Certainty programs have given participating producers a safe harbor protection against new state regulations or against the enforcement of existing state regulations, provided the producer agrees to follow certain practices for the length of the Certainty agreement. The EPA and the USDA support these efforts and are committed to assisting states as they develop their programs. The USDA can also provide producers with technical and financial assistance to support state Certainty programs.

[18] "Minnesota Agricultural Water Quality Certification Program." 2014. Minnesota Department of Agriculture. http://www.mda.state.mn.us/protecting/waterprotection/awqcprogram.aspx.

[19] While appropriateness of alternative approaches is case-specific, examples could include approaches such as CWA 319 plans, "straight to implementation" source water protection plans, category 4b activities, or other approaches, as appropriate. In all cases (with the exception of the longstanding tool under category 4b), impaired waters remain on the CWA 303(d) list, but are assigned lower priority for TMDL development while alternative restoration approaches are pursued until water quality standards are achieved. See "New Vision for the CWA 303(d) Program – An Updated Framework for Implementing the CWA 303(d) Program Responsibilities." U.S. Environmental Protection Agency. December, 2013. http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/programvision.cfm.

[20] "Integrated Municipal Stormwater and Wastewater Plans." U.S. Environmental Protection Agency. http://cfpub.epa.gov/npdes/integratedplans.cfm.

[21] The Regional Conservation Partnership Program (RCPP) supports cooperation between the Natural Resources Conservation Service (NRCS) and partners such as agricultural associations, water and irrigation districts, conservation organizations, and universities by providing funding agreements leveraging the Agricultural Conservation Easement Program, Environmental Quality Incentives Program (EQIP), Conservation Stewardship Program, or the Healthy Forests Reserve Program for partners to engage landowners and producers in regional and watershed-scale soil, water, and wildlife conservation work. "Regional Conservation Partnership Program." 2014. Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/farmbill/rcpp/.

[22] See http://www.madsewer.org/Programs-Initiatives/Yahara-WINs.

[23] See http://www.yaharapridefarms.org/.

[24] A medium that allows buyers and sellers to interact, directly or through intermediaries, to facilitate an exchange for money or barter, where forces of demand and supply operate, and where there are means for determining price of the traded goods or services, communicating price information, facilitating transactions, and effecting distribution.

[25] Similar to the voluntary carbon credit markets and purchase of offsets driven by a desire to mitigate greenhouse gases for reputational reasons and/or desire to gain experience in anticipation of a compliance-driven market.

[26] Please see http://www.nyc.gov/html/dep/html/watershed_protection/index.shtml for further information.

[27] Please see http://web.extension.illinois.edu/lmw/cat83_3062.html or http://www.foodandagpolicy.org/sites/default/files/AGree%20PEO%20report_June%2027.pdf for further information.

[28] The Electric Power Research Institute, with federal, state, and local collaborators, launched a multi-state trading pilot program in 2013 for the Ohio River Basin, partly based on the nutrient problems in the Gulf of Mexico but also more localized nutrient impairment in the Ohio River and the increasing treatment and control costs among wastewater and energy utilities. In December 2013, the Administrator of the EPA and the Secretary of Agriculture signed a partnership between their two agencies for water quality trading partnerships and projects over the next several years. In

2014 a National Network for Water Quality Trading was officially launched to develop principles for consistency , integrity, and innovation; the Network includes national and regional, and public and private, environmental organizations and associations. Also in 2014, a National Water Quality Trading Alliance was formed to advance the scientific, legal, and policy underpinnings of market-based strategies, with nutrient management and water/agriculture partnerships a primary area of focus.

[29] NPDES. National Pollutant Discharge Elimination System – the regulatory premitting system to implement Clean Water Act requirements on point source polluters.

[30] Contributing factors to uncertainties, particularly regarding water quality credit trading involving agricultural credits generated from agronomic practices, include:

- Lack of a baseline for agricultural performance (both a data baseline and a baseline standard above which a producer/landowner would be eligible);
- Lack of accurate, accessible data (reliable information is essential to all functioning markets);
- Lack of certainty or consensus over the appropriate geographic relationship between credits generated from agricultural sources (which may be very widespread and diffuse) and offsets needed by POTWs or urban storm water inputs (which tend to be very localized); and,
- Lack of knowledgeable technical intermediaries to work between credit generators and potential credit buyers to facilitate and manage market transactions.

