Municipal-Agricultural Watershed Partnerships

Project Guide

SAND COUNTY FOUNDATION

ENVIRONMENTAL POLICY INNOVATION CENTER

NATIONAL WILDLIFE FEDERATION

Municipal-Agricultural Watershed Partnerships **Project Guide**

Sand County Foundation inspires and enables a growing number of private landowners to ethically manage natural resources in their care, so that future generations have clean and abundant water, healthy soil to support agriculture and forestry, plentiful habitat for wildlife and opportunities for outdoor recreation.

Our mission is to build policies that deliver spectacular improvement in the speed and scale of conservation.

The Great Lakes Regional Center (GLRC) of the National Wildlife Federation works on critical national and regional water resource issues with a particular focus on protecting and restoring our Great Lakes. Protecting the Great Lakes also means protecting the health and quality of the aquatic and terrestrial ecosystems in the Great Lakes basin, as well as the human communities that depend upon them.

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For additional information, please contact Bartlett Durand at bdurand@sandcountyfoundation.org; Elizabeth Lillard at LillardE@nwf.org; or Tim Male at tmale@policyinnovation.org

Photos by Sand County Foundation staff.

Municipal-Agricultural Watershed Partnerships Project Guide

Executive Summary

Water quality requirements for cities, towns, treatment facilities and point sources can be complex and expensive to address. Managers have traditionally had to address them within the boundaries of a single political jurisdiction.

New opportunities are rising to build more flexibility into water quality enhancement programs and to work on a watershed scale. These approaches can significantly lower overall treatment costs, provide access to new financing for treatment, and allow municipalities and utilities to work in partnership with neighbors throughout the watershed.

Voluntary partnerships with farmers, ranchers, agribusinesses and agricultural groups provide some of the best possible opportunities to achieve nutrient goals collaboratively. Municipalities can pay farmers to implement best management practices they may already familiar with and, if regulators approve, the nutrient benefits from those practices can be counted toward the city or utilities' permit compliance goals. We believe it can frequently be a win-win for cities and agricultural producers. Cities and their taxpayers benefit by achieving cost-effective water quality goals, and potentially creating amenity values within the watershed that don't always arise from chemical and physical treatment at a water quality plant. Producers benefit through payments from municipalities and utilities to cover or offset the costs of management practices that often provide them an economic benefit. While voluntary by the producer, the financial incentives available allow practices to become binding for the term of contractual agreements with a municipality or intermediary contracting entity.

Wisconsin has taken a leadership role in these kinds of partnerships. The same or similar approaches can be replicated in other states. Wisconsin's 'Adaptive Management' is a flexible approach to reducing nutrients in a watershed, allowing partnerships to form to find the best methods for each area to reduce nutrient runoff, and monitoring the actual reduction. Wisconsin has developed a state-level program structure that allows municipalities to achieve permit compliance through watershed-based partnerships with farmers. No other state has developed a similar formal program, although several are in the process of exploring the concept through research and pilot projects. This guide is informed by various watershed projects in Wisconsin, national policies, other state initiatives, and outlines how to develop coordinated Municipal-Agricultural Watershed Partnerships.

The guide is divided into three parts. Part One reviews how to scope a successful project. Part Two gives an overview of the Wisconsin program and several Wisconsin Municipal-Agricultural Watershed Partnerships. Part Three outlines steps for developing a Municipal-Agricultural Watershed Partnership.

[1] 2019. EPA Memorandum: Water Quality Trading Policy to Promote Market-Based Mechanisms for Improving Water Quality. https://www.epa.gov/nutrient-policy-data/water-quality-trading-memos

[2] See materials on Wisconsin's Adaptive Management program here https://dnr.wi.gov/topic/SurfaceWater/adaptivemanagement.html

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Context for Stakeholders

Nutrient pollution (nitrogen and phosphorus) is a major cause of water quality impairment throughout the United States. Nutrient pollution in surface water and groundwater used for recreation and drinking threatens human health and the environment. Algae blooms, cyanotoxins and elevated nitrate levels are all caused by nutrient pollution. In the Mississippi River Basin, nutrient pollution degrades lakes, rivers and streams and contributes to the Gulf of Mexico's dead zone (hypoxic zone).

Common sources of nutrient pollution in watersheds include discharges from municipal wastewater treatment plants, industrial discharges, urban stormwater runoff, discharges from home septic systems and agricultural runoff.[3] Although the relative contribution of each source varies between watersheds, in most Midwestern watersheds, agricultural runoff is the largest overall contributor.

In some Midwestern areas, it is possible to reduce nutrient pollution and improve water quality through holistic, collaborative, and coordinated watershed planning and implementation projects jointly led by municipal, industrial and agricultural sources. In some cases, these Municipal-Agricultural Watershed Partnerships may present a more cost-effective and efficient means of reducing nutrient pollution than having municipal and agricultural sources work separately. Municipal-Agricultural Watershed Partnerships discussed in this guide represent a 'watershed approach' to addressing nutrient pollution.[4]

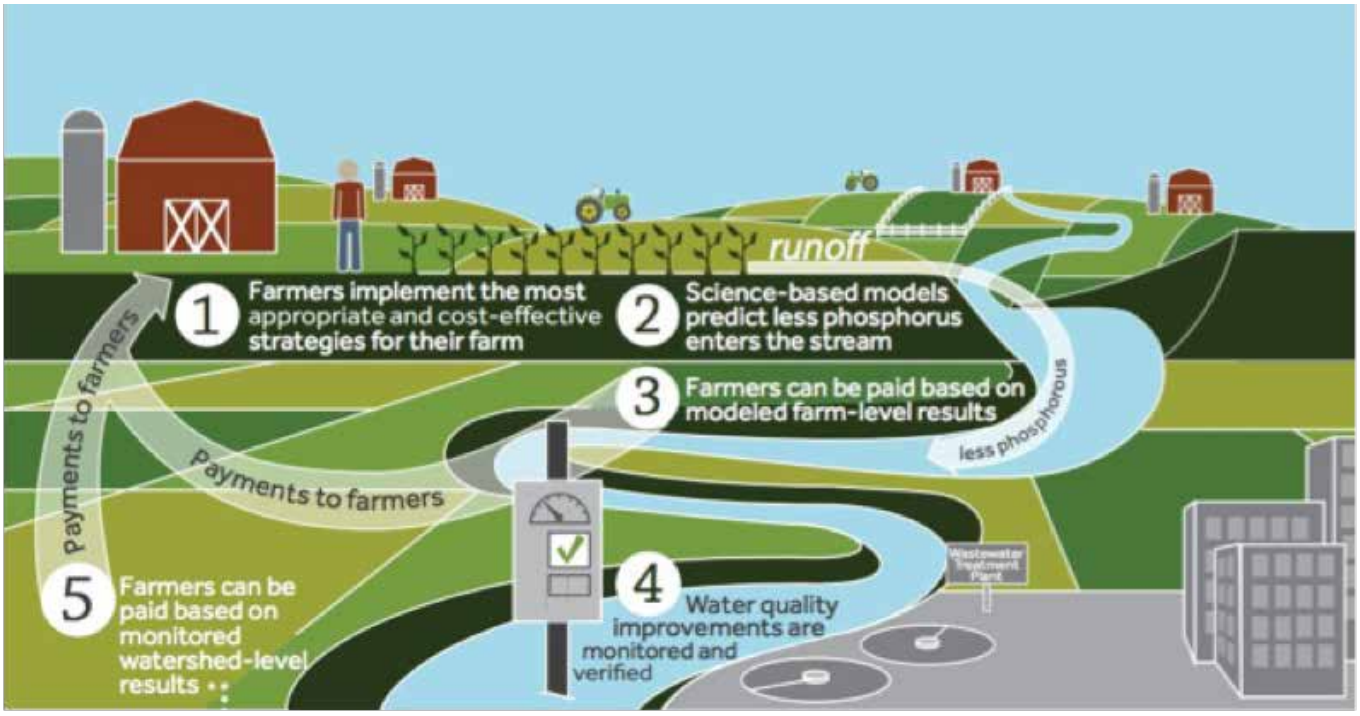
For decades, the U.S. Environmental Protection Agency (EPA), the United States Department of Agriculture Natural Resources Conservation Service (NRCS) and many states have supported using a watershed approach.[5] However, for the most part, we still lack a focused and straightforward path for Municipal-Agricultural Watershed Partnerships. Wisconsin's Watershed Adaptive Management Option stands out as an exception. It provides a program structure through which municipal stakeholders (with Clean Water Act permits that include water quality-based limits for phosphorus and sediment) can achieve permit compliance by working with farmers in their watershed to improve water quality. Municipal and agricultural stakeholders in Wisconsin are successfully working with this program to develop and implement Municipal-Agricultural Watershed Partnerships that focus on implementing conservation practices in agricultural areas.

[3] Under the Clean Water Act, municipal wastewater treatment plants, industrial discharges and urban stormwater runoff are categorized as "point sources" of pollution.

[4] Joint Municipal-Agricultural Watershed Partnerships may provide important opportunities for more cost effectively and efficiently addressing nutrient pollution in certain areas within states. Information for assessing the suitability of your watershed for a joint project is included later in this guide. However, joint Municipal-Agricultural Watershed Partnerships will not be able to be used to achieve all pollution reductions necessary to restore water quality within states or in the Gulf of Mexico. After Municipal-Agricultural Watershed Partnerships are used to address nutrient pollution in suitable project areas, a significant amount of agricultural runoff from areas outside of municipal-agriculture project areas will still need to be addressed. Plans addressing runoff and discharges solely from urban areas may also need to be implemented.

