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NORTH CENTRAL REGION
WATER NETWORK

Successful Watershed Management in the Midwest: Getting to Scale

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Executive Summary

After decades of experience and research in watershed management, much has been learned about developing and implementing successful watershed initiatives that improve environmental and social outcomes. However, currently available water quality data from United States Environmental Protection Agency shows that 51% of assessed rivers and streams; 70% of assessed lakes, reservoirs, and ponds; 79% of assessed bays and estuaries; 73% of assessed coastal shoreline; 92% of assessed ocean and near coastal waters; 48% of assessed wetlands; 98% of assessed Great Lakes shoreline; and 100% of assessed Great Lakes open waters are impaired. Nitrogen, phosphorus, mercury, and polychlorinated biphenyls are among the most common causes of impairment.

Given the current condition of Midwest water resources and the complexity of actions needed to achieve lasting success, deliberate efforts need to be made to implement watershed management across larger geographies in a robust way. This paper offers a vision and theory of change for how successful watershed management systems can be scaled up across the Midwest. It (a) proposes a primary unit of watershed management that can be scaled up and sustained over time, b) articulates the necessary elements to foster and support the scale-up efforts, and (c) proposes actionable strategies for operationalizing the scale-up effort. While we focus the cases and recommendations of this paper in the Midwestern U.S., we hope that some of the recommendations will have applicability in other regions of the U.S. and to the field of watershed management as a whole.

For the purposes of this paper, we define successful watershed management as a system that achieves water-related environmental, social, and economic goals in a designated time frame, with the goals and the time frame agreed upon by a representative group of stakeholders.

The Scalable Unit

A scalable unit is defined as a "microsystem or a mesosystem that can be replicated as an intervention is scaled up." It is typically an administrative unit that includes both the infrastructure and the relationship architecture that are likely to be present in larger scales of the same system.

SUMMIT PARTICIPANTS DEFINED THE SCALABLE UNIT IN WATERSHED MANAGEMENT IN TWO PARTS:

1. Scale-Appropriate Planning, Prioritization and Implementation: Summit participants noted that watershed planning, prioritization and implementation would need to occur in different ways at different scales. In the interest of efficiency, watershed assessment and prioritization (high-level planning) could be conducted primarily on larger scales, with more detailed planning and implementation at smaller scales focused in priority watersheds and critical areas. In most states in the Midwest, watershed planning at approximately HUC 8 scales (average 703 sq. miles) can represent the social and ecological needs within the watershed. Successful implementation of watershed plans requires strong, local networks to expand awareness of watershed issues and maintain trust. In the upper Midwest, these local social networks tend to be more similar in size to a HUC 10 (typically ranges in size from about 40,000-250,000 acres) or HUC 12 watershed (typically ranges in size from about 10,000-40,000 acres), therefore implementation at smaller scales tends to be necessary for success. Although summit participants recommended

HUC 8 and similar scales as a focus for assessment and prioritization and smaller scales as a focus for more detailed watershed planning and implementation, they recognized that there needs to be some flexibility around the scalable unit given the differences in populations, geographies, and governance systems in different states. Summit participants also highlighted the need to prioritize HUC 12s based on local needs and readiness.

2. **Necessary Support Elements of the Scalable Unit:** Summit participants also identify four necessary elements that would be required to support the scale up of watershed management. These necessary elements are considered critical to the success of watershed management efforts at smaller scales and it's been concluded that these elements would have to exist at larger scales in order for scale up efforts to be successful.

   THE FOUR ELEMENTS ARE:

   Human capital: Skilled and trained personnel in leadership or management roles are crucial to the effective implementation of any initiative. To find the right people it is important to have a clear understanding of the skills required to manage and implement scaling up efforts and to offer training to fill any skill gaps.

   Social capital: It is also important, especially in the watershed context, to recruit local champions who are invested in the scale-up process. Listening carefully to local stakeholders to understand their needs is also important for laying the groundwork of any scaling up effort. Engaged stakeholders can also lead to increased buy-in from government officials and corporate representatives in the scale-up effort.

   Policy framework: Identifying and developing policies that promote the scale up of successful initiatives can incentivize such efforts.

   Finance framework: Reliable and adequate sources of funding should be established. This will allow leadership and managers to focus on the initiatives rather than fundraising. Pressures created by the varying interests of multiple funding agencies can also be reduced.

Operationalizing the Scale-Up of Watershed Management in the Midwest

The first step in any scaling up effort is articulating a vision and outlining strategies to implement the vision. This paper corresponds to this first step of the framework.

Scaling up watershed management in the Midwest will require support from many different constituencies. The Midwest has robust leadership at the state and multistate levels and across sectors addressing water resource management. However, summit participants agreed that no single organization has the capacity or resources to operationalize the scale-up of successful watershed management across the region. To succeed in this effort, we suggest a new, cross-sector, collaborative organization to work toward the shared goal of scaling up watershed management in the Midwest. For ease of discussion, we will call this organization a Midwest Watershed Collaborative. The Midwest Watershed Collaborative concept was inspired by existing collaboratives, such as the Source Water Collaborative and Chicago Wilderness.

Similar to the Source Water Collaborative, a Midwest Watershed Collaborative could support pilot efforts and offer centralized services to organizations implementing the pilot efforts.

When forming such a collaborative, existing organizations and networks can be leveraged to house and/or lead the new effort. A collaborative must include key stakeholders and champions from the environmental and non-environmental sectors. Given the critical role that policy plays in watershed management, a collaborative must also include partners who participate in the political process, engage with policymakers, and can mobilize stakeholders to advocate for a collaborative in policy and funding arenas. Influential people and opinion leaders are especially important, since their support and participation in a collaborative would provide legitimacy and urgency. Once a collaborative is established as being legitimate, it would become easier to influence policy, attract funders, and increase public support.

TO ESTABLISH THE ELEMENTS NECESSARY TO SUPPORT SCALE-UP, SOME OF THE TASKS THAT A COLLABORATIVE WILL NEED TO UNDERTAKE ARE:

- Develop a knowledge management system
- Cultivate new leadership
- Organize outreach campaigns
- Influence policy
- Provide technical and financial expertise

While there is substantial evidence for the vision and scale-up strategies we propose, it will be important to assess the current state of progress, begin more systemic strategies to expand adoption of necessary elements, and to test, monitor and evaluate scale-up efforts as a whole.

A collaborative and its members would need to periodically reassess and adapt the theory of change laid out in this paper as well as the strategies for scaling-up.

While this paper has focused on scaling up successful watershed management systems, it is important to recognize that capacity can be lost as well. While some Midwestern states have increased their watershed management capacity over the past decade, other states have lost significant capacity over the same time period. By promoting a shared understanding of the foundations and necessary elements of successful watershed management systems across the Midwest, a collaborative and its members would be able to more effectively advocate at local, state, and national scales and maintain the capacity to achieve shared water resource management goals.

Introduction

After decades of experience and research in watershed management, much has been learned about developing and implementing successful watershed initiatives that improve environmental and social outcomes. However, currently available[1] water quality data from United States Environmental Protection Agency (USEPA) shows that 51% of assessed rivers and streams; 70% of assessed lakes, reservoirs, and ponds; 79% of assessed bays and estuaries; 73% of assessed coastal shoreline; 92% of assessed ocean and near coastal waters; 48% of assessed wetlands; 98% of assessed Great Lakes shoreline; and 100% of assessed Great Lakes open waters are impaired (USEPA, n.d.-a). Some of the common causes of impairment are mercury, nutrients, and polychlorinated biphenyls (USEPA, n.d.-a).

The Midwestern United States[2] was the home of the first watershed conservation project in the nation (Hitch, 2015) and continues to be a hotbed of conservation innovation. Many of the cases presented in this paper highlight how at local, state, and regional scales across urban and rural landscapes, from agencies, to academia, environmental organizations, agriculture, and utilities, people are committed to moving the needle toward water sustainability. Despite strong leadership, however, Midwestern watershed initiatives like those in the rest of the U.S. have not achieved broad, lasting environmental impact. This is partly because landscape use is intensifying through agricultural intensification and ongoing urbanization, and more frequent extreme weather events are exacerbating runoff (Pryor et al., 2014). Lag times between land management changes and measurable water quality changes (Meals, Dressing, & Davenport, 2010) and the need for many diverse groups to come together to manage water creates additional complexities in achieving and documenting improved water management. While states' establishment of priority watersheds have helped organize watershed management efforts, funding for watershed initiatives is frequently covers only fractions of the landscape for less than 5 years at a time. For example, while funding for watershed projects allocated through Section 319 of the Clean Water Act and USDA NRCS Regional Conservation Partnership Program grants are critical components of successful watershed managment efforts, they typically fund projects for less than 5 years. USEPA, NRCS, states, and local implementers are developing new approaches to mitigate fragmentation, however, short timelines and patchwork projects do not match the reality of water connectivity across the landscape or the reality of people, families, and businesses that have a long history of stewardship where they live and work.