[31] The following structure needs to be in place to foster trading:

- Clear recognition and approval of trading as an acceptable compliance strategy by applicable regulatory entities;
- Permit requirements that enable trading as a mechanism to reduce costs, liabilities, or compliance timeframes, or yield a more desirable environmental outcome than conventional treatment;
- Performance standards defining the "commodity" or service – (e.g., quantity of nutrient reduction achieved at a specific place in a specified time period, such as pounds of nitrogen per year at the point where an NDPES or MS4 discharge enters the receiving waters);
- Auditable or third-party verification of "product" (e.g., pound of nitrogen discharge reduced);
- Aggregation of sufficient credits to meet (or partially meet) permit or consent order requirements;
- Price discovery capability to assure the NPDES permit holder that the alternative compliance strategy or rural or urban "green infrastructure" is at least as cost effective as the conventional treatment; and,
- Contract enforceability to hold those selling credits accountable for actual delivery.

[32] See http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/water/manage. These practices include drainage water management, bio reactors, wetlands, and emerging technologies including saturated buffers, phosphorous filters, and reuse of tailwaters.

[33] Structural challenges facing certification of credits generated from agriculture include:

- Direct measurement of pollution (i.e. nutrient concentration) prior to treatment and post treatment, thereby allowing direct measurement of the pollution reduction achieved;
- Quantification of environmental performance in the same metrics as used by NPDES facilities;
- Regular replication and predictability of outcomes. The practice can be anticipated to have very similar outcomes despite the variables of agriculture such as precipitation rates, temperature variability, variations in cropping and cropping history, etc.;
- Ease of transmission of data;
- Readily verified outcomes by third parties;
- Outcomes are based largely on capital investments rather than management practices that have to be implemented every year. This reduces costs and management requirements and increases reliability and verifiability; and,
- Low cost delivery of nutrient reductions and improved water quality.

[34] Design considerations in establishing market mechanisms include:

- Data must be secure, verifiable, and inexpensive. Proprietary data regarding operations and activities of producers and landowners must remain confidential; data must be highly reliable and easily verified by third parties; data acquisition costs need to be lower than they currently are (e.g., current data samplers for N and P cost thousands of dollars, though technological innovations are becoming available that promise to significantly lower costs and facilitate the validation of the performance of land management practices).

- Buyers, sellers, and regulators must be accountable. Important elements of accountability include: chain of custody, QA/QC performance verification; permanence or continuity of credit value; contract enforcement (which might be used in place of regulation to assist the regulated community which has legal requirements to meet specific standards, with the assurances it needs of performance by non-regulated actors such as agriculture); independent third-party certification; insurance and or reinsurance of credits (e.g., if there is a failure, someone needs to accept liability, which might be through an independent insurer or through a pool of retired credits that can be drawn upon to meet shortcomings).
- Markets must be properly structured to meet the needs of anticipated participants. Considerations include: aligning contracts with permit requirement needs of purchasers; rewarding improvements in cost efficiency in delivering ecosystem services to incentivize technical or structural innovation; and, separating credit buyers from credit generators in the permitting process. In other words, water quality markets must operate like conventional business markets where there is clear agreement on the product, the delivery, the quality, and the price, and it must be possible to enforce contracts. Given the large number of both potential credit generators and potential credit buyers, there is a clear need for thoughtful and appropriate scaling of projects to optimize value, and for establishing markets where buyers and sellers are located, because credits will typically be traded within the same watershed, and credit pricing and credit types will likely vary by location.
- Regulatory drivers, while often necessary to create water quality and broader ecosystem service markets, should stimulate efficiency and innovation rather than only compliance. Considerations include: Creating both predictability and incentives that lead to innovation; allowing for - and striving to foster - multiple solutions to optimize practicability and minimize cost; and allowing credit "stacking" for multiple services to incentivize holistic credit generation for multiple ecosystem services (e.g., CO_2 reduction, storm water management/flood reduction, gully erosion prevention, nutrient/chemical management, and biodiversity enhancement from building grassed waterways).