[5] EPA, for example, has supported using a watershed approach for its nonpoint source Clean Water Act (CWA) Section 319 program, its Total Maximum Daily Load (TMDL) CWA section 303(d) program and its CWA point source permit program. Federal farm bill conservation programs have also incorporated watershed focuses to greater and lesser extents over the years. The Conservation Effects Assessment Program (CEAP) carried out by NRCS and partners also has a watershed focus.

While no other state has a program similar to Wisconsin's Adaptive Management Option, several have or are in the process of promulgating water quality trading programs in an attempt to spur similar Municipal-Agricultural Watershed Partnerships. However, trading programs have not historically stimulated the development of similarly innovative projects. Instead, many municipal entities have evaluated water quality trades with farmers and decided not to move forward, because they found trading entailed insurmountable issues including trade ratios, historical credits, Total Maximum Daily Load (TMDL) and non-TMDL baselines (and associated short- and long-term credits) and implementation timing limitations. Wisconsin's adaptive management program has been successful because it allows flexibility for municipalities to work with farmers without having to overcome these steep water quality trading barriers.



Municipal-agriculture partnerships utilize the capital available to municipalities to implement nutrient projects across a watershed. One option is paying farmers for nutrient reduction through their farm-specific practices. Source: Pay-for-Performance Conservation: A How-To Guide, Winrock International, p.6.

Although other Midwestern states lack the clear policy pathway for municipal-agriculture collaboration provided by Wisconsin's Adaptive Management Compliance Option, they may still be able to approve similar projects on a case-by-case basis. Working together, municipalities and state regulators can outline steps necessary to obtain certainty in compliance. Moreover, encouraging such projects may be an important mechanism for advancing implementation of state Nutrient Reduction Strategies (NRS).[6]

[6] In 2008, EPA published the Gulf Hypoxia Action Plan, which called on states to develop NRS for cutting by 45% their phosphorus and nitrogen pollution loads to the Gulf of Mexico. The agency also issued framework elements that suggested states use a "prioritized watershed approach" focusing on both urban and agriculture sources, as appropriate, for developing and implementing their NRS. The framework elements include: (1) Prioritize watersheds on a statewide basis for nitrogen and phosphorus loading reductions; (2) Set watershed load reduction goals based upon best available information; (3) Ensure effectiveness of point source permits in targeted/priority sub-watersheds; (4) [In] Agricultural areas … develop watershed-scale plans that target the most effective practices where they

Outside of Wisconsin, where NRS or other water quality programs (not regulatory compliance), may drive Municipal-Agricultural Watershed Partnerships, projects could still be used to provide regulatory certainty for permitted stakeholders and to document and credit voluntary implementation progress for agricultural stakeholders. In these states, NRS priority watersheds and pollution reduction goals, rather than water quality-based permit limits, could be the driver and starting point for stakeholders interested in pursuing Municipal-Agricultural Watershed Partnerships.

This guide aims to meet Midwestern states where they are in their approaches to addressing nutrient pollution. It provides additional first-hand information on Municipal-Agricultural Watershed Partnerships that can be used as a blueprint for advancing implementation successes in suitable areas in all states. Local stakeholders can use this information to explore the feasibility of a Municipal-Agricultural Watershed Partnership in their watershed. States, working with EPA, can use this guide to encourage sound projects. Specifically, states and EPA can work to provide regulatory certainty incentives to municipal and industrial sources and recognition to agricultural sources that work together to develop and implement sound Municipal-Agricultural Watershed Partnerships.

This guide is informed by on-the-ground projects in Wisconsin that vary in terms of scale, complexity and maturity. However, all projects referenced herein were initiated by municipal wastewater treatment plant stakeholders and involve collaboration with multiple nutrient sources (including urban stormwater and agricultural nonpoint sources). Advantages associated with these projects include:

Cost control - Individual point sources in Wisconsin estimate that, when fully implemented, Municipal-Agricultural Watershed Partnerships, will be 2 to 12 times less expensive than implementing onsite engineering solutions to reduce nutrients.

Regulatory certainty - Point sources in Wisconsin have been able to secure credit for reducing the phosphorus load from agricultural sources on a 1:1 basis. For each pound of phosphorus runoff from a farm field that a point source works with farmers to prevent, a point source can claim one pound of reduction credit for itself. Point sources can use these credits to satisfy or offset reductions required in their permit.

Increased efficiency - Municipal-Agricultural Watershed Partnerships have improved conservation delivery for farmers and efficient use of financial and other resources by point sources.

Workable project timelines - Wisconsin officials may allow stakeholders up to 20 years for implementation of Municipal -Agricultural Watershed Partnerships.

Flexibility/Adaptive Management - Municipal-Agricultural Watershed Partnerships allow for adaptation in implementation approaches in response to changing conditions and circumstances and allow for flexibility in establishing and changing pollutant load reduction goals in a watershed (depending on the extent of stakeholder engagement and water quality information).

are needed most; (5) Storm water and Septic systems; (6) Accountability and Verification measures; (7) Annual public reporting of implementation activities and biannual reporting of load reductions and environmental impacts associated with each management activity in targeted watersheds; (8) Develop work plan and schedule for numeric criteria development. All 12 state members of the Nutrient Reduction Task Force have developed NRS for meeting the Action Plan's 45% nutrient pollution reduction targets. The Iowa and Illinois NRS provide excellent examples. In addition to reducing by 45% the total nutrient pollution they are contributing to the Gulf of Mexico, these NRS aim to reduce nutrient pollution in local waterbodies and restore water quality within their borders.

Collaboration - Municipal-Agricultural Watershed Partnerships provide a clear format in which all sources can work together without additional regulation or compromised privacy. Having a clear collaborative space maximizes the probability of achieving the desired environmental outcomes and eliminates finger-pointing and other unproductive interactions between stakeholders.

Holistic focus - Municipal-Agricultural Watershed Partnerships focus on improving water quality and soil health instead of being narrowly focused on reducing end-of-pipe discharges from individual municipal or industrial facilities (as is the case with water quality trading).

Ancillary benefits- In addition to improved water quality, Municipal-Agricultural Watershed Partnerships typically provide benefits like enhanced stream habitat and recreational water uses.

Reduced carbon and environmental footprint - Municipal-Agricultural Watershed Partnerships reduce reliance of urban and industrial facilities on energy-intensive brick and mortar solutions and additional chemicals for nutrient reductions, thereby improving their carbon and environmental footprints.

The remainder of this guide is divided into three parts:

- Part One provides initial scoping considerations for Municipal-Agricultural Watershed Partnerships.
- Part Two provides a brief overview of Wisconsin's Adaptive Management Option and Municipal-Agricultural Watershed Partnerships being carried out in the state.
- Part Three provides steps for developing a municipal-agriculture project. Although the steps in Part Three are numbered, the order of operations may vary and stakeholders may take some steps simultaneously.

This guide aims to provide important detail without losing sight of the forest for the trees. However, many point source stakeholders considering Municipal-Agricultural Watershed Partnerships have not worked with farmers previously and, at the start, will lack the institutional capacity and know-how to work with farmers. They will be unfamiliar with the people and mechanisms through which farmer engagement and agricultural implementation can occur.

Municipal stakeholders in Wisconsin overcame this learning curve and worked hard to identify service providers, mechanisms and processes for working with farmers to implement conservation practices. Much of what was learned by stakeholders is outlined here. However, stakeholders seeking additional guidance on the agricultural project component should read the companion document, "Yahara Pride Farms Farmer-led Watershed Group: A Model Effort." It outlines in more detail how a farmer-led watershed group, or similar entity, can work with farmers to implement conservation practices and achieve watershed project goals.

Part One: Scoping Out a Successful Project

Experience in Wisconsin has shown that there are several prerequisites that should be in place to help ensure successful development and implementation of a watershed project. These foundational elements are briefly discussed below.

Catalyst

While water quality is a common goal of every citizen, there needs to be a specific driver to encourage participation in a Municipal-Agricultural Watershed Partnership. Due to regulatory pressure, the principal starting point is through wastewater regulations. Wastewater treatment plants often face a requirement of expensive upgrades to their plants to meet new regulatory standards. Investment in incentives for its neighbor-farmers to adopt practices would garner greater nutrient reduction than what the plant could have achieved on its own. This then offers a driver for farmers to adopt practices through financial incentives, and the partnerships can garner support from other environmental groups and area stakeholders.

Through this program, stakeholders with water permits can achieve regulatory certainty through the use of pollution reduction credits that can count toward their current or potential future permit requirements. Agricultural stakeholders can obtain additional, more flexible funding for voluntary conservation efforts. The state and local community gains improved environmental outcomes for water bodies or drinking water sources. Although individual drivers may vary, it is critical that stakeholders choose to come together and work in a collaborative manner on a Municipal-Agricultural Watershed Partnership, because they believe that it is the best opportunity to address their concerns.

Leader/Facilitator

Facilitating organizations play a critical role in some municipal-agriculture projects. They help coordinate a municipality's objectives and can organize the management of distributed projects with many farmers that are voluntary participants in achieving those goals.

Successful watershed projects have an overall leader/facilitator. This individual can emerge from municipal, industrial, agricultural or other stakeholder groups. The leader/facilitator works with stakeholder groups or representatives to:

- Inspire confidence and build trust among all stakeholder groups
- Develop and articulate a shared vision and put the pieces of a project together
- Discuss the project in the respective 'languages' of various stakeholder groups
- Push the envelope and create a climate of innovation
- Navigate through the churn and noise and ultimately get to 'yes'
- Keep things simple
- Manage expectations

The overall project leader/facilitator should not be confused with the on-the-ground project coordinator. Project coordinators are generally selected after a watershed plan is developed to carry out on-the-ground implementation in agricultural areas. A project coordinator:

- Works with project leadership to facilitate on-the-ground execution of a watershed plan
- Has a strong understanding of agricultural operations and the watershed
- Works with and provides a familiar and trustworthy face for farmers in the project area
- Works in a watershed for the full term of a project
- Directs other on-the-ground project staff working on education and outreach, technical assistance and implementation

When a project area is relatively small, in some cases, the leader/facilitator may be the same person as the on-the-ground coordinator.