Given the current condition of Midwest water resources and the complexity of actions needed to achieve lasting success, deliberate efforts need to be made to implement watershed management across larger geographies in a robust way. This paper offers a vision and theory of change for how successful watershed management systems can be scaled up across the Midwest. The paper a) proposes a primary unit of watershed management that can be scaled up and sustained over time, b) articulates the necessary elements to foster and support the scale-up efforts, and c) proposes actionable strategies for operationalizing the scale-up effort. While we focus the cases and recommendations of this paper on the American

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[1] The USEPA report used data from Assessed Waters reports and Impaired Waters reports for each state ranging from 2004-2016.

[2] According to the United States Census Bureau, the Midwest includes Indiana, Illinois, Michigan, Wisconsin, Ohio, Iowa, Kansas, Missouri, Minnesota, Nebraska, South Dakota, and North Dakota.

Midwest, we hope that some of the recommendations will have applicability in other regions of the U.S. and in the field of watershed management as a whole.

THIS PAPER IS ORGANIZED IN THE FOLLOWING MANNER:

Section 1: **Watersheds, watershed management, and the watershed approach** defines these terms to provide a common understanding.

Section 2: **Defining success in watershed management** describes the challenges of conceptualizing success in watershed management and provides clarity for how the authors of this paper measure, define and conceptualize success.

Section 3: **Perspectives on scaling up and applications for watershed management** explores literature on scaling up in the social, non-profit, and health sectors, and discusses its applicability to watershed management.

Section 4: **Methodology** describes the methods and sources of information that were used to develop the content and recommendations in this paper.

Section 5: **Defining the scalable unit** defines the term scalable unit and proposes a scalable unit to represent the full scale of watershed management.

Section 6: **Necessary elements to support the scale-up of watershed management** presents a list of elements that are critical to the success of scaling up efforts. The four categories of necessary elements are human capital, social capital, policy framework, and finance framework.

Section 7: **Operationalizing the scale-up of watershed management in the Midwest** proposes an operationalization framework to plan and manage the scaling up process.

Section 8: **Conclusion**

The primary audiences for this paper are watershed management leaders in the Midwest, including watershed coordinators, community planners, local, state, and federal agencies, utilities, conservation NGOs, professional societies, utilities, and universities.

Watersheds, watershed management, and the watershed approach

A watershed is commonly defined as a topographically delineated area that collects and drains water from rain and snowfall to a common outlet such as a stream, lake or river (USEPA, n.d.-b). Watersheds are a widely accepted unit for watershed management, and a useful hydrological unit since it allows for a systems approach to studying land and water (Kerr & Chung, 2001). Additionally, watersheds are physical-biological units and socioeconomic-political units that provide useful bounds for watershed planning and implementation (Ffolliott, Baker, Edminster, Dillon, & Mora, 2002).

Watershed management is the implementation of land and water management practices that ensure the preservation, conservation and improvement of water and other natural resources within a watershed (Achouri, 2003). Recognizing the interrelationships among soil, water, and land use and the connection between upland and downstream areas is fundamental to watershed management (Ffolliott et al., 2002). Developing strategies for the sustainable management of natural capital within specific social, economic, and environmental contexts involves the integration of aspects of forestry, agriculture, hydrology, ecology, soil science, physical climatology and other sciences. The multidisciplinary nature of watershed management calls for collaboration among natural scientists, engineers, social scientists, policy makers, and citizens that own and manage the land. In essence, watershed management is resource management with the watershed serving as the organizing unit (Achouri, 2003).

According to the USEPA, the watershed approach is the most effective framework to address today's water resource challenges. Over the past few decades, the USEPA and other governmental agencies have given priority attention and funding to the watershed approach (Born & Genskow, 1999; Browner, 1996; USEPA, 2018). The watershed approach is defined as "a coordinating framework for environmental management that focuses public and private sector efforts to address the highest priority problems within hydrologically-defined geographic areas, taking into consideration both ground and surface water flow" (Browner, 1996). The guiding principles of the watershed approach are: (a) Partnerships: Involving stakeholders who will be affected by management decisions throughout the decision-making process; (b) Geographic focus: Activities are directed within specific hydrologically defined geographic areas; and (c) Sound management techniques based on strong science and data: Using sound scientific data, tools, and techniques in an iterative decision-making process (Browner, 1996). In addition, Born and Genskow (1999) identified the key elements of the watershed approach as:

- the application of a systems approach using watersheds as the fundamental analytical unit;
- multiple-scale, multiple-objective planning for watershed and sub-watershed units;
- multi-organizational coordination and public participation;
- science-based and information-driven decisions; and
- adaptive processes to reflect changing conditions, needs, and new knowledge (Born & Genskow, 1999; USEPA, 2013).

In this paper, the term **watershed management** refers to the management of land and water resources using the watershed approach.

Defining success in watershed management

There are significant challenges to defining what success looks like for watershed management initiatives. Ecology, demographics, and governance structures are variable within and across states resulting in different ideas of what constitutes success. Many watersheds cross the boundaries of common governmental units (e.g., counties, states) sometimes resulting in different measurement systems. Time lags between practice implementation and changes in water quality or supply can obscure both improvements and lack of progress. Finally, the overall complexity of watershed issues makes it difficult to attribute outcomes to specific actions (Born & Genskow, 2000; Genskow & Born, 2006; Kenney, 2000; Leach, 2002; Moore & Koontz, 2003; Sabatier et al., 2005). As a result, there is a lack of consensus among researchers, as well as practitioners, watershed managers, and funders, regarding the definition of success and the criteria for measuring success in watershed management.

Over the years, two general measures have evolved to evaluate the success of watershed management initiatives. The first type recognizes organizational, process, and social-capital-related outcomes as measures of success. Some examples of these outcomes are watershed group formation, dispute resolution, and trust building. The second type requires watershed management initiatives to be judged based on their success in achieving environmental outcomes such as waterbodies meeting designated uses (Genskow & Born, 2006; Kenney, 2000; USEPA 2013) and providing other ecosystem services, such as production of food, fuel, and fiber.

Both environmental and social measures are necessary to fully evaluate the success of watershed management initiatives. Improved environmental outcomes may not be measurable for decades due to the years necessary to plan and implement watershed management initiatives, as well as legacy issues such as altered stream geomorphology and phosphorus build-up take years. Therefore, organizational, process, and social-capital-related outcomes can serve as important intermediary measures of success (Born & Genskow, 1999; Genskow & Born, 2006; Kenney, 2000; Prokopy, Genskow, et al, 2009). In addition, some social measures help evaluate the social infrastructure that can support management practices that maintain or improve environmental quality. However, the relationship between social and environmental measures is rarely linear or causal, so caution should be exercised when developing and utilizing success criteria (Kenney, 2000).

For the purposes of this paper, we define successful watershed management as a system that achieves water-related environmental, social, and economic goals in a designated timeframe, with the goals and the timeframe agreed upon by a representative group of stakeholders.

Perspectives on scaling up and applications for watershed management

Experience and research in watershed management has provided us with many valuable lessons on effective watershed management in various contexts. Some cases of successful watershed-scale interventions have been reported throughout the U.S. over the past few decades, but these isolated successes have not collectively added up to broadscale improvements in water quality. A report by the Food and Agriculture Organization of the United Nations, *Preparing the Next Generation of Watershed Management Programs*, identifies several key issues of major concern related to participatory, integrated watershed management. One of the issues identified relates to scalability. The report states that there is uncertainty about the sustainability and replicability of watershed projects and calls for further investigation, analysis and consultation on this subject (Achouri, 2003). The World Bank, too, raised similar concerns. Its review of watershed management projects noted that "many [World] Bank projects, while able to achieve considerable gains in the short term as a result of an intensive injection of funds and expertise, are neither replicable nor sustainable following project completion" (World Bank, 2000).

If the lessons learned from successful watershed management initiatives can be systematically implemented on larger scales, broader impact could be achieved. The first step in successfully expanding and institutionalizing the implementation of successful watershed management initiatives on larger scales is the development of a vision and actionable strategies. This paper offers both a vision and strategies to execute the vision to scale up the implementation of successful watershed management initiatives across the Midwest.

In order to understand the principles of scaling up and its benefits and constraints, we reviewed literature from the social, nonprofit, and health sectors, where has been comprehensively examined and executed. These scaling up concepts were adapted to the watershed management context and are detailed in the following sections.