[35] States where notable trading between sectors is occurring include Connecticut, Minnesota, North Carolina, Ohio, Pennsylvania, and Virginia. Additional states have trading programs with limited trading: California, Colorado, Oregon, and Wisconsin. States with programs where no trades have occurred to date include Idaho, Maryland, Michigan, and Montana. Additional states such as Iowa have policies that endorse tracing but do not yet have trading frameworks. For details, see:

http://www.ct.gov/deep/cwp/view.asp?a=2719&q=325572&deepNav_GID=1635

http://www.pca.state.mn.us/index.php/water/water-permits-and-rules/water-rulemaking/water-quality-trading-rule-development.html#draftrule
http://portal.ncdenr.org/web/wq/ps/nps/tarpamnutrienttrade http://www.epa.ohio.gov/dsw/wq_trading/index.aspx

http://www.pennvest.state.pa.us/portal/server.pt/community/pennvest_internet/9242

http://www.deq.virginia.gov/Programs/Water/PermittingCompliance/PollutionDischargeElimination/NutrientTrading.aspx

[36] There has been significant progress on trading pilots in the Ohio River Basin, such as the 2013 Ohio River Basin Trading Program, developed by Electric Power Research Institute in partnership with the Ohio River Valley Water Sanitation Commission, the U.S. EPA, the USDA, and others).

Recommendations for policymakers to advance market mechanisms:

- Establish the magnitude and potential margin of markets to reduce excessive nutrients in various watersheds within the Mississippi River Basin. Begin with the "hot spots" to take advantage of the greatest return on early trading efforts, and then use the lessons learned to build more efficiency into future trading efforts.
- Identify and pursue additional opportunities to gain experience in market mechanisms consistent with the design considerations above. Experiment with mechanisms simple and reliable enough to instill confidence and attract participation to get more experience.
- Explicitly recognize and approve trading as a compliance option for NPDES permit holders to allow regulatory compliance by "purchasing credits" from nonpoint sources.
- Establish provisions for allowing multiple forms of credit generation within single projects. Referred to as "credit stacking," this allows for multiple ecosystem services (e.g., water quality improvement, flood protection, and wildlife habitat) credits to be generated from a single project, providing greater incentives for credit generators to invest in projects with high social, economic, and ecological values.

Specific opportunities to explore:

- Trading across state lines in the Mississippi River Basin (e.g., a World Resources Institute study, partially funded by both the EPA and the USDA, showed that trading may be feasible across states from Illinois to Mississippi. See for example http://www.wri.org/publication/addressing-risk-and-uncertainty-water-quality-trading-markets).
- Harness growing interest among potential buyers and sellers for trading and adaptive management in the Upper and Middle Mississippi River watersheds. Educate water and wastewater utilities and agriculture about recent initial trades made in the Ohio River (based on the EPRI work identified above); estimate the size of the potential market; and integrate trading with watershed governance by having watersheds compete for contracts with clear terms regarding what watersheds would need to do to enter contracts.
- Voluntary market mechanisms: In addition to operating inside of regulatory driven markets, there are opportunities to advance water quality through voluntary market mechanisms. Voluntary markets already operate in this country (e.g., voluntary carbon markets), often driven by

personal or corporate ethical standards, or a desire to gain experience in anticipation of the establishment of a regulatory driven market. Some companies are already working to reduce their "water footprint" as a part of their sustainability policies. Other companies are working to market themselves as "green" by voluntarily engaging to improve water quality. Such actions provide an indication of the potential for voluntary water quality markets in the absence of compliance drivers or other regulatory frameworks.

[37] See http://www.acwa-rrws.org/monitoring.html for more information.

[38] See http://www.iasoybeans.com/environment/sites/default/files/watermonitoring.pdf for more information.

[39] See http://agincentives.org/projects/yahara-lakes/.

[40] Dialogue participants identified the following as important considerations in designing and implementing a collaborative data collection effort.

- Involve a local partnering organization that producers trust, such as an agricultural organization, multi-stakeholder watershed association, conservation district, conservation organization collaborating effectively with producers, etc.
- Establish a clear purpose for collection and use of the data that all participants support and benefit from, particularly agriculture (e.g., data to improve nutrient use efficiency, better understand the effectiveness of various conservation practices, etc.)
- Identify clear responsibilities of each participating entity, such as:

  Binding agreements about storage, access, and sharing of data (e.g., to ensure that it cannot be used for regulatory enforcement purposes). Individual utilities will need to determine whether they are required to make publicly available any data that they are collecting, analyzing, and storing, and, if so, ensure that agricultural participants have a full understanding and consent of when and how data would be made public.

  Respective roles and responsibility of agricultural partners (individual producers and their associations) and the utilities in designing and executing/overseeing data collection.

  Roles and responsibilities of any additional partners with an interest in advancing voluntary action to reduce nutrient loading from agriculture, which might include fertilizer companies, agriculture retailers, Natural Resources Conservation Service (NRCS), conservation districts, universities, and others.