In addition to an overall leader/facilitator, it is important that each stakeholder group has their own representative. This is particularly true for agricultural stakeholders, who will, in most watersheds, be the group implementing the majority of conservation practices to reduce nutrient loads to levels identified in a Municipal-Agricultural Watershed Partnership. Farmers need a trusted peer leader(s) who understands, articulates and advocates for the unique interests of agricultural stakeholders. An agricultural stakeholder leader needs to acknowledge the opportunity to work in a collaborative space and be prepared to work on breaking through barriers that often exist between farmers and municipal, industrial and government agency stakeholders. In addition to an individual trusted group leader, farmers may also want to consider developing their own farmer-led watershed group. For more information on the development and functions of a farmer-led watershed group please see the companion document: "Yahara Pride Farms Farmer-led Watershed Group: A Model Effort."

Communication with regulators

Clear communication with the state regulatory agency, agricultural agency and EPA in advance of project development and implementation is critical. This is particularly true if stakeholders with water permits want to use a watershed project for regulatory compliance or certainty purposes. It is strongly recommended that a Memorandum of Understanding (MOU) be developed between permitted entities planning to undertake a Municipal-Agricultural Watershed Partnerships and regulators. A MOU should be used to formally document critical project terms prior to project development and implementation. In addition to providing clarity, a MOU preserves institutional memory. Institutional memory is important because watershed projects may have lengthy implementation timeframes (10-20 years). During the term of a project, staffing at participating entities and regulatory agencies may change. MOUs help ensure important information agreed upon at the start of a project will not have to be renegotiated when personnel turnover occurs.

Stakeholders do not have to have a detailed watershed plan in place before engaging in MOU discussions. However, prior to beginning MOU discussions, stakeholders should have given considerable thought to such issues as project scale, potential agricultural runoff reduction capacity, relevant monitoring and modeling methodologies and related items. A non-exhaustive list of items that should be considered for inclusion in an Municipal-Agricultural Watershed Partnerships MOU include:

- watershed scale and location
- point of compliance for working to monitor/measure changes in water quality
- nutrient reduction goals
- the method(s) for determining how nutrient reductions will be modeled and measured
- how interim progress and the ultimate achievement of water quality objectives will be determined
- the role of water quality monitoring
- project timeline
- preservation of nutrient credits

Adequate funding

In the absence of adequate funding, even the best designed approach for achieving nutrient reductions at the watershed level will not be successfully implemented. Therefore one of the first steps in scoping a Municipal-Agricultural Watershed Partnership is to develop a reasonably conservative estimate for the cost of full project implementation. Once a project cost estimate has been developed, an initial analysis of funding options, including funding from potential point source project stakeholders, can be considered. At the scoping stage, potential project stakeholders should consider whether a combination of traditional state and federal conservation funding for agricultural sources, traditional point source funding (state revolving loan funding and similar federal programs) and new funding from point source project participants will be sufficient to support plan development and implementation. As others have noted , well-developed watershed plans can serve as an investment prospectus and will likely help attract new investment and bring in additional dollars from traditional funding sources.

Business case for project implementation

Simply stated, the business case is the economic benefit from engaging in a Municipal-Agricultural Watershed Partnership. The business case will continue to be refined as interested stakeholders develop information. However, it is unlikely that potential project stakeholders will be willing to move forward with project planning (or commit to an investment in a watershed project) if a rudimentary business case can't be provided at the outset. How the business case is demonstrated and articulated will vary depending on the stakeholder group. For municipal and industrial entities, the business case may be that a watershed-based project will allow them to achieve regulatory compliance or certainty or to meet operational objectives at a lower cost than implementing additional technology upgrades at the plant to reduce their nutrient loading. Eventually, this information will need to be presented to the applicable utility commission, city boards, county boards and other decision makers able to authorize engagement in a project. At the scoping stage, the business case for farmers will likely include an

[7] Adam Kiel, Iowa Soybean Association

assessment of the opportunity to gain access to a more flexible pot of cost share dollars. At later stages, farmers will consider costs and benefits to their individual operations, should they choose to incorporate management practices that provide a benefit to a project.

It is also important to note that the business case is not always about dollars and cents. Many stakeholder groups focus on the triple bottom line, which includes social, environmental, and financial benefits, when assessing the business case for project engagement.

It is important to develop support among farmers, agriculture groups and other stakeholders in both urban and rural communities.

Part Two: Overview of Wisconsin's Policy Approach and Wisconsin's Project

Wisconsin's Adaptive Management Option:

Created in 2010, the Adaptive Management Option is a Clean Water Act permit compliance approach for total phosphorus (TP) and Total Suspended Solids (TSS) Water Quality Based Effluent Limits (WQBELs). A sewage treatment plant can utilize the approach, if it is located in a watershed where water quality impairment is caused by both point and nonpoint sources—with nonpoint sources contributing at least half of pollutant loading—and the sewage treatment plant would otherwise have to use filtration or a similar technology to meet applicable P or TSS WQBELs. If nonpoint sources do not contribute half of pollutant loading, the permittee may still be able to use the approach if they can show that water quality criterion cannot be met without additional controls on nonpoint sources. Under the Adaptive Management Option, a permittee must develop a watershed plan to help achieve water quality standards in a specified area. The plan must provide a road map for achieving verifiable reductions in pollutant loading from point and nonpoint sources. Permittees are to use monitoring and modeling data to verify pollutant loading reductions and adjust the plan to ensure achievement of project goals. Permittees may be allowed up to four permit terms (20 years) to achieve final in-stream water quality goals. During the implementation period, permittees must meet interim effluent limitations of 0.6 mg/L during the first permit term and 0.5 mg/L in the second permit term.

Wisconsin Project Overviews:

This guide aims to provide a guide, based on practical project experience in Wisconsin, to entities interested in developing and implementing Municipal-Agricultural Watershed Partnerships to achieve various NRS, state program or operational goals. The steps in Part Three are based on a review of four Municipal-Agricultural Watershed Partnerships underway in Wisconsin (highlighted below). These projects were initiated by wastewater treatment plants and include partnerships with municipal stormwater entities, farmers and others. Three of the projects are utilizing Wisconsin's Adaptive Management Compliance Option to meet reductions in total phosphorus (TP) and total suspended solids (TSS) specified in a TMDL. The fourth project is an adaptive management pilot project.

Project name: Yahara Watershed Improvement Network (Yahara WINS)

Location: Madison, Wisconsin
Scale: 19 aggregated HUC-12s covering 5 HUC-10s
Land area: 540 square miles
Initiator: Madison Metropolitan Sewerage District
Participants: 24 MS4s, three wastewater treatment plants, three county land conservation departments, one farmer-led watershed group (Yahara Pride), USGS, NRCS, Wisconsin Department of Natural Resources, Clean Lakes Alliance, UW-Madison, and multiple other parties.
Primary driver: State numeric water quality criteria and Rock River TMDL
Parameter of interest: Total phosphorus and total suspended solids (TSS)
Goal: Meet TMDL phosphorus allocations for all sources and applicable permit limits. This amounts to an annual P reduction of 96,000 pounds of phosphorus at full buildout.
Project length: 20 years
Projected cost: $94 million total cost adjusted for inflation
Project leader: Madison Metropolitan Sewerage District
Current status: Completed a four-year pilot project. Full scale implementation began in 2016.
Additional information: www.madsewer.org/yaharawins

Project name: Oconomowoc Watershed Protection Plan (OWPP)

Location: Oconomowoc, Wisconsin
Scale: four aggregated HUC-12s
Land area: 131 square miles
Initiator: City of Oconomowoc Wastewater Utility
Participants: one wastewater treatment plant, one MS4, three county land conservation departments, Clean Water Association, Tall Pines Conservancy, Ruekert and Mielke consulting firm, Farmers for Lake County, Clean Water Association, Sand County Foundation, NRCS, and multiple other parties.
Primary driver: State numeric water quality criteria and Rock River TMDL
Parameter of interest: Total phosphorus
Goal: Meet TMDL phosphorus allocations and applicable permit limits for the Oconomowoc wastewater treatment facility and the Oconomowoc MS4. This amounts to an annual P reduction of 9,750 pounds of phosphorus at full buildout.
Project length: 15 years
Projected cost: $3.38 million total cost
Project leader: City of Oconomowoc Wastewater Utility
Current status: Full scale implementation began in 2015.
Additional information: www.oconomowocwatershed.com

Project name: Silver Creek Pilot Watershed Project

Location: Green Bay, Wisconsin
Scale: one HUC 12
Land area: 7.5 square miles
Initiator: NEW Water (Green Bay Metropolitan Sewerage District)
Participants: one wastewater treatment plant, Oneida Nation of Wisconsin and Tilth Agronomy, two Land and Water Conservation Departments, USDA Natural Resources Conservation Service, UW-Green Bay, Fox Wolf Watershed Alliance, U.S. Geological Survey, The Nature Conservancy, U.S. Fish and Wildlife Service, Ducks Unlimited, Alliance for the Great Lakes, WDNR and multiple other parties.
Primary driver: State numeric water quality criteria and Lower Fox River TMDL
Parameter of interest: Total phosphorus and total suspended solids (TSS)
Goal: Annual P reduction of 2,000 pounds per year during each year of the pilot project.
Project length: five-year pilot project with anticipated transition to a 20-year full scale project
Projected cost: $3.7 million through 2017 and $4.3 million through 2019
Project leader: Green Bay Metropolitan Sewerage District
Current status: five-year pilot project is nearing completion and facility is working to develop full-scale project for DNR approval by the end of 2018.
Additional information: www.newwater.us/projects/silver-creek-project/