What is "scaling up"?

Scaling up (or getting to scale), involves expanding an intervention, such as a program, practice, or idea, that has been proven to be effective in order to reach larger populations and achieve impact on a transformative scale (Eckhart-Queenan, Grindle, Hadley, & Thompson, 2015; Harris, 2010; Weiss, 2010). Apart from spreading the impacts across a larger scale, scaling up watershed management initiatives can also lead to faster achievement of outcomes, an increase in resources, greater visibility, and higher levels of support (Bradach, 2003; Harris, 2010). Scaling up most commonly involves adapting a successful intervention to a new site or expanding the capacity of an existing site to serve more people (Harris, 2010). The primary objective of scaling up is to reproduce the results of a successful program rather than simply recreating all its features (Bradach, 2003). Furthermore, scaling up goes beyond simply the replication of programs and can involve the scaling up of innovations, technologies, skills and policies (Coffman, 2010).

In the context of watershed management, scaling up involves adapting lessons learned from successful models of watershed management to larger geographic scales. This does not imply that lessons learned should be replicated or standardized across the nation without consideration of local conditions and needs. Instead, scaling up strategies must incorporate and reflect the unique physical and social characteristics of each watershed. This requires the creation of a suitable institutional structure to guide and develop the scaling up process.

When is scaling up viable and justified?

Scaling up has potential and can be justified for initiatives that meet these conditions: (a) There is substantive evidence of success to justify scaling up; (b) The approach has a strong theory of change or logic model that links inputs to outcomes and impacts; (c) The initial outcomes are encouraging; and (d) There is an evaluation system in place to track key performance data going forward (Bradach, 2003; Harris, 2010).

As a result of decades of research on watershed management, there is strong evidence indicating that certain models or practices in watershed management, supported by robust theories of change, are more likely to lead to success (e.g., management informed by sound science and local knowledge, robust participation from people affected by management decisions). However, best practices rarely treat a sufficient portion of the landscape or a sufficient portion of the water flowing through it to achieve water management goals.

Once the determination is made that an initiative has the potential to be scaled up, a plan, institutional structures, supporting systems and infrastructure need to be developed to ensure success at full scale.

What can we learn about scaling up from the private sector?

Scaling up in the for-profit sector has been established in the form of franchising, and it offers some valuable lessons that can be applied to the watershed context. Although there are differences between the environmental and for-profit sectors, there are lessons that sectors seeking to scale up can learn from franchising:

- Adopting a recognized model: Building on or replicating successful programs at new sites makes it easier to attract resources since funding agencies know that the new program has a positive track record. This lesson is especially relevant to watershed initiatives that are looking to attract investments from the private sector.

- The value of proven programs: The advantages of leveraging knowledge generated by programs that have been proven to be successful are: (a) new sites can replicate these successful programs at faster rates, (b) the odds of obtaining the desired outcomes are higher, and (c) the risk of failure is lower. This sharing of knowledge among sites where similar watershed initiatives are being implemented can be facilitated by developing a learning network.

- The value of a network: A network of sites where similar initiatives are being implemented allows for the exchange of knowledge and ideas that promote experimentation and learning. When new sites are added to the network they can access resources and expertise that are generated by other sites (Bradach, 2003).

What can we learn about scaling up from the public health sector?

Cases of successful scaling up that most closely reflect the watershed management context are from public health. Barker, Reid, and Schall (2016) described four steps in a sequence of activities that are required to scale up a program. The four steps are: (1) Set-up, (2) Develop the "scalable unit", (3) Test of scale-up, and (4) Go to full-scale (Fig 1). The first step, set-up, "prepares the ground for introduction and testing of the intervention that will be taken to full scale." The second step, developing the "scalable unit," involves the development of a change package by testing out interventions at individual sites. The third step, test of scale-up, is where interventions are tested out in different settings. The last step, go to full-scale involves the rapid uptake of the intervention through replication across numerous sites (Barker et al., 2016).

The context and concerns described in Barker, Reid, and Schall (2016) framework resemble those that might be encountered in watershed management (e.g., high levels of complexity, solutions that need to serve large populations, limits to market-based approaches), therefore their steps to scale up a program were used as the basis to develop the framework to scale up watershed management in the Midwest.
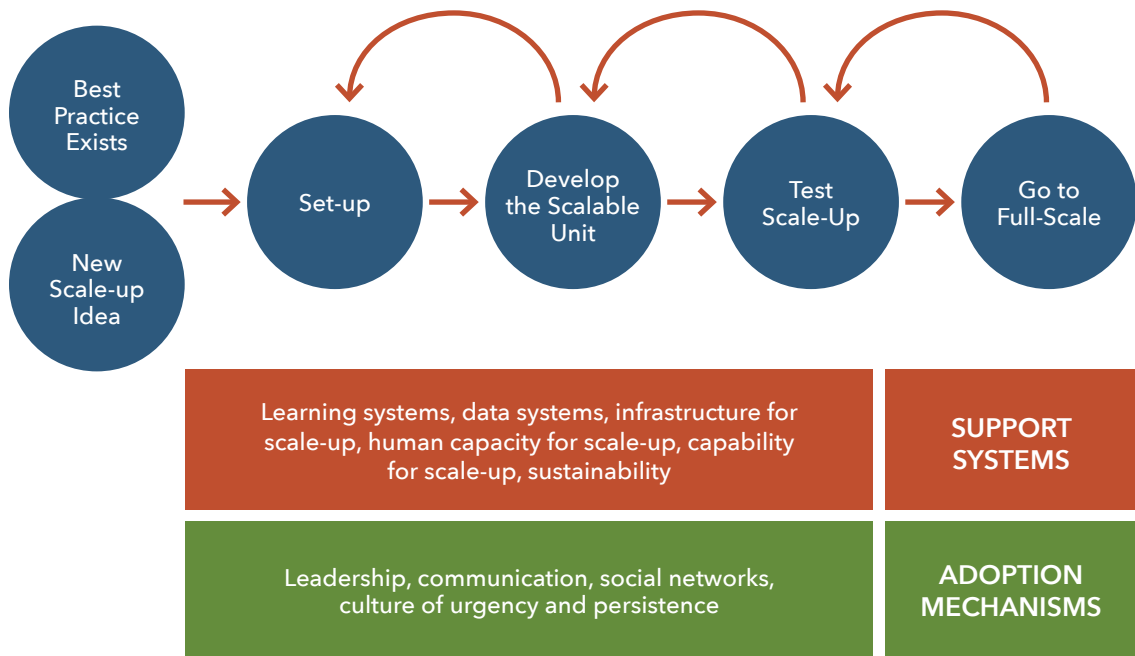

Figure 1. Framework for going to full-scale (modified from Barker, Reid, & Schall, 2016).

Methodology

This white paper is informed by two sources of data: (a) Peer and nonpeer reviewed literature and (b) watershed experts who attended a summit in November 2017. The strategies to scale up watershed management initiatives that are presented in this paper were developed from these two sources of data so as to reflect both real-world, on-the-ground expertise and academic expertise.

The summit at which the strategies to scale up watershed management initiatives were developed was titled "Successful Watershed Management in the Upper Midwest: Getting to Scale" and was held on November 6-7, 2017 in Dubuque, Iowa. The summit had 40 participants. Participants represented a variety of sectors, including government, academic, nongovernment, independent consulting, Extension, and watershed management.

The summit began with an introduction to the concept of scaling up and case studies of successful watershed management in the Midwestern states of Wisconsin, Minnesota, Nebraska, and Iowa. The rest of the summit consisted of three working sessions where participants deliberated on the definition of a "scalable unit" for watershed management, the necessary elements to support the scale-up of watershed management in the Midwest, and strategies to operationalize the scale-up. Ideas generated during the three working sessions were recorded and later organized by the authors of this paper. This paper summarizes the ideas and strategies that were developed at the summit and justifies them with literature and case studies.

By integrating two sources of information, namely literature and summit participants, we hope to present a comprehensive vision and actionable strategies to implement the scale-up of watershed management initiatives across the Midwest.

Defining the scalable unit

We begin our discussion of scaling up watershed management in the Midwest by defining exactly what is to be scaled up: the scalable unit.

A scalable unit is defined as a "microsystem or a mesosystem that can be replicated as an intervention is scaled up." It is typically an administrative unit that includes both the infrastructure and the relationship architecture that are likely to be present in larger scales of the same system (Barker et al., 2016).