  Agreement about which entity is responsible for coordinating and managing the participation of all entities and individuals involved in the effort.
- Consider carefully the potential risks to entities and individuals in each sector of entering into a collaborative data collection effort (e.g., risks associated with sharing data) and identify steps to mitigate those risks.
- Secure at the outset adequate funding to implement a data collection initiative over sufficient time (at least five years) to ensure that producers (and others) derive value from the effort by being able to establish relationships between land management practices and changes in outcomes.

[41] Funding source might include a combination of contributions from the utility, producers/landowners, NGOs, USDA cost-share resources (e.g., Edge of Field monitoring program through EQIP), and government grants.

[42] Consider collaborations such as the Digital Energy and Sustainability Solutions Campaign (http://www.digitalenergysolutions.org/) through which information and communication technology companies - such as Intel, Verizon, Google, and Microsoft – support "precision conservation" based on big data that helps decision-makers improve targeting of resources to achieve environmental priorities. For example, in the Chesapeake Bay, they have funded and assisted the Chesapeake Conservancy to provide affordable technology to track water quality and quantity.

[43] A project of The National Great Rivers Research and Education Center: http://www.ngrrec.org/GREON/.

[44] Potential beneficiaries of a WPU include the following:

- Water treatment plants would benefit, as nutrient removal projects would be targeted for maximum benefit and removal, while preventing mandated implementation of very expensive treatment processes to achieve a relatively small reduction in nutrient load.
- Business and industry would benefit, as nutrients would be reduced without mandated point source nutrient load reductions that can cause shutdowns and relocations.
- Members of the environmental community would benefit, as significant progress would be made in achieving their objectives to reduce nutrient loads, and resources would be generated for research on innovative technologies to reduce nutrient loading.
- The regulatory community would benefit, as reductions in nutrient loads would be achieved without having to definitively establish costly Water Quality Based Effluent Limits for nutrients.
- Municipalities would avoid mandated implementation of storm water controls and other unfunded mandates that would achieve low return on investment for water quality improvement. (Municipalities might be eligible to receive assistance from the WPU to economically and effectively manage their storm water).
- Citizens would benefit, as more costly solutions to reducing nutrient loading will not be passed along to them (e.g., increased water/sewage bills, increased prices for food, etc.).

[45] Potential sources of funding for a WPU include:

- Assessments of landowners and/or residents within the relevant geography (e.g., supplemental water use or sewage fee);
- New and/or partial redirection of existing input taxes, (e.g., on fertilizers, pesticides, or irrigation water);
- State sales tax established through popular vote, such as the Clean Water, Land, and Legacy Amendment to the Minnesota Constitution, approved by Minnesota voters in 2008;
- Government sources, which might include state and federal grants (e.g., the EPA's 319 funds), cost share funds (e.g., USDA conservation funds and new Regional Conservation Partnership Program resources), or green payments (e.g., the USDA's Conservation Reserve Program); and,
- Interest income, such as on a portion of the capital raised by the WPU and used as a source of loans to fund the generation of water quality credits, with repayment of loans (with interest) as credits are traded/sold.

[46] Such accommodation might include suspension of enforcement of the act for specific utilities in the relevant geography for a limited period of time to allow for the approach to be tried. This option will need further exploration with EPA officials. It should also be noted that as is the case with many market mechanisms as described above, a traditional water quality standard-based enforcement alternative will be necessary to drive participation and to regulate point sources that are unwilling to cooperate with the WPU plan or that impede achievement of its goals.

[47] Questions to address regarding further development of the WPU concept include:

- Is a "utility" the right model? Should the WPU be a public, private, or quasi-public/private entity?
- What ought to be the relationship of the WPU to government? Should the entity be governed by a public utilities commission?
- How might governance be designed to balance accountability to the public with the independence necessary for an entrepreneurial approach?
- What ought to be the relationship between the WPU and existing water-related entities and infrastructure, including drinking water, water treatment, storm water, drainage districts, and others?
- What ought to be the measurements of success for the WPU?
- What ought to be the criteria for eligible projects? How should baseline conservation practice standards be established to ensure that funded projects provide basic good stewardship? How might the system be designed to ensure that investment opportunities are open and accessible to both large and small landowners/producers?
- How might the process of authorization and establishment for a WPU be designed to garner and maintain public support? Ideally, a process results in either a statewide/regional voluntary decision by public officials or a public referendum.
- What level of funding/action is needed to solve the nutrient problem, and how much could likely be generated by a WPU? What would the return on investment be?

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