Project name: Milwaukee River Watershed Conservation Partnership

Location: Milwaukee River Watershed, Southeastern Wisconsin
Scale: 12 HUC 12s
Land area: 700 square miles
Initiator: Milwaukee Metropolitan Sewerage District
Participants: three wastewater treatment plants, three county land conservation departments, Clean Water Association, Ozaukee Washington Land Trust, Mid-Moraine Water Quality Collective, Cedar Creek Farmers Group, Clean Farm Families Producer Group, Sand County Foundation, NRCS, University of Wisconsin Extension, and multiple other parties.
Primary driver: State numeric water quality criteria and Milwaukee River Basin TMDL
Parameter of interest: Total phosphorus, Total Suspended Solids, Bacteria
Goal: Collaborate to address: healthy soils, clean water, smart business
Project length: 5-year collaborative commitment
Projected cost: $5 million total cost
Project leader: Milwaukee Metropolitan Sewerage District
Status: Project received a Regional Conservation Partnership Program award in 2016, and participants are working to voluntarily engage urban, suburban and rural communities to plan, prioritize, fundraise and implement best management practices that address landscape management and water quality within the Milwaukee River Watershed.
Additional information: https://www.mmsd.com/what-we-do/flood-management/workingsoils

[8] While MMSD leads the Yahara WINS project, the municipal participants operate under a formal intergovernmental agreement (IGA). The IGA includes an Executive Committee that administers the joint activities of the group. The Executive Committee consists of five voting members and 3 nonvoting advisory members. Per the IGA, the MMSD designated representative serves as the Executive Committee President.

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For more information on projects, please visit websites provided in above project overviews.

Part Three: Project Development Steps

Step One: Analyze the pollutant(s) of interest in the prospective project area

Municipal-Agricultural Watershed Partnerships are suitable in watersheds in which there is a nutrient or sediment water quality concern that stakeholders want to address. Stakeholders may identify a water quality concern based on a state's Clean Water Act section 303(d) list, Nutrient Reduction Strategy (NRS), TMDL, alternative watershed plan or drinking water facility reports. In addition to nutrients and sediment, other pollutants (e.g. chloride, fecal coliform bacteria) may also be concerns. Stakeholders should discuss which pollutants are of greatest interest to individual stakeholders. It may be the case, for example, that stormwater entities would not participate in a project solely focused on nutrient reductions but would participate in a project focused on both nutrient and sediment reductions, because they anticipate having more difficulty meeting current or future permit requirements for sediment. The reverse may be the case for some wastewater treatment plants.

Organizers of watershed-based projects should also be forward-thinking when identifying pollutants of interest. For example, the primary focus of the Yahara WINS project is to achieve reductions in total phosphorus (TP) and total suspended solids (TSS) in accordance with the applicable TMDL. However, stakeholders took the proactive step of including nitrogen species (NH3-N, NO3+NO2, TKN) as part of the project's water quality monitoring program. They did so to better position themselves in the event that a future regulatory driver for nitrogen emerged. The project also incorporated dissolved phosphorus, chlorophyll, dissolved oxygen and stream biology (fish and macroinvertebrates) in its monitoring program. The Green Bay MSD pilot project also analyzes for a list of parameters that goes well beyond those identified in the applicable TMDL (TP and TSS). In addition to TP and TSS, Green Bay MSD monitors for Total Kjeldahl Nitrogen, total dissolved phosphorus, volatile suspended solids, temperature, specific conductivity, pH, and dissolved oxygen. Green Bay MSD also anticipates expanding the list of analytes to include nitrate/nitrite and ammonia.

Step Two: Identify the ideal scale for your project

Stakeholders must identify an appropriate overall scale for a project and decide on the scale at which important project activities like monitoring and inventorying will be carried out. For a watershed project that focuses primarily on using in-field, edge-of-field and riparian practices in agricultural areas to meet nutrient reduction goals, HUC 12s are helpful scalable units. The HUC 12 scale is manageable for taking inventory of existing agricultural practices and from a monitoring and water quality modeling standpoint. Working within HUC 12s in a larger project area supports effective farmer and landowner engagement, tracking and collaboration among stakeholder groups that share a similar sense of

community. The USDA Agricultural Research Service's Agricultural Conservation Planning Framework (ACPF) GIS tool, which identifies opportunities for agricultural practices and is a useful farmer engagement tool, focuses on HUC 12 areas.

In many cases operational or geographical considerations will necessitate that the overall scale for a Municipal-Agricultural Watershed Partnership be larger than a single HUC 12 - e.g. an aggregated group of HUC 12s, a HUC-10 or even aggregated HUC-10s. However, it should be recognized that project complexity generally increases as scale expands. When scoping out a project for a larger area like a HUC-10, stakeholders should keep in mind that they may need to allocate human and financial resources and time for conducting inventories and stakeholder engagement for individual HUC12s in a larger project area.

The Yahara WINS project is a case in point. Madison Metropolitan Sewerage District (MMSD) initiated the project. The primary stream into which MMSD discharges effluent from the wastewater treatment process is located in a HUC-12 that is dominated by point source contributions. There is not sufficient nonpoint capacity in that HUC-12 to accomplish the required phosphorus reductions under the applicable TMDL. In addition, MMSD's point of compliance for the Rock River TMDL is at the bottom of a HUC-10 and water quality at the compliance point is significantly impacted by upstream activities and conditions. Because of these watershed conditions and MMSD's goal of meeting TMDL allocations, MMSD decided it could only proceed with a Municipal-Agricultural Watershed Partnership, if it worked at the aggregated HUC-10 scale. In total, the WINS project consists of 19 aggregated HUC-12s, which comprise five HUC 10s. Although the total Yahara WINS project area is quite large, nutrient loading and other considerations are generally analyzed at a smaller scale (TMDL stream reaches) within the project area.

Step Three: Confirm feasible agricultural load reductions

For Municipal-Agricultural Watershed Partnerships to be feasible, a significant portion of the nutrient load in the watershed project area must come from agricultural sources. Discharges from wastewater treatment facilities or industry cannot substantially dominate in the watershed. Most Municipal-Agricultural Watershed Partnerships will look to achieve the majority of the required nutrient reductions through investments in agricultural control practices, because they are typically significantly less expensive than urban practices or making brick and mortar, engineered improvements onsite at point source facilities.

If stakeholders are unsure of the location or effluent information for permitted entities in a prospective project area, they can request this information from their state permitting agency. State permitting agencies will have the addresses, latitude and longitude and discharge monitoring reports for point sources, which can be plotted on a map with watershed boundaries.

Identifying farmers and land owners may take more time. However, at the outset identifying all farmers and landowners in a watershed is not necessary. Stakeholders need only estimate feasible agricultural load reductions associated with the relevant land base in a prospective project area. To develop an estimate, stakeholders need to establish current baseline conditions using appropriate models. Stakeholders in Wisconsin have used the Soil & Water Assessment Tool (SWAT) model. Stakeholders also need to work with farmers and other agricultural stakeholders to determine interest in partnering

and implementing conservation practices. The nutrient reduction capacity for agricultural sources in a watershed is a function of current conditions, the willingness of farmers and landowners to implement conservation practices/engineered solutions, and the anticipated improvement associated with practice implementation. The nutrient reduction capacity of conservation practices can be estimated using available data and/or 'book' values. Science assessments completed with state NRS, which analyze nutrient reductions from conservation practices, are helpful tools for estimating achievable agricultural load reductions.

Yahara WINS worked with the Dane County Land and Water Resources Department to determine whether it would be feasible to achieve its target load reductions from agricultural land in its prospective project area. Yahara WINS and the county analyzed the number of acres of agricultural land in the watershed, relative cropping practices, and evaluated the effectiveness of past conservation implementation efforts in achieving phosphorus reductions.

Although Yahara WINS did not develop a specific estimate of pounds of phosphorus per acre that could be reduced in its watershed, Green Bay and Oconomowoc did estimate feasible per acre reductions. As part of its pilot project effort, the Green Bay Municipal Sewer District estimated that a 1.2 pound per acre phosphorus reduction could be achieved through implementation of agricultural practices in its target watershed. The Oconomowoc wastewater utility estimated that a 1.45 pound per acre phosphorus reduction could be achieved through implementation of agricultural practices in its full-scale project area.

A pilot project may also be helpful in more accurately assessing nutrient reduction capacity within a watershed. Yahara WINS and Green Bay used pilots to better assess load reduction capacity. Experience gained working with farmers and quantifying reductions during pilot projects gave stakeholders confidence that sufficient phosphorus reductions for a full-scale project could be achieved. Green Bay is currently using its pilot project data to determine whether it should refine its initial 1.2 pound per acre phosphorus reduction estimate before developing its full-scale project. For more information on pilot projects as an optional step in a Municipal-Agricultural Watershed Partnerships, please see Step Thirteen below.

Step Four: Determine the overall load (mass) reduction target for the project

Determining the overall load (mass) reduction to achieve a percent reduction goal or a water quality target is generally driver, scale and partner dependent. If the primary driver is compliance with a TMDL or permit requirement, the load reduction target should be relatively easy to determine. At least to start, target reductions can be set equal to the total load reduction identified in an applicable TMDL or permit or to an agreed upon percentage of the total.