SUMMIT PARTICIPANTS DEFINED THE SCALABLE UNIT IN WATERSHED MANAGEMENT IN TWO PARTS:

1. Scale-Appropriate Planning, Prioritization and Implementation: Summit participants noted that watershed planning, prioritization and implementation would need to occur in different ways at different scales. In the interest of efficiency, watershed assessment and prioritization (high-level planning) could be conducted primarily on larger scales, with more detailed planning and implementation (e.g. USEPA nine element planning) planning at smaller scales focused in priority watersheds and critical areas (USEPA, 2008b). In most states in the Midwest, watershed planning at approximately HUC 8 scales , which averages about 450,000 acres (Virginia Department of Conservation and Recreation, n.d.) can represent the social and ecological needs within the watershed. Successful implementation of watershed plans requires strong, local networks to expand awareness of watershed issues and maintain trust. In the upper Midwest, these local social networks tend to be more similar in size to a HUC 10 watershed, which typically ranges in size from about 40,000-250,000 acres, or a HUC 12 watershed, which typically ranges in size from about 10,000-40,000 acres) (Wilson, K.V., Clair, M.G., Turnipseed, & Rebich, 2009), therefore implementation at smaller scales tends to be necessary for success. Although summit participants recommended HUC 8 or HUC 10 scales as a focus planning and smaller scales as a focus for implementation, they recognized that there needs to be some flexibility around the scalable unit given the differences in populations, geographies, and governance systems in different states. For example, some watersheds might need more intensive planning efforts at the local HUC 12 scales than others. Summit participants also highlighted the need to prioritize HUC 12s based on local needs and readiness.

2. Necessary Support Elements of the Scalable Unit: Summit participants also identify four necessary elements that would be required to support the scale up of watershed management. These necessary elements are considered critical to the success of watershed management efforts at smaller scales, and it's been concluded that these elements would have to exist at larger scales in order for scale up efforts to be successful.

THE FOUR ELEMENTS ARE:

Human capital: Skilled and trained personnel in leadership or management roles are crucial to the effective implementation of any initiative. To find the right people it is important to have a clear understanding of the skills required to manage and implement scaling up efforts and to offer training to fill any skill gaps.

Social capital: It is also important, especially in the watershed context, to recruit local champions who are invested in the scale-up process. Listening carefully to local stakeholders to understand their needs is also important for laying the groundwork of any scaling up effort. Engaged stakeholders can also lead to increased buy-in from government officials and corporate representatives in the scale-up effort.

Policy framework: Identifying and developing policies that promote the scale up of successful initiatives can incentivize such efforts.

Finance framework: Reliable and adequate sources of funding should be established. This will allow leadership and managers to focus on the initiatives rather than fundraising. Pressures created by the varying interests of multiple funding agencies can also be reduced (Barker et al., 2016; Bradach, 2003; Eckhart-Queenan et al., 2015; Harris, 2010).

LARGER SCALE

SMALLER SCALE

12-Digit HUC

10-Digit HUC

8-Digit HUC
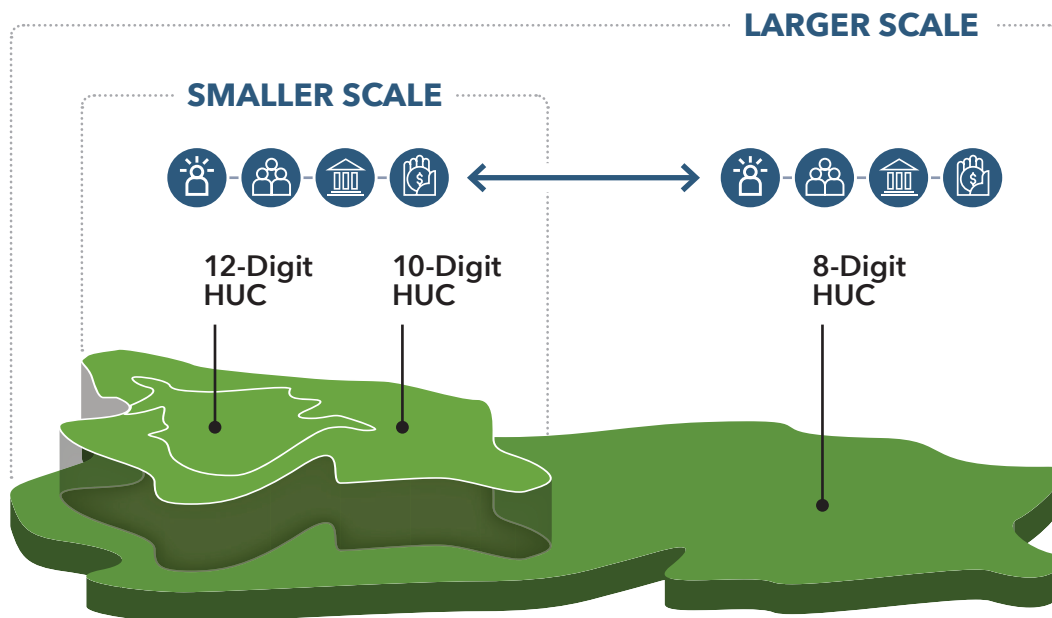
Necessary elements to support the scale-up of watershed management

This section describes the four necessary elements to support the scale up of watershed management efforts namely, human capital, social capital, a policy framework, and a finance framework.

In an effort to understand the conditions under which watershed management is successful, summit participants considered the organizational and sociopolitical contexts in which they operate. They identified four elements as being critical to the success of watershed management efforts at smaller scales and as necessary conditions for the success of watershed management efforts at larger scales.

Summit participants recognized that states have already established frameworks for watershed management. Some states have incorporated components of the necessary elements into their watershed frameworks. While we found that there were often substantial gaps between existing programs and all the elements listed in this section, to get to scale these states can build on their existing frameworks rather than starting from scratch.

In this section, these necessary elements are explored and strategies to develop them at larger scales are presented.

a. Human Capital

Drawing from their extensive experience in watershed management, summit participants suggested that human capital and effective leadership are critical to successful scaling up efforts. Various studies have identified human capital as a critical factor for the success of watershed initiatives at smaller scales. Summit participants emphasized human capital in the form of leadership from watershed coordinators, citizen participation, and leadership from landowners and land managers in both urban and rural landscapes. Strategies to establish human capital at larger scales are explored in this section.

SUMMIT PARTICIPANTS OFFERED THE FOLLOWING RECOMMENDATIONS RELATED TO MAXIMIZING HUMAN CAPITAL:

• Establish a **nested management structure** corresponding to the scalable unit. For example, watershed managers at HUC 8 and similar scales would conduct watershed assessment and prioritization, and watershed coordinators at HUC 12 and similar local scales would lead more detailed planning and implementation efforts.

• Invest in **leadership of watershed professionals** by
  • professionalizing watershed management by establishing educational qualifications and training requirements for watershed professionals,
  • developing compensation guidelines and model position descriptions for watershed professionals,
  • establishing professional organizations to support the professional development of watershed professionals and increase networking opportunities, and
  • developing tiered professional certification programs for citizens and watershed professionals.

- Encourage **citizen leadership** and participation in watershed initiatives by
  - recruiting citizen leaders to champion watershed initiatives within their communities,
  - supporting the participation of local government officials in collaborative watershed groups, and
  - supporting landowner and land manager participation in watershed groups.

(A) Nested management structure:

Summit participants recommended establishing a formal, nested management structure to help improve efficiency and provide clarity around roles and responsibilities. They proposed a management structure with two levels of management at the scales that correspond to the scalable unit:

- Managers at larger scales: Watershed assessment and prioritization would be conducted at larger scales such as HUC 8. Personnel at these scales would lead assessment efforts and support more detailed planning and implementation by coordinators at smaller scales.

- Watershed coordinators at smaller scales: more detailed watershed coordination, planning and implementation activities would occur at smaller scales, such as HUC 12, primarily led by watershed coordinators. In the experience of summit participants, one coordinator could prioritize a single small watershed for at least 5 years then address other nearby priority areas as part of a rotational strategy. Any transition to new watersheds should only occur after having adequate time to develop relationships and trust in the first watershed, or as part of efforts to reach people that can influence landowners and managers in the first watershed.

Summit participants also indicated that more detailed planning and implementation may occur at larger scales in areas that are more sparsely populated and where social networks allow. Participants from Great Plains states were more likely to indicate that watershed coordinators could be successful at larger scales, indicating the importance of paying attention to the nature of the social fabric where watershed management efforts take place.

In this case, too, summit participants acknowledged that management structures would ultimately depend on the populations, geographies and governance systems in different states, and they recommended that flexibility be maintained. Managers in Midwestern states and watersheds that are more sparsely populated may find that implementation at larger scales may work for their communities and stakeholders. However, care should be taken to ensure that the implementation unit is small enough for watershed coordinators to be successful and for environmental changes due to management to be detected.