It is important to note that there may be a significant time lag between the development of a TMDL or other watershed plan and initiation of a Municipal-Agricultural Watershed Partnerships. If that is the case, the TMDL or other plan may not accurately reflect baseline conditions. Use of outdated watershed planning numbers may result in an over or under estimation of load reductions. To address this challenge, the MOU for the Yahara WINS project allowed stakeholders to adjust the TMDL baselines

and develop updated baselines for use in the watershed project. Instead of adopting baseline numbers included in the TMDL, current loads and projected reductions for agriculture and municipal areas were determined by rerunning models for the relevant source categories with more recent information. Stakeholders used the SWAT model to estimate aggregate agricultural loading and the Source Loading and Management Model (SLAMM) or Program for Predicting Polluting Particle Passage thru Pits, Puddles, & Ponds (P8) to model loading for urban areas.[9] Updated loads for wastewater treatment plants were developed based on data provided to the Wisconsin DNR in Discharge Monitoring Reports (DMRs). For more information on the SWAT model and agricultural field-scale models please see Step Nine below.

Deciding on load reductions may be a more involved but also a more flexible process, if a TMDL or other watershed planning document does not yet exist for the watershed in which stakeholders seek to develop and implement a project. For example, if stakeholders seek to develop a watershed project to help implement a state's NRS or to achieve regulatory certainty in advance of potential future regulatory action, they may be able to identify an overall load reduction from a range of possible reductions. Stakeholders could seek to offset their total or a portion of their individual load or to reduce all or a portion of the load identified in a watershed plan. This leaves a lot of space for tailoring a load reduction goal.

In deciding on an overall load reduction goal for a project, consideration needs to be given to using either an explicit uncertainty factor or addressing it implicitly through the use of conservative assumptions. The Yahara WINS project addressed uncertainty implicitly by assigning conservatively low phosphorus reduction values to the suite of phosphorus reduction practices used in its project implementation/cost model (discussed below) and using conservative calculations when adjusting baseline load information for both point and nonpoint sources. Wisconsin's Department of Natural Resources agreed to the use of this approach. Addressing uncertainty implicitly is less onerous than using multiplication factors or trade ratios. Trade ratios used in water quality trading programs can be in the range of 2-4:1 for trades between point sources and nonpoint sources. If Yahara WINS had used an explicit multiplier in this range to address uncertainty, the required load reductions would have made moving forward with a watershed project infeasible from both a cost and implementation standpoint – the project price tag would have been prohibitive and there would not have been enough agricultural reduction capacity associated with the land base in the project area.

[9] For an overview of the SWAT and P8 models, see Step Nine below.

Source Loading and Management Model for Windows (WinSLAMM) is an urban storm water model that analyzes runoff, sediment and nutrient loading for each defined land use type by storm event. WinSLAMM uses time-based weather data, land use, soils, pervious to impervious surface ratios and land use practices to complete an hourly assessment of storm water flow and the delivery of nutrients and sediment. The model can also be used to assess delivery of Fecal Coliform, lead and other heavy metals. WinSLAMM can be used to predict the effect of structural (ex. Detention ponds, bio-filtration basins, grass swales) and non-structural (ex. Street sweeping, impervious area disconnection) practices. Additional information on WinSLAMM can be found at http://winnslamm.com

Step Five: Estimate the total project cost, unit cost and develop a cost allocation approach

The total project cost and unit cost (i.e. cost per pound of nutrient or sediment reduction) estimates as well as the method for cost allocation are important pieces of information that stakeholders can use to evaluate the business case for participating in a watershed project. As discussed below, point sources facing permit-driven nutrient reduction requirements will compare the cost of achieving compliance through a Municipal-Agricultural Watershed Partnerships to the cost of achieving compliance through traditional brick and mortar engineering solutions implemented at the plant. To do so, they need these figures.

Developing a project cost estimate will require information from multiple sources. For example, the Yahara WINS project obtained unit cost and shelf life information for agricultural practices from the Dane County Land and Water Resources Department and information on installation and operational cost of stream gaging stations from United States Geological Survey (USGS).

The Yahara WINS project developed a project-specific cost "model" to estimate the $94 million cost of its 20-year project. The cost model consists of a series of Excel spreadsheets that include the following inputs:

- The cost for each practice (excluding staff costs) for a mix of potential agricultural conservation/ engineering practices to be used in the project
- Staff time and cost associated with practice design (where appropriate), installation and verification
- Water quality monitoring costs
- An inflation adjustment factor

Practice cost estimates included the anticipated practice shelf life and were based on a review of actual practice costs. Where a range of cost information was available, the high end of the range was used as a conservative estimate. Estimates of staff time and cost were based on actual experience and best professional judgment of local stakeholders that have worked on conservation in the watershed.

Yahara WINS' cost model used a 17-year ramp up approach, with the total reduction goal being maintained for the final three years of the 20-year project. Model outputs included the annual costs for staff, practices and water quality monitoring for each year of the 20-year project. The breakdown by general cost category was as follows: staff/operational costs (32%); practice costs (62%) and water quality monitoring costs (6%). In addition, the model predicted the annual staffing requirements needed to support the project. From these model outputs, project leaders derived the unit cost of $75 per pound of phosphorus reduction.

Yahara WINS also developed an approach for allocating costs among partners. Under the approach, the cost for any individual point source and for nonpoint (in the aggregate) is directly proportional to the phosphorus reduction requirement for that source. For example, if a municipality had to achieve 5% of the total project phosphorus reduction goal for the project in order to meet its TMDL requirement, it was responsible for 5% of the total project cost. Point sources approved of this method, and it was a key piece of securing partners. This cost apportionment approach is included in the stakeholders' intergovernmental agreement, discussed below and included as Appendix 1.

Step Six: Evaluate partnership opportunities

Successful watershed projects are built on partnerships. The partnership mix will vary between watershed projects and successful engagement will likely depend on the ability of the project leader(s) to understand the interest of each partner group and clearly articulate how those interests can be met through participation in the watershed project. Partners can generally be divided into a few, non-exclusive categories including point sources with Clean Water Act (CWA) permits, drinking water facilities regulated under the Safe Drinking Water Act (SDWA), nonpoint sources (primarily farmers), funding partners and non-funding/other partners.

Exploring partnership opportunities with other municipal and industrial point source dischargers and municipal drinking water authorities in the prospective project area is a good starting point. Municipal-Agricultural Watershed Partnerships in Wisconsin have been led and significantly funded by point source dischargers that are motivated by a mix of current or potential future regulatory (CWA permitting) and operational drivers. However, due to differing permit timelines, operational needs and other factors, not all point sources will necessarily be equally engaged and interested in a project from the outset. Instead, one or more point sources may lead an effort to engage other point source partners in a watershed. Specifically, one or more leaders may take the initiative to develop and articulate a business case for participation- i.e. demonstrate that participation in a watershed project is a cost-effective means of achieving desired regulatory certainty or meeting operational needs.

Partnerships with local Soil and Water Conservation Districts (SWCD), local NRCS Offices, farmer-led watershed groups and other agricultural stakeholders (agronomists, nutrient management planners etc.) are the other fundamental type of partnership in a Municipal-Agricultural Watershed Partnerships. Although, in theory, point sources could attempt to work one-on-one with all farmers in a watershed, working with farmer-focused or farmer-led entities presents a more orderly and strategic approach to comprehensively engaging farmers. Agricultural stakeholder or conservation entities also provide a delivery mechanism and can be engaged as service providers that conduct conservation inventories and assessments, implement practices and track and monitor progress. In some states, agricultural groups like Corn Growers Association, Soybean Growers Association, and Dairy Business Association are already partnering with and helping to lead watershed projects. In engaging farmers, directly or through the use of other agricultural stakeholders, it is important to discuss soil health and water quality. Agricultural stakeholders may be more motivated to engage, if they understand that a project will provide new, long-term and flexible funding for soil health initiatives, not solely address water quality.

Stakeholders interested specifically in learning about, forming or working with a farmer-led watershed group may want to reference the companion document, "Yahara Pride Farms Farmer-led Watershed Group: A Model Effort." It provides an overview of the development and watershed project engagement efforts Yahara Pride Farms, a farmer-led watershed group that is working on identifying, implementing, certifying and tracking agricultural conservation practices in the Yahara WINS project. The roles, mechanisms, technologies and other elements discussed in the companion document are also instructive for groups other than farmer-led watershed groups that would like to function as agricultural service providers in Municipal-Agricultural Watershed Partnerships.

Outside of the municipal permitted entity and farmer partner categories, there are other important partnership opportunities. Many partners will be obvious potential partners because water quality or

water quality improvement is part of their normal course of business. Examples include counties, state agencies (e.g. department of agriculture, department of natural resources) and federal agencies (e.g. USGS, USDA/NRCS). Local 'friends' groups and advocacy groups are also common partners. Other opportunities may be less obvious. For example, businesses that are interested in recruiting and retaining highly qualified employees may participate in a project because their employees value clean water and recreational opportunities.

The Yahara WINS project led by MMSD provides an example of a robust partnership, which includes 24 municipal partners. MMSD led point source engagement with a focus on the business case for project participation. MMSD discussed the total cost, unit costs and cost allocation approach with potential municipal partners. Sewage treatment plants worked with consultants to develop their costs for complying with nutrient reductions through onsite treatment plant upgrades and were able to compare these with project costs presented by MMSD. MMSD developed a range of unit cost estimates ($/pound of phosphorus controlled) for municipalities that owned municipal separate storm sewer systems (MS4s), based on input from multiple consultants and MS4s. If a municipal entity managed stormwater as well as sewage treatment plant infrastructure or paid MMSD to treat its sewage, MMSD discussed the opportunity for dual savings in both stormwater and wastewater treatment.

MMSD used a two-step process for presenting the business case to municipalities. MMSD first met with public works, engineering staff and consultants for each municipality to provide project and cost savings details. These meetings laid the groundwork for the second step- engaging with elected officials who had decision-making authority. MMSD took a similar approach within its own entity. MMSD staff developed a white paper to inform a discussion with engineers and facilitate later discussion with the MMSD Commission. A copy of the white paper is included as Appendix 2. In making participation decisions, elected officials relied heavily on public works/engineering staff and consultants' opinions.