(B) Effective leadership:

To ensure the long-term success of the nested management structure, summit participants emphasized the need for effective and ongoing leadership from a diverse group of stakeholders.

Evidence for the role of effective leadership within multilevel governance systems that manage complex ecosystems is provided by Olsson, Folke, Galaz, Hahn, and Schultz, (2007). Leadership is a critical factor in bridging multilevel governance systems to build and maintain the resilience of complex and dynamic ecosystems. Leadership can come in various forms such as key individuals who provide vision for management (Agranoff & McGuire, 2001; Westley, 2004), key stewards who facilitate the flow of knowledge and information from different sources, and network leaders who represent the interests of different stakeholder groups (McCay, 2002). These leaders and actor groups serve the roles of knowledge carriers, generators, and retainers, facilitators, stewards, sense makers, interpreters, visionaries, inspirers, innovators, experimenters, followers, and reinforcers (Folke, Hahn, Olsson, & Norberg, 2005).

Apart from the formal leadership outlined in the nested management structure, summit participants also identified leadership support in the form of technical and administrative expertise as essential. Technical services, as well as educational and financial services, are often provided directly to farmers by private and public sector farm advisors (Bonnell, 2018). Farm advisors can be certified crop advisors, soil and water conservation technicians, Extension educators, and agricultural products and services representatives, and were identified by summit participants as key stakeholders with whom watershed professionals need to build relationships. Furthermore, leadership by citizens (ideally a core group of credible and committed stakeholder champions), including those who own and manage land, is important. Other forms of leadership were also discussed, including leadership from evangelists with power and influence within watershed communities, and liaisons who can network among communities and give people a voice.

(i) Leadership by watershed professionals: Multiple literature reviews indicate that effective leadership by watershed professionals is integral to the success of watershed initiatives. Of the 37 studies on multistakeholder watershed partnerships analyzed by Leach & Pelkey (2001), 22 of them identified effective leadership and management as a factor for success. Other factors included adequate funding, interpersonal trust, and committed participants. Also, specific characteristics of watershed coordinators, such as neutrality and positive perceptions of effectiveness, were positively associated with the group's perceived impact (Leach & Sabatier, 2003).

IN ORDER TO NURTURE THE LEADERSHIP SKILLS OF WATERSHED PROFESSIONALS AND TO MAINTAIN A HIGH STANDARD FOR WATERSHED LEADERSHIP, SUMMIT PARTICIPANTS RECOMMENDED THE ESTABLISHMENT OF THE FOLLOWING SUPPORT ELEMENTS:

• Access to professional development opportunities: For managers and coordinators at all scales to be successful, they must have easy access to professional development opportunities. Some professional development trainings, often through university Extension, have been designed around core competencies for watershed managers that have been identified in the literature (Koundinya et al., 2018; Wolfson et al., 2015). It is also important to establish a culture of learning within watershed organizations, and eliminate traditional structural barriers to accessing knowledge and expertise.

• Professionalizing watershed management: Professional organizations such as state or regional associations of watershed professionals can offer easy access to broad knowledge and technical and social expertise. They can also provide more formal professional development opportunities, certificates, or other recognized professional advancement programs. These associations can also take the lead on developing compensation guidelines for watershed coordinators and develop model position descriptions based on core competencies that include time for relationship building, planning, implementation, and evaluation of efforts. This can help address the issue of high turnover among watershed coordinators and managers.

Professionalizing watershed management:

Professionalizing watershed management entails the establishment of educational qualifications and training requirements for watershed professionals. Professionalization would establish standards that enhance the quality of the workforce, enhance public trust and confidence, enhance the status of the occupation, guide the behavior of professionals, establish and standardize roles to facilitate recruitment and retention by employers, and establish a shared set of values, culture, ethos, and mindset for the profession. Professionalization contributes to people's ability to work effectively within and across organizations (National Research Council, 2013).

Related to professionalizing watershed management, summit participants underscored the importance of developing compensation guidelines and model position descriptions that allowed time for relationship building, planning, implementation, and evaluation. Summit participants suggested that professionalization might address the issue of high turnover within the watershed profession and recommended that a professional organization like a state or regional association be established to develop position descriptions and compensation guidelines, and support the professional development of watershed professionals.

To support these recommendations, the following section summarizes research on the advantages and disadvantages of professionalization in professions where it has been established, such as nursing, and uses this as a foundation to propose a framework for the professionalization of watershed management.

Professional certification:

A number of studies have examined the impact of professional certification on its holders, and have identified both advantages and disadvantages.

In the nursing profession, it has been concluded that nurses who continue their education and belong to professional organizations are more likely to be independent thinkers and utilize creative problem-solving techniques, which positively impacts patient safety and outcomes (Heath, Andrews, & Graham-Garcia, 2001). Other positive impacts of certification include a sense of personal achievement, job satisfaction, validation of knowledge, greater earning potential, commitment to professionalism, and access to job opportunities (Gaberson, Schroeter, Killen, & Valentine, 2003). Certification also leads to increased professionalism, which in turn is associated with attitudes of self-regulation, self-determination, independence and a sense of empowerment (Piazza, Donahue, Dykes, Griffin, & Fitzpatrick, 2006; Wynd, 2003).

Research on nurses who do not have professional certificates, shows that they perceive the value of certification as influencing accountability, accomplishment, growth, and specialized knowledge and think that it improves recognition among employers, peers, and consumers (Niebuhr & Biel, 2007). Similarly, certificate holders perceived the benefits of their certification to be increased competence, increased confidence, and a greater feeling of professionalism (Davis & Rubin, 1976).

The most common criticisms of certification programs are that they are expensive to apply for (Wiley, 1995) and are also expensive and time-consuming to develop and establish (Morrison, Hsieh, & Wang, 1992). Certification programs can become very bureaucratic and associations that establish certification programs may be more interested in creating an additional source of income than in advancing their members' professions (Morrison et al., 1992). Another potential drawback of certification is that it offers specialized trainings with a narrow focus, which is not always what employers value (Wiley, 1995).

Having considered the above advantages and disadvantages, summit participants proposed a two-tiered professional certification program:

Tier 1 certification: Watershed leadership training for citizens, including farmers, agricultural producers, and interested stakeholders.

Tier 2 certification: Watershed leadership training for watershed professionals.

Summit participants recommended that curricula and mode of delivery for these certification programs should draw from research on core competencies for successful watershed management (Koundinya et al., 2018; Wolfson et al., 2015).

Support from a professional organization:

In an effort to understand how membership in a professional organization might benefit professionals in the field of watershed management, we again reviewed research in professions like nursing, where membership in professional organizations is well established and has been examined.

Professional organizations provide numerous beneficial services to their members. For example, they advance and disseminate specialized knowledge and information by publishing journals and newsletters. They also provide avenues for continued education and professional development, by conducting conferences and workshops (Bauman, 2008). Some organizations take on the role of advocates for the profession, and might even be able to influence public policy related to their area of expertise (Bauman, 2008; Pope, 2004).

Research in the field of nursing reveals that by joining a professional organization, nurses gain a competitive edge by becoming active and informed members of their community and by connecting them to their peers at local and national levels. Active membership can increase one's visibility within a professional network, and also provide access to industry or academic leaders. Additionally, members get the opportunity to share ideas with each other and collaborate on projects (Frank, 2005).

Mata, Latham, and Ransome (2010) describe the evolutionary process of joining a professional organization as follows. First, members attend and present at conferences. This can lead to networking, skill building, collaboration, and mentoring. These activities may contribute to increased professional development and increased capacity for advocacy, which could translate into more effective programming in the members' professional field.

Summit participants recommended setting up professional organizations for watershed professionals such as a regional or statewide watershed professionals association to support the professional development of members.

NETWORKING: One of the most important benefits of pursuing a professional certificate or becoming a member of a professional organization is the opportunity to network with peers and other professionals.

Networking refers to the building, maintaining, and use of relationships (Wolff & Moser, 2009). It represents "proactive attempts to develop and maintain personal and professional relationships with others for the purpose of mutual benefit in their work or career" (Forret & Dougherty, 2001). Networking is a vital skill since it can help individuals search for and secure employment, gain access to information or resources and obtain guidance, sponsorship, and social support (de Janasz & Forret, 2008). Some reports suggest that 70–80% of all jobs are obtained through effective and consistent networking rather than from advertising (Koss-Feder, 1999). Developing relationships within a network enhances social capital, which can provide individuals with a substantial advantage in their careers (Adler & Kwon, 2002). Additionally, the content of one's network provides access to information, resources, and career sponsorship, which in turn are related to salary, promotions, and career satisfaction (de Janasz & Forret, 2008).