MMSD's approach proved successful. All municipal entities with which it discussed partnership agreed to execute an Intergovernmental Agreement (IGA) that contractually obligates them to provide funding support for the project. See Appendix 1 for the full text of the Yahara WINS IGA.

At the same time as MMSD was working to secure municipal partnerships and develop its pilot project, farmers in the watershed were in the process of forming a farmer-led watershed group, Yahara Pride Farms. MMSD decided to engage in partnership conversations with Yahara Pride Farms as well. Both parties approached the relationship cautiously at first. However, leadership from both parties quickly recognized that a partnership would advance their individual goals; Yahara Pride Farms could help implement conservation practices that would more cost effectively achieve nutrient reductions and provide regulatory compliance and point sources could provide the farmer group new long-term, flexible funding for soil and water conservation efforts.

Municipal-Agricultural Watershed Partnership conversations led to Yahara WINS and Yahara Pride Farms executing an initial contract in 2013 in which Yahara WINS provided funding to Yahara Pride Farms to support a demonstration program as part of Yahara WINS' pilot project. While the dollar amount of the first contract was not large, it gave both parties experience working together and built trust. Since then, the relationship has grown and been formalized. A Yahara WINS member now sits on the Yahara Pride Farms Board of Directors and a farmer member sits on the Yahara WINS Executive Committee for the Municipal-Agricultural Watershed Partnerships. Yahara WINS and Yahara Pride Farms now execute funding agreements on an annual basis and have also executed other agreements that

have provided funding to Yahara Pride Farms to purchase equipment and conduct studies. Examples of funding agreements between Yahara WINS and Yahara Pride Farms are included in Appendix 3. For more information on the partnership see the companion document, "Yahara Pride Farms Farmer-led Watershed Group: A Model Effort."

In addition to partnering with the farmer-led watershed group, Yahara WINS also partners with county Land and Water Resource Departments (LWRD) in the project area for agricultural implementation assistance. LWRDs are Wisconsin's version of Soil and Water Conservation Districts. The collective efforts of the LWRDs and the Yahara Pride Farms group maximize effective engagement with farmers in the watershed. Both the farmer-led watershed group and the LWRDs track and report on practice implementation to Yahara WINS, which in turn provides aggregated load reductions to stakeholders and Wisconsin DNR. A discussion of the relationship between Yahara WINS and the county LWRDs in the project area is included below in the section below on service agreements.

Step Seven: Develop a watershed plan to guide project implementation

Successful Municipal-Agricultural Watershed Partnerships require careful planning. The complexity of plans varies based on a number of factors including project scale, number and diversity of participating entities, and whether the plan is being used by participating entities as a regulatory compliance or certainty strategy. Stakeholders should coordinate closely with appropriate state and federal agencies throughout the plan development process to avoid delays in approval and project implementation.

Plans for watershed projects should not stress format over functionality - plans need to make sense to those entities responsible for implementing projects. However, there are certain fundamental elements that help ensure a plan will provide a foundation for successful project implementation and not just end up sitting on a shelf. EPA, through its CWA section 319 program for nonpoint sources, has identified nine key elements that should be included in all watershed plans. According to 319 guidance, all plans should include:

- Discussion of causes and sources of pollution
- Estimation of load reductions expected from plan implementation
- Description of management measures and critical implementation areas
- Estimation of technical and financial assistance needs
- Description of an information and education strategy
- A project schedule
- Description of interim, measurable milestones
- Description of indicators that will be used to measure progress
- Description of a monitoring strategy

State and local stakeholders in all states that work with farmers on watershed planning will likely have experience developing and implementing watershed plans based on the EPA's nine key elements. Similar planning elements also underpin other state and federal watershed programs including state NRS, TMDL implementation and Wisconsin's Adaptive Management Option. The watershed plans for the Yahara WINS and Oconomowoc Municipal-Agricultural Watershed Partnerships both incorporate the nine key elements. Those plans can be accessed at above provided project websites.

The process for developing a watershed plan is as important as the substance of the plan. While a leader(s) will ultimately need to be responsible for writing a plan, providing a sound process for stakeholder engagement during plan development is critical for developing a sense of ownership and leadership among partners that will drive implementation after the plan is complete. Stakeholders that do not feel like they played a role in developing a plan are much less likely to take active roles in implementation. This is particularly true with respect to farmers. The Yahara WINS project held routine stakeholder meetings where various aspects of the watershed plan were discussed and stakeholder input was sought.

The Yahara WINS watershed plan lays out an overarching strategy for achieving phosphorus reductions. It does not identify specific locations (i.e. farms and fields) where practices will be implemented, nor does it prescribe which practices will be implemented. Rather, exact locations and specific practices are left to the expertise of farmers who are working with the county LWRDs or YPF. In addition to wanting to further facilitate farmer engagement, Yahara WINS took this approach because the magnitude of the phosphorus reduction goal (approximately 96,000 pounds per year) would have made it impractical to identify specific locations in the plan. By contrast, the Oconomowoc watershed plan, which has a significantly smaller phosphorus reduction goal (approximately 9,750 pounds per year), identifies specific fields (critical source areas) and reduction practices. Oconomowoc worked with agricultural stakeholders during the planning process to identify these practice opportunities.

Step Eight: Develop organizational/governance structure for carrying out the project

For watershed projects in which multiple municipal entities are participating and providing funds to support the effort, some type of formal, overarching organizational and governance structure is important. A governance and decision-making process should be developed and written down. It should address: how entities will work together, how they will engage with regulators, and how they will work with agricultural producers, non-governmental organizations, county agencies, USGS, NRCS and SWCDs to carry out the work associated with the watershed project. The document that lays out project governance structure should also include a discussion of cost allocation, as mentioned above.

The Yahara WINS project Intergovernmental Agreement (IGA), included as Appendix 1, serves as the fundamental organizing and governance document for municipal partners. It addresses:

- Project administration
- Project goals
- Joining or withdrawing from the IGA
- Decision-making authority
- Budget development
- How members are charged
- How funds are distributed
- Contracting authority
- Auditing and reporting
- Permittee provisions

In Wisconsin, municipal entities have specific statutory authority to enter into agreements to jointly exercise any power that they can exercise individually. States that do not have explicit statutory authority may still be able to use an intergovernmental agreement approach but should clarify this in advance of project development.

Step Nine: Develop a joint monitoring and modeling approach for tracking progress and determining compliance with load reduction and pollutant concentration goals

Monitoring and data collection allows Adaptive Management to 'true up' environmental models and find the best approaches for nutrient reduction. It provides avenues for pay for performance or pay for practice techniques, and over time provides regulators and permit holders greater confidence in nutrient reduction goals.

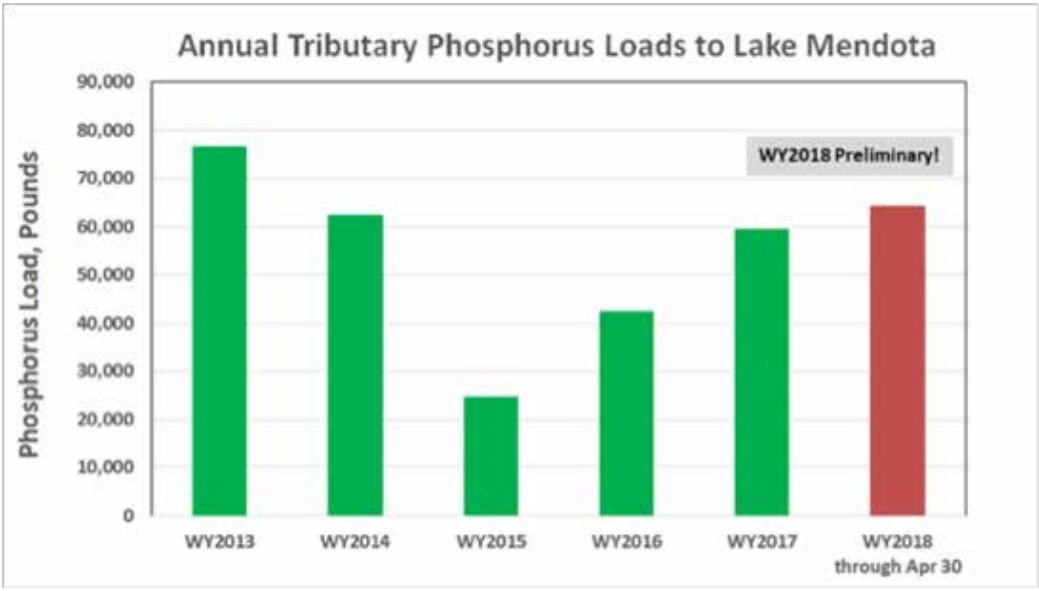
Pollutant load reductions from sewage treatment plants, stormwater and agricultural sources and pollutant concentrations for point sources need to be tracked. Quantified load reductions and concentrations, identified through a combination of monitoring and modeling, are important methods of demonstrating interim progress and ultimate attainment of project goals. Additional methods of

demonstrating progress (farmer engagement, meeting attendance, number of practices implemented) are useful but not sufficient, especially when regulatory certainty or compliance are at stake. Project stakeholders should work with relevant agencies to negotiate the use of a reasonable method for using monitoring and modeling to gauge progress and determine ultimate project success. Stakeholders and regulatory agencies must reach agreement on a methodology for measuring interim progress and attainment of final project goals, if the reductions achieved through a project are to be used by point sources for permit compliance or regulatory certainty purposes.

A commitment to try to measure progress through water quality monitoring, as opposed to just modeling, distinguishes holistic Municipal-Agricultural Watershed Partnerships from water quality trades. In exchange for a commitment to complete monitoring and work toward in-stream water quality goals project stakeholders gain additional implementation benefits and flexibilities. They do not have to contend with interim and final pollutant reduction credits, historical credits, short implementation windows or trade ratios.

While a commitment to water quality monitoring is critical, use of water quality monitoring to document progress, particularly interim progress, can be challenging. In many systems, water quality is oftentimes a lagging indicator of progress or improvement. This may be particularly true in large or complex systems, where results can be highly variable from year to year or within a given year and can be heavily influenced by weather and timing of sample collection.

The following graph helps illustrate the challenge of using water quality monitoring data as the sole indicator of progress. In this example, there has been a steady ramp up of on-the-ground conservation practices in each year, but measured loads have been heavily impacted by the amount and/or timing of precipitation and runoff events. Because of challenges like this, many years' worth of data is needed to document water quality trends. Progress associated with implemented conservation practices or engineered solutions may not be apparent, if in-stream water samples are the only or primary basis for making such a determination. This makes pairing monitoring and modeling efforts important.



To develop a water quality monitoring program, project stakeholders will need to consult with one another and applicable regulatory agencies. Elements of a watershed monitoring plan will, at a minimum, include: parameters that samples will be analyzed for (e.g. TP, TN, NO3-N), sample locations, sampling frequency, sample timing (e.g. baseflow vs. event related sampling) sample type (e.g. grab, composite), collection and analytical methods, and other important factors to ensure that the resulting data is of sufficient quality. Stakeholders will need to collect and analyze in-stream samples and may want to consider edge-of-field monitoring. Edge-of-field monitoring can be an important way to monitor progress and may be something that farmers are already engaging in through watershed activities being carried out by trade associations like the Iowa Soybean Association. In addition to providing important real time monitoring information, edge-of-field monitoring may provide an important means of validating modeling results.

As with identifying pollutants of concern, when identifying monitoring parameters, consideration should be given to addressing current and reasonably anticipated future data needs. For example, the Green Bay project is primarily focused on TP and TSS, as these parameters are the specific focus of the applicable TMDL. However, Green Bay also analyzes water samples for Total Kjeldahl Nitrogen, total dissolved phosphorus, volatile suspended solids, temperature, specific conductivity, pH, and dissolved oxygen. They anticipate further expanding this list to include nitrate/nitrite and ammonia.

Opportunities to work with USGS (usually though a joint funding agreement) and others to collect water samples and/or provide analytical services should be explored. USGS may also be able to provide helpful historical baseline monitoring data that can be used in developing a watershed project. Oftentimes point sources such as wastewater treatment plants or drinking water authorities have staff that have sample collection experience and have laboratories that can provide analytical services. Trade associations working on water quality may also be interested in providing monitoring or water sample testing assistance. In addition, citizen volunteer monitoring programs can provide water quality monitoring services and be a valuable community engagement tool.

Partners in the Yahara WINS project that are supporting water monitoring efforts include:

- USGS-sample collection, flow monitoring, data evaluation
- MMSD-sample collection and analytical services
- Rock River Coalition (citizen volunteer monitoring program)-sample collection, data evaluation
- WDNR-stream biology/habitat evaluation
- Dane County-sample collection

Partners in the Oconomowoc Watershed Protection Plan that are supporting water monitoring efforts include:

- City of Oconomowoc WWTF-sample collection, analytical services, data evaluation
- Citizen volunteers-sample collection
- Sand County Foundation-sample collection and flow monitoring

Partners in the Green Bay Metropolitan Sewerage District ("GBMSD") Pilot Project that supported water quality monitoring efforts include:

- GBMSD-sample collection, analytical services, data evaluation
- USGS-sample collection, flow monitoring
- University of Wisconsin Green Bay-sample collection, data evaluation
- Oneida Tribe-stream biology, data evaluation

In addition to having a sound monitoring plan in place, selecting the appropriate models is critical. In some cases, multiple models may be needed to accurately account for the range of agricultural practices being used in a watershed project. In cases where multiple models are used, stakeholders need to determine whether the models list outputs in different units (e.g. pounds of phosphorus, phosphorus delivered to the edge of the field, phosphorus delivered to the nearest stream). Stakeholders will also need to understand the model process (how a model calculates outputs), output units, and model limitations, in order to communicate results and use results to drive decisions. If a project involves the use of new practices, stakeholders may need to modify existing models to accommodate these practices.

Modeling will need to be done at the watershed and field scale. For watershed-scale modeling, the SWAT model will likely be sufficient for most projects. SWAT can be used to model phosphorus, nitrogen and sediment.[10] At the field scale, multiple models may need to be used to model different structural and management practices being implemented. Field scale models commonly being utilized in Wisconsin projects include: SNAP-Plus and STEPL.[11] SNAP-Plus is a model unique to Wisconsin that is used to calculate the phosphorus index (PI) for fields.[12]

[10]SWAT is a small watershed to river basin-scale model to simulate the quality and quantity of surface and ground water and predict the environmental impact of land use, land management practices, and climate change. SWAT is widely used in assessing soil erosion prevention and control, non-point source pollution control and regional management in watersheds. Additional information on SWAT can be found at https://swat.tamu.edu/

[11]The Spreadsheet Tool for Estimating Pollutant Load (STEPL) is an Excel spreadsheet-based regression model that calculates annual sediment and nutrient load reductions from urban and agricultural practices at a field to watershed scale. STEPL uses soils, drainage, land use, pollutant input and weather data to calculate sediment, phosphorus, nitrogen and BOD reductions from various Best Management Practices (BMPs). STEPL can be used to predict the effect of structural (ex. waste storage facility, retention basins, diversion, fencing for exclusion) and non-structural (ex. Strip cropping, buffers, alum treatment) practices as well as custom practices that have known pollutant load reduction efficiency rates. Additional information on STEPL can be found at http://it.tetratech-ffx.com/stepl/steplweb.html

[12]The phosphorus index is the potential for phosphorus runoff from a specific field to a nearby stream or lake.

In states that do not have models for calculating field PI where stakeholders would like to use PI as a metric, it may be possible to calculate PI by combining the RUSLE model for soil loss with a phosphorus coefficient.[13] STEPL is used to model certain conservation and structural practices on cropland. BARNY is the primary model being used in Wisconsin projects to model barnyard practices.[14] Other models such as the P8 model and the Agricultural Phosphorus Loss Estimator (APLE) model developed by USDA-ARS may also be useful.[15]

Although it has not yet been used in Wisconsin, stakeholders in Wisconsin and other states may also want to strongly consider using USDA's Nutrient Tracking Tool (NTT), which utilizes the Agricultural Policy Environmental eXtender (APEX) model, to model nutrient reductions from agricultural practices.[16] The NTT is currently being parameterized for certain Midwestern states. Before committing to use the tool, stakeholders should ensure that it has been parameterized for their state and will provide accurate load reduction outputs. The NTT models P, N and sediment reductions for structural and management practices from individual fields and can also route the flow of water through HUC-12 watersheds to help determine nutrient loading reductions for a suite of practices being implemented in a local area. This routing function may provide important information that can supplement watershed modeling done through SWAT or the USDA Agricultural Research Service's Agricultural Conservation Planning Framework (ACPF) discussed above. Because NTT models structural and management practices, use of NTT may also eliminate the need to use multiple field scale models and develop model exchange rates.

[13]Revised Universal Soil Loss Equation Version 2 (RUSLE2) is the primary program used by most models and USDA to calculate soil loss from agricultural fields. The model is field-specific with multiple land management categories that can be inputted. The model is designed to connect to a database based on geographic area that provides the base information and options that the user can choose to run the model and make soil loss calculations. The program analyzes soil loss through sheet and rill erosion caused by storm events and the associated overland flow. It does not analyze concentrated flow path (gully) erosion. Climate, soil type, topography and land use and management are the primary factors used to calculate the soil loss. The RUSLE2 user selects all the primary factors, except topography, from the database. RUSLE2 users enter slope length and steepness values to determine topography and also choose a shape descriptions for fields.

[14]BARNY is the State of Wisconsin's version of the USDA Agricultural Research Service (ARS) feedlot runoff model. The BARNY model is still in development and requires additional field verification. It is currently a qualitative assessment of runoff and phosphorus loss from feedlots more than a quantitative one. Numbers from BARNY may be used, but appropriate qualifier ratios may need to be applied. Additional information on BARNY can be found at https://extension.soils.wisc.edu/wcmc/a-new-tool-for-estimating-phosphorus-loss-from-cattle-barnyards-and-outdoor-lots/

[15]The Program for Predicting Polluting Particle Passage through Pits, Puddles and Ponds – Urban (P-8) is an urban watershed-based model that predicts sediment and nutrient in delivery factors in storm water. P-8 uses time based weather data, land use, land runoff curve numbers, pervious to impervious surface ratios, existing storage and land use practices to complete an hourly assessment of storm water flow and sediment, phosphorus and nitrogen delivery. P-8 can be used to predict the effect of structural (ex. Detention ponds, flow splitters) and non-structural (ex. Buffers) practices. Additional information on P-8 can be found at http://wwalker.net/p8/

Annual Phosphorus Loss Estimator (APLE) model is an Excel spreadsheet-based model that calculates agricultural field losses of sediment and dissolved phosphorus in surface runoff. APLE is designed to only calculate phosphorus loss from the field itself. It is not designed to look at loss reductions through a buffer or treatment area. User input data to support calculations are soils, field size, annual weather, crop nutrient uptake, number, type and duration of animals on the field and nutrient inputs. Options that can be analyzed are changes in duration of animals on the field, method of incorporation of manure or fertilizer, etc. Additional information on APLE can be found at https://www.ars.usda.gov/midwest-area/madison-wi/us-dairy-forage-research-center/docs/aple-homepage/

Project stakeholders should work in advance with appropriate regulatory agencies to determine the models and monitoring they will use to document progress in their watershed projects. The Green Bay Metropolitan Sewerage District and the Yahara WINS project MOUs allow interim progress toward P and TSS reductions and achievement of final project goals to be demonstrated through modeling. Having these provisions in project MOUs was a critical factor in gaining point source participation in the Yahara WINS effort. The project would not have moved forward, if agreement had not been reached on using modeling to document interim progress and compliance with final target reductions. Basing progress and regulatory compliance solely on water quality monitoring data presented an unacceptable level of risk for stakeholders. The GBMSD and Yahara WINs project MOUS are included as Appendices 4 and 5.