Examples of efforts to support networking of local watershed coordinators include existing watershed academies and the Leadership for Midwestern Watersheds program, a peer learning annual meeting for watershed coordinators across the Upper Midwest.

Professional-level compensation:

Summit participants expressed universal concern regarding high turnover within the watershed profession. In their study of watershed councils in Oregon, Parker, Margerum, Dedrick, and Dedrick (2010) found that 38% of councils had experienced a turnover in their coordinator positions within 4 years. In a survey, former watershed coordinators identified compensation and job security as the primary reasons for their departure. This is concerning because frequent turnover can affect councils' productivity and community relations, since coordinators are often the key liaisons to people in the community. To address this, Parker and colleagues (2010) offer these recommendations to councils: focus more energy on clarifying coordinator responsibilities, discuss council governance arrangements, develop board capacity, and plan for transitions.

Summit participants were optimistic that professionalizing watershed management and compensating professionals adequately would curtail high turnover within the profession.

Watershed professionals **DO** have access to professional development opportunities that cover a broad range of watershed management core competencies

Watershed professionals have access to professional development opportunities that cover **MOST BUT NOT ALL** the watershed management core competencies

Watershed professionals have **LIMITED** access to professional development opportunities that cover a broad range of watershed management core competencies
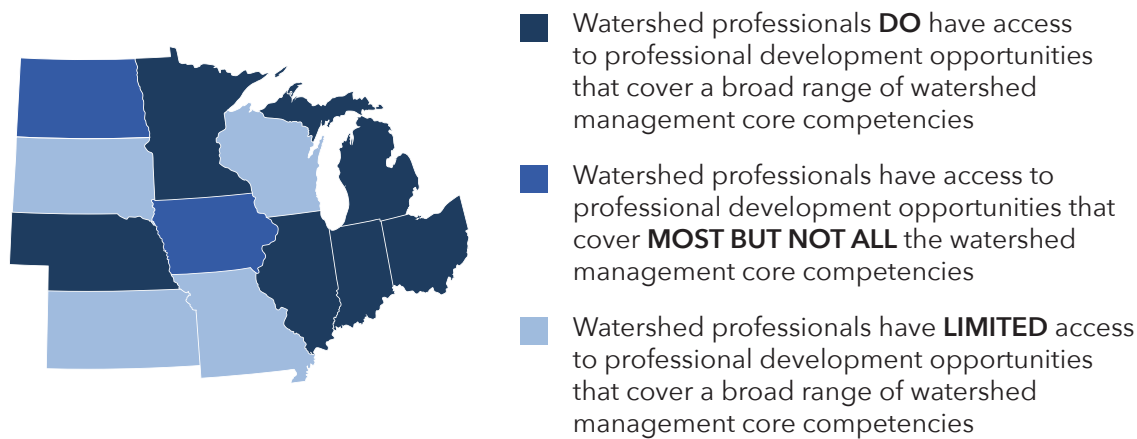
Figure 2. Snapshot of Midwestern states where professionals have access to professional development opportunities that cover a broad range of watershed management core competencies (science, policy, management, and leadership components) [modified from Koundinya et al., 2018]

(ii) Leadership by citizens: Summit participants provided many examples of successful watershed management initiatives that have been championed by citizen leaders. Citizen leaders are critical since they provide credibility to watershed initiatives, have power and influence in their communities, and give voice to the concerns of community members. Summit participants recommended making efforts to recruit citizen leaders who showed commitment to championing watershed initiatives.

Empirical research suggests that an important factor that influences the outcomes of watershed initiatives is an active citizenry. The Natural Resources Law Center's (1998) research on 76 western watershed initiatives found that participation by major stakeholders and respected individuals, along with leadership (in the form of a coordinator), resources (funding, facilities, expertise), appropriate focus, and efficient decision making, is one of the five qualities most instrumental to success in watershed initiatives. Local citizens can provide valuable insights into an area's natural, social and political systems (Sabatier et al., 2005; E. P. Weber, 2003; Wondolleck & Yaffee, 2000), and their participation in collaborative processes gives decision makers access to vital information on their preferences and needs (Cortner & Moote, 1999; Wondolleck & Yaffee, 2000).

Citizen participation in watershed management most commonly takes the form of involvement with collaborative watershed groups. A typology of collaborative groups has been developed based on member composition. The three types are citizen-based, agency-based, and mixed groups (Moore & Koontz, 2003). This typology is essential since each group is effective in a different context. For example, Steelman and Carmin (2002) suggest that agency-driven efforts are most appropriate when the issue is complex and there is a "thinness of the community around the issues at hand," whereas community-driven efforts are most appropriate when the issues are broader in scope and there is a need for wide community support.

A group of citizens whose participation influences environmental policy outcomes is local government officials. Their involvement in regional watershed initiatives is crucial since they ensure regulations are implemented at the local level, they have unique insights that are relevant to local policy making, and they can be influential when it comes to supporting or opposing policies in a community (Angel, Jonas, & Theyel, 1995; Kearney & Smith, 1994; Webler, Tuler, Shockey, Stern, & Beattie, 2003). The factors that influenced the decisions of local governmental officials in New England to participate in regional collaborative environmental policymaking on watershed management planning found that decisions were made based on whether they felt like they could help make a positive difference, whether they saw working on the problem as consistent with their environmental ethic, and whether it was in their community's interest that they participate in the process (Webler et al., 2003).

CITIZEN LEADERS IN MICHIGAN TRANSLATE TRAINING INTO SHORELINE BENEFITS

Michigan has over 11,000 inland lakes that provide recreational opportunities, habitat for fish and wildlife, beautiful views, and add to Michigan's economy in numerous ways. However, the development of the shoreline area along lakes often results in the natural native shore being replaced with seawalls and rock rip-rap as well as lawns down to the water's edge. Nearly 40% of the Michigan lakes monitored as part of a National Lake Assessment were found to have poor lakeshore habitats.

The Michigan Natural Shoreline Partnership, a collaboration of 15 organizations with experts from industry, academia, state agencies, and riparian organizations, helps lake associations, park and recreation personnel, and citizens throughout the state protect water through the implementation of natural shoreline practices. Through the Michigan Shoreland Stewards Program, a statewide network of citizens has been trained to offer educational sessions on natural shoreline benefits. As a result, over 350 Michigan citizens have achieved Shoreland Steward status, meaning that their nearly 80,000 feet of shoreline met criteria for a healthy shoreline and near shore habitat. Michigan Shoreland Stewards are reducing erosion, enhancing fish and wildlife habitat, improving aesthetics, and making more efficient use of public and private shoreline management resources.

FARMERS TAKE THE LEAD IN WATERSHED MANAGEMENT

In the last few years, several farmer-led watershed groups have been established in the Midwest to improve both water quality and farm performance. In general, a farmer-led watershed group has the following components: (a) An identified and shared, water, soil, or other natural resource concern; (b) A group of farmers organized within a defined watershed and willing to have leadership roles in addressing the shared concern(s); and (c) A vision for change, ideas of how to get there, and lots of meetings and activities (Olmstead, 2015c).

Through participation in farmer-led watershed groups, farmers have the opportunity to play a role in making decisions related to water management, which gives them a sense of ownership over their watershed (Morton, 2008). Additionally, by giving farmers a voice in local policy making, the watershed groups increase their connection to issues and their interest in actively managing their resources (Weber, 2000).

In 2013, the University of Wisconsin-Extension launched the Farmer-Led Watershed Council pilot project in four sub-watersheds, one each in Dunn, Pierce, Polk, and St. Croix counties. The project is a collaboration between farmers, UW-Extension, and state and county government agencies with the goal of improving water quality in the St. Croix and Red Cedar River Basins (Olmstead, 2015a).

The Wisconsin model is inspired by Iowa State University Extension and Outreach's work in Northeast Iowa. Iowa State University Extension and Outreach has found that engaging farmers in investigating problems and in finding solutions is more effective than top-down approaches driven by state or government officials (Olmstead, 2015b). The goals of Wisconsin's Farmer-Led Watershed Councils are to engage farmers as partners and leaders to reduce agriculture's impact on water quality in a sustainable, long-term fashion, and to develop councils of farmer leaders on a sub-watershed scale to increase the use of water-quality-promoting farm practices (Olmstead, 2015a, 2016).

From 2013–2016, Wisconsin's Farmer-Led Watershed Councils achievements included: (a) Collecting data to create a baseline for phosphorus movement in the watersheds; (b) Educating farmers and project partners on topics related to water quality, soil health, and climate change; (c) Developing conservation incentives to encourage greater adoption of conservation practices; (d) Conducting on-farm research to test no-till and cover crop scenarios; (e) Cost-sharing the construction of thousands of feet of grassed waterways; (f) Holding meetings, seminars, and field days with farmers focused on conservation, water quality, and soil health (Olmstead, 2016).

b. Social capital

Like all efforts involving common pool resources, successful watershed initiatives depend on a number of social factors. Watershed initiatives are located within a broader social and political context that can have an impact on the scaling up process. Assessments of watershed management projects have shown that they are more likely to be successful in communities with high social capital. In recognition of this, summit participants identify social capital as another necessary element for the successful scaling up of watershed initiatives. Social capital refers to features such as "networks, norms, and trust that can improve the efficiency of society by facilitating coordinated actions" (Putnam, 1993b) that make possible the achievement of certain ends that would not be attainable in its absence (Coleman, 1988; Putnam, 1993b).

SUMMIT PARTICIPANTS OFFER THE FOLLOWING RECOMMENDATIONS RELATED TO INCREASING SOCIAL CAPITAL:

- Involve community members in watershed-related decisions, activities, and planning.

- Before launching intensive watershed efforts, gauge stakeholder and community readiness. Prioritize projects with high stakeholder and community readiness.

- Increase social capital in communities by strengthening networks. This can be done by organizing informal social activities, community volunteer events, community listening sessions, as well as supporting the development of formal organizations like community watershed associations.

- Build trust between community members and leaders of public and private institutions by developing relationships based on reciprocity.

Successful watershed initiatives have often adopted participatory approaches by involving stakeholders and community members. In participatory models, the public plays a role in administrative decision-making, watershed management activities, developing management plans, and other planning, execution, and management processes (D'Silva & Pai, 2003; Duram & Brown, 1999; Sabatier et al., 2005; Webler & Tuler, 2001; Webler et al., 2003). Watershed initiatives that involve broad-based public involvement can lead to the long-term maintenance of water quality improvements even when funding for these projects is reduced or eliminated (Mullen & Allison, 1999). Other important outcomes of public participation are effective policies that incorporate local knowledge and a shared understanding among all participants (Beierle & Cayford, 2002; Rydin & Pennington, 2011).

Given the positive outcomes of public participation in watershed initiatives, it is important to understand how it can be encouraged and sustained. Studies have found that social capital encourages the public's participatory behavior in watershed projects and leads to successful functioning of initiatives that involve common pool resources (Ohno, Tanaka, & Sakagami, 2010). Mullen and Allison's (1999) qualitative study showed that the success of watershed management initiatives correlated with social factors like the extent of stakeholder involvement, the availability of social capital in the watershed, and the presence of a real

or perceived water resource concern or problem. Of these, short- and long-term successes depended most on the amount of social capital in the watershed.

Gauging stakeholder and community readiness: Summit participants highlighted stakeholder readiness as a necessary precondition for launching intensive watershed management efforts. Gauging stakeholder readiness involves getting a sense of the community's knowledge and awareness of the issues, motivations and drivers, triggers, agreement levels on key issues, and then identifying whether there is a documented or acknowledged problem. Stakeholder readiness can be shifted through planned interventions or through catalyzing events, such as a large runoff event, new funding, or new regulation. Research indicates that community-based watershed initiatives are more likely to occur when there are real or perceived local water quality or quantity problems that mobilize social capital to address them. (Mullen & Allison, 1999)

Increasing social capital by strengthening networks: Social capital increases through the development and strengthening of social networks. Social networks are webs of relationships that connect people within groups and across groups and organizations. Most watersheds could benefit by having stronger ties among people in the watershed, more functional bridges between different groups (e.g., farmers, urban residents, anglers, water utilities), and better connections to resources offered by local, state, or national support organizations in the public and private sector (Floress et al., 2011).

SOCIAL CAPITAL IS MADE OF THREE TYPES OF NETWORKS: BONDING, BRIDGING, AND LINKING.

- Bonding networks are close ties between people; for example, connections among family, friends, and neighbors. Bonding networks are strong when people with common backgrounds trust each other and engage each other. Bonding networks among people can be strengthened by providing opportunities for community members to spend time together by participating in informal, social activities.

- Bridging networks are weak ties between people who are different from each other and engage infrequently. However, these networks offer opportunities to its members; for example, via participation in an association or organization. Bridging networks are strong when community members with different social background trust and engage with each other. This network can be strengthened in communities by inviting people from a variety of backgrounds to volunteer activities, community events, and other such events.

- Linking networks "create access to organizations and systems that help people get resources and bring about change." Linking networks are strong when community members trust and engage with leaders of public and private institutions. Some ways in which linking networks can be strengthened by organizing community input sessions on issues relevant to the public or by forming regional networks about an issue that the community cares about. (Scheffert, Horntvedt, & Chazdon, n.d.)

Summit participants noted that watershed professionals and agencies have a role to play in helping build social capital and encourage participation. They suggested that social capital could be promoted by offering programs for social network development and creating formal structures for communities to learn and get involved in watershed-related decision-making. An example of such a formal structure is watershed associations. Watershed associations "bring together citizens and natural resource management agencies for the purpose of environmental planning" (Leahy & Anderson, 2010). Participation in watershed associations could lead to increased social capital. For these efforts to be successful, summit participants stressed that state and federal agencies with regulatory and policy oversight of watershed management would need to coordinate and consistently communicate their expectations to prevent confusion and gaming of the system.

Building trust: Trust is a critical component of social capital, and summit participants therefore cited it as an important factor in supporting scale-up efforts. Summit participants recognized that lack of trust between the public and natural resource professionals could derail efforts. Research indicates that members of the public often do not trust natural resource agencies and do not support decisions that they make (Shindler, Brunson, & Stankey, 2002).

One way to improve trust between the public and natural resource professionals is through reciprocity. Reciprocity is the "simultaneous exchange of goods and knowledge of roughly equal value, or continuing relations over time" (Coleman, 1988; Putnam, 1993). It contributes to the development of long-term obligations between people, which helps in achieving positive environmental outcomes (Pretty, 2003).

Summit participants suggested that trust with the public could be established by building relationships with community members, being transparent about processes and data, engaging community and stakeholder groups early and frequently, and communicating with them clearly and openly. Finally, they also emphasized the need for reaching consensus on goals for the watershed as well as setting realistic expectations of what can be achieved.

c. Policy framework

The success of watershed management efforts depends on environmental and social factors within the watershed, as well as external factors such as local, state, and federal policies that impact land use and watershed management decisions. Effective watershed policies are necessarily complex because decision-making authority is shared across public and private sectors, as well as different levels of government (Ostrom, 1990).

SUMMIT PARTICIPANTS OFFERED THE FOLLOWING RECOMMENDATIONS FOR DEVELOPING A POLICY FRAMEWORK TO SUPPORT SCALE-UP:

- States, in partnership with federal and local government, must develop policy to encourage watershed assessment and prioritization at larger scales and more detailed planning and implementation at smaller, local scales

- Watershed policies should incorporate outcome-based, numeric, performance measures

- Watershed plans must include accountability criteria

- Federal, state, and local watershed efforts must be coordinated and corresponding agencies should work together synergistically

During their discussion on watershed policy, summit participants concluded that any policy framework that supports the scaling up of watershed initiatives would have to incorporate the following essential features:

(A) Incorporate the Watershed Management Scalable Unit into State Policy Frameworks

The scalable unit in watershed management, as identified in this paper, involves watershed assessment and prioritization at larger scales (e.g., HUC 8) and more detailed planning and implementation at smaller scales (e.g., HUC 12), *as appropriate for their populations and geography.* States, in partnership with the federal government, have a key role and function in helping the country efficiently and effectively achieve its environmental goals. They have the flexibility to design programs based on the unique needs and conditions in the state. Given the authority that states have, they can support scaling up by developing policies that provide for watershed assessment and prioritization at larger scales and more detailed planning and implementation at smaller, local scales. This strategy will promote collaboration and relationship-building between government units that operate at different scales. It will provide a framework for strategically allocating limited public sector resources over time. Ideally, it will also encourage government units to find ways to integrate watershed initiatives with programs that address broader community needs such as education, recreation, and job creation (Minnesota Board of Water and Soil Resources, 2018b).

Watershed assessment and prioritization at HUC 8 and similar scales:

Watershed assessment and prioritization at HUC 8 and similar scales should involve representatives from all government units and stakeholders that operate within those boundaries. Participants in the planning process could include soil and water conservation districts, watershed districts, counties, municipalities, university extension, conservation organizations and environmental organizations, representatives of agriculture and other businesses that depend on water, and water utilities. This framework of watershed assessment and prioritization involves multiple participants; therefore a formal agreement that establishes expectations, activities, roles, and outcomes should be developed.