Step Ten: Service agreements

Projects, especially projects that seek to achieve load reductions through increased conservation in agricultural areas, don't implement themselves. They require an investment in people who can provide the services needed to assist farmers in assessing, engineering, implementing and monitoring conservation practices. In many projects, SWCD, NRCS and county staff who routinely work with farmers and landowners will be expected to play a major role. However, they may not have sufficient staffing capacity to meet the new obligations associated with a major watershed project while maintaining the expected level of service in other parts of the county. Consideration should be given to providing financial assistance to counties or other traditional service providers that have expertise but may have current limitations on the staff resources that they can direct to a new watershed project. To facilitate the provision of services to farmers, stakeholders will need to develop service agreements that identify what services counties or others will provide for the project in exchange for compensation.

The Green Bay project currently provides funding for one county staff position for focused support in its pilot watershed project. The Yahara WINS project has developed service agreements with each of the three counties that have a land base in the Yahara Watershed. The most recent service agreements with Dane County provide funding for staff support and practice implementation. Yahara WINS has structured contracts to include both fixed cost payments and performance-based payments. The fixed-cost portion of the agreement provides the county with a guaranteed source of annual funding for a five-year period sufficient to cover three staff positions. The performance-based component is not guaranteed and is based on the county meeting established phosphorus reduction goals by working with farmers to implement practices. Copies of Yahara WINS' service agreements with Dane and Columbia counties are included in as Appendix 6.

[16]The Agricultural Policy/Environmental eXtender (APEX) model is a field to watershed scale daily simulation used to calculate the potential effect of land management practices on soil and nutrient loss at the field and watershed scale. APEX uses elevation, soils, weather, land use and land management data to calculate stream flow and sediment, nitrogen and phosphorus delivery factors. Additional information on APEX can be found at http://apex.tamu.edu/media/57882/conservation-practice-modeling-guide.pdf

In addition to agreements with counties and farmers, project stakeholders may also want to enter into service agreements with USGS. USGS can provide funding and staff support for the installation, operation and maintenance of water quality monitoring gaging stations. The Yahara WINS project has an extended five-year joint funding agreement (JFA) with USGS to provide support for five USGS gaging stations. The JFA is included as Appendix 7. The WINS project also has a service agreement with the Rock River Coalition, which supports a robust citizen volunteer monitoring program. This agreement is included as Appendix 8.

Step Eleven: Obtain "regulatory certainty"

As mentioned above in Part One, for watershed projects that are being used by point sources as a means of achieving regulatory compliance or certainty, there needs to be a common understanding on key issues between project point source stakeholders and the appropriate regulatory agency. It is important to document common understanding through MOUs, which may need to be executed at both the scoping/pilot project stage (if applicable) and before undertaking planning and implementation of a full-scale project. Examples of areas where common understanding and agreement are needed include:

- Watershed plan development process/timeline and contents
- Watershed scale and boundaries/project area
- Project implementation timeline
- How project implementation will be credited/provide regulatory certainty or compliance
- How agreed upon nutrient reduction levels will measured through modeling and monitoring to demonstrate progress and final compliance
- Which models can be used to measure nutrient reductions
- How often, and in what form, must progress reports be made to applicable agencies
- Options for preserving credits for use in trading or other programs if a project is unsuccessful

As mentioned previously, the Green Bay Metropolitan Sewerage District and Yahara WINS projects both developed MOUs with the Wisconsin Department of Natural Resources. The Yahara WINS project had separate MOUs for the pilot project and the full-scale project. Having a MOU in place that addressed key areas was critical in getting point sources to agree to participate in the full-scale project. Copies of the Green Bay and Yahara WINS MOUs can be found in Appendices 3 and 4.

Step Twelve: Communication, education and outreach

Stakeholders need to regularly communicate with various stakeholder groups and the public throughout the development and implementation phases of Municipal-Agricultural Watershed Partnerships. Funding and staff support for communication, education and outreach should be made available and identified in the watershed plan. Although technical staff on a project may perform some education and outreach functions, it is not realistic for technical staff or project coordinators to provide technical services and all project outreach. The number of staff and time needed for outreach will depend on the size of the project, the diversity of stakeholders, and other factors.

Once a project is underway, ongoing demonstration plots, updates, and outreach is a key way to educate the community on the shared benefit of a municipal-agriculture project. Certain nutrient reduction techniques may be beneficial outright to a farm's operation.

A communications approach should be strategic and include: external and internal objectives and goals, core messages, target audiences, preferred communication channels, communication tools, timeline and metrics for evaluating success of education and outreach effort. This flowchart is provided for illustrative purposes and displays elements that are identified in the most recent version of the Yahara WINS Adaptive Management Plan.

Strategic communication efforts provide several important benefits. Some benefits that flow from strong communication, education and outreach include:

- Providing critical and timely information (technical, environmental and social) to help keep member communities and other partners informed and engaged over the long-term
- Achieving broader community recognition and support
- Providing avenues for member communities and partners to amplify and extend messages about project successes
- Creating participation opportunities for member communities and partners
- Maintaining and potentially expanding project investments and funding

Step Thirteen (optional): Pilot project

A pilot project may be useful in some situations to better evaluate whether a full-scale watershed project can be successfully implemented. A pilot project may be particularly useful in watersheds that are large and complex, where the project is being used for regulatory compliance or certainty by multiple point sources or where there is not a history of collaboration. A pilot project can:

- Allow for a more accurate assessment of nutrient reduction capacity
- Allow parties to gain experience working together and build trust
- Allow time to work out challenging issues with regulatory authorities while still moving forward

Yahara WINS conducted a four-year pilot project. Approximately 25 municipalities partnered and provided supporting funds. Many other non-funding partners (e.g. USGS, Dane County, advocacy/ friends groups) also participated. The pilot project was important because it was the first experience for all stakeholders to engage in a Municipal-Agricultural Watershed Partnerships project based on Wisconsin's Watershed Adaptive Management Option. The pilot project allowed participants time to:

- Gain experience working together on a regulatory compliance project
- Develop the organizational/governance structure for a full-scale watershed project
- Develop a MOU with the Wisconsin DNR on key issues for a full-scale project
- Evaluate agricultural best management practices including cost effectiveness and the willingness of landowners to implement the practices
- Test assumptions used in the development of the project cost model
- Evaluate available alternative compliance options
- Assess water quality impacts associated with practice implementation
- Assess the level of community support and willingness to contribute funds to a project with conservation practice implementation outside of municipal borders
- Evaluate funding mechanisms for nonpoint source loading

A copy of the Memorandum of Understanding between participants in the Yahara WINS pilot project is provided as Appendix 9. Green Bay Metropolitan Sewerage District also conducted an adaptive management pilot project. The pilot project charter is provided as Appendix 10.

Conclusion:

States outside of Wisconsin are working hard to achieve the goals laid out in their NRS and to move the needle on implementation, nutrient load reductions and water quality improvements. As a concrete next step, states can explore Municipal-Agricultural Watershed Partnerships. While Municipal-Agricultural Watershed Partnerships will not be viable in all areas, they do provide a workable and proven option for advancing implementation progress through municipal-agricultural transactions. Municipal-Agricultural Watershed Partnerships present an opportunity to provide regulatory certainty to point sources and to provide recognition for voluntary efforts by farmers. These efforts can also create new, long-term, flexible funding for farmers to implement conservation practices that will improve soil health and help restore water quality.

Appendices

Appendix 1: Intergovernmental Agreement for an Adaptive Management Plan for the Yahara Watershed (2016)

Appendix 2: Yahara Watershed Improvement Network (Yahara WINS) Strategic Communications Plan (December 2018)

Appendix 3: 2017 Yahara WINS Grant Agreement with the Yahara Pride Farms

Appendix 4: Memorandum of Understanding between Green Bay Metropolitan Sewerage District and the Wisconsin Department of Natural Resources, Confirmation of Understanding Regarding Adaptive Management Program (2018)

Appendix 5: Memorandum of Understanding (between the Wisconsin Department of Natural Resources and Madison Metropolitan Sewerage District) for an Adaptive Management Pilot Project in the Yahara Watershed (2012)

Appendix 6: Service Agreements Between Yahara WINS and Dane County
Service Agreement Between Yahara WINS and Columbia County

Appendix 7: Joint Funding Agreement Between the United States Geological Survey and Madison Metropolitan Sewerage District for Gaging Stations in Adaptive Management Project Area for Yahara WINS

Appendix 8: Contract Between Yahara WINS and the Rock River Coalition to Fund a Volunteer Citizen Monitoring Program

Appendix 9: Memorandum of Understanding Between the Madison Metropolitan Sewerage District and the Wisconsin Department of Natural Resources for the Yahara Watershed Adaptive Management Program (2014)

Appendix 10: Silver Creek Pilot Watershed Project Team Charter

Appendix 11: Pay for Performance Conservation: A How-To Guide

Appendix 12: Wisconsin Department of Natural Resources, Fact Sheet for Adaptive Management