IN ADDITION TO INCLUDING THESE ELEMENTS, A COMPREHENSIVE WATERSHED ASSESSMENT MUST INCLUDE:

- Purpose of the assessment

- Description of the assessment boundary, area covered by the asessment; participant roles, and the assessment decision-making process.

- Summary of priority issues and priority HUC 10-12 scale subwatersheds. Priorities should integrate water quality and quantity, groundwater, drinking water and human health, economic and community well-being, fish and wildlife habitat, and other related issues.

- Goals and measurable objectives for the assessment area and the management process (e.g building trust among collaborators, increasing civic engagement).

- Implementation strategies that take into consideration partner roles and capacity at local, state, and national scales; maintain the sovereignty of government units; encourage and incentivize collaboration between parties with common goals, within the same sector or different sectors solutions. (AGree, National Association of Clean Water Agencies, 2015; Local Government Water Roundtable, 2013; Minnesota Board of Soil and Water Resources, 2016; Minnesota Board of Water and Soil Resources, 2018a, 2018b). Note that implementation of the larger scale assessment is not necessarily designed to achieve short-term documentable water quality or quantity impacts. These impacts are best documented at smaller HUC 10-12 scales.

- Process and timeline for revising assessment.

The watershed assessment and prioritization process should engage both experts and stakeholders in an inclusive and equitable manner. Recent research shows that non-collaborative approaches to policymaking are no longer perceived as legitimate, leading to governments taking more inclusive approaches to policy development (Akhmouch & Clavreul, 2016). Also, collaborative policymaking has been found to be more successful in terms of producing policy reflecting public views, resolving conflict, building trust, and educating the public on environmental issues (Beierle & Cayford, 2002). Town hall meetings, citizen conferences, and other such forums are now commonly used to gather information on public opinion and interest. Public engagement should be part of an integrated feedback loop (i.e., all stakeholders should be informed of changes and/or progress and their input should be gathered in order to inform future policy-related efforts). Elements of the assessment and prioritization process should clearly describe the relationship between the larger scale assessment process and smaller scale watershed planning and implementation efforts.

Watershed planning and implementation at HUC 12 and similar scales:

By conducting watershed assessment and prioritization at HUC 8 and similar scales, governmental units and stakeholders at the HUC 12 scale can focus effort and resources on more detailed watershed planning and implementation (Local Government Water Roundtable, 2013). The success of watershed management at larger scales depends wholly on successful implementation of watershed plans at smaller scales. Local governmental units and their partners understand the local circumstances and culture and are therefore better positioned to work with landowners to encourage them to adopt better land management practices.

Government units at HUC 12 and similar scales include watershed districts, soil and water conservation districts, natural resources districts, or county boards and commissions. These government units already frequently have a role in developing and implementing watershed plans, which involve activities such as awareness–building; establishing conservation easements; constructing, maintaining, and implementing watershed management projects; encouraging landowners to implement best management practices on their land; and enforcing regulations and permits. USEPA has identified and described nine key elements of a watershed plan and often requires plans that it funds to include these elements (USEPA, 2008b).

Nongovernmental organizations (NGOs) can play most of the same roles in implementation as local governments. NGOs often have more flexibility than the government to try new practices and approaches or implement more rapidly, however they do not serve in regulatory capacities. Having both government and NGO options for assisting landowners and managers with implementation can be beneficial when trust is an issue. Regardless of who is leading implementation, successful implementation requires accountability and monitoring programs to track outcomes and measure success.

The conversation among summit participants about policymaking led to an examination of the roles of federal and state governments in environmental management and the need to rethink them. Often, federal and state environmental programs are not coordinated, and corresponding agencies do not work in synergy with one another. To address this and other concerns, Cooperative Federalism 2.0 (ECOS, 2017) was presented as a governance framework that could considerably promote the success of watershed scaling up efforts.

These states **DO** have statewide policies or frameworks that emphasize watershed planning at larger scales and implementation at smaller scales

These states **DO NOT** have state-wide policies or frameworks that emphasize watershed planning at larger scales and implementation at smaller scales
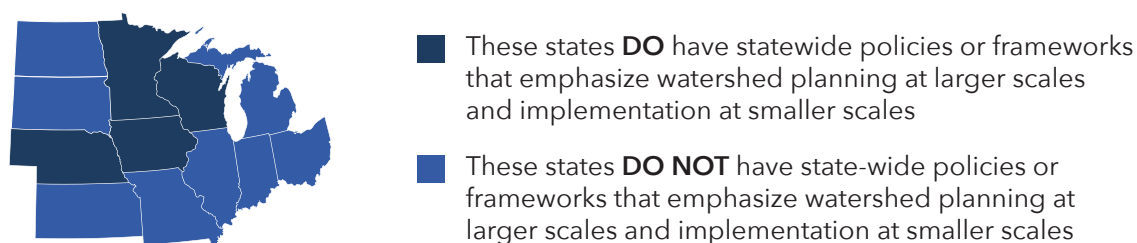
Figure 3. Snapshot of Midwestern states that have statewide strategies in which watershed planning at larger scales (i.e., HUC 8 or HUC 10) is aligned with implementation at smaller scales (i.e., HUC 12). Statewide strategies are those that allow for watershed planning that addresses the entire state.

NINE ELEMENTS OF WATERSHED PLANS:

a. Identification of causes of impairment and pollutant sources or groups of similar sources that need to be controlled to achieve needed load reductions, and any other goals identified in the watershed plan.

b. An estimate of the load reductions expected from management measures.

c. A description of the nonpoint source management measures that will need to be implemented to achieve load reductions, and a description of the critical areas in which those measures will be needed to implement this plan.

d. Estimate of the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon to implement this plan.

e. An information and education component used to enhance public understanding of the project and encourage their early and continued participation in selecting, designing, and implementing the nonpoint source management measures that will be implemented.

f. Schedule for implementing the nonpoint source management measures identified in this plan that is reasonably expeditious.

g. A description of interim measurable milestones for determining whether nonpoint source management measures or other control actions are being implemented.

h. A set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made toward attaining water quality standards.

i. A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established under item h. (USEPA, 2008b)

COOPERATIVE FEDERALISM 2.0: Under the tenets of cooperative federalism, "the U.S. Congress establishes law, the federal government implements the law through national minimum standards for the media/pollutant in question, and states can seek authorization or delegation to implement the programs needed to achieve these standards" (ECOS, 2017). Today, however, state agencies are responsible for the implementation of more than 90% of federal and state environmental programs. Cooperative Federalism 2.0 is an attempt at fundamentally realigning the environmental program implementation responsibilities between states and the federal governments. The premise is to empower, engage, and leverage the capability and expertise of the state environmental agencies and the USEPA in a way that best serves the public and the environment. (ECOS, 2017)

IF PROPERLY IMPLEMENTED, COOPERATIVE FEDERALISM 2.0 COULD LEAD TO

- "Equal or greater environmental and public health protection and outcomes through smart deployment of resources on critical priorities

- Reduced operating costs due to a more efficient division of services, streamlined operating relationships, best practice sharing, and elimination of redundancies across states and divisions of USEPA;

- More effective allocation of limited resources by determining the best roles and functions states and USEPA are each best suited to perform

- With time, fewer disputes over who should take credit for successes and achievements, and who is responsible for decisions and actions that result in setbacks." (ECOS, 2017)

THE CHANGES IMPLIED BY COOPERATIVE FEDERALISM 2.0 ARE:

- Ensuring adequate capital and resources to implement federal environmental laws remain a priority.

- States and USEPA collaboratively identify key outcomes (rather than outputs) of implementing federal environmental law.

- Regularly review, improve, and reform USEPA and states' working relationship.

- Allowing states the flexibility to adapt programs to their unique geophysical, ecological, social, and economic conditions to ensure environmental protection and economic growth.

- Establish best practices for enforcement and compliance to ensure consistency and transparency across USEPA regions.

- Finding ways to support small communities in their implementation of national minimum standards.

- Develop multistate and multinational approaches to deal with complex environmental challenges. (ECOS, 2017)

(B) Develop and Implement Performance Monitoring That Will Capture Successes and Identify Areas for Policy and Practice Improvement

PERFORMANCE METRICS OR GOALS (TARGET OR STRETCH) FOR SHORT, MEDIUM, AND LONG-TERM EVALUATION AND LEARNING MUST BE INCORPORATED INTO WATERSHED PLANS. THESE PERFORMANCE METRICS:

• Should be outcome-oriented, with outputs such as field days and practice changes being monitored to understand how and why progress is or is not being made.

• Should include numeric ecological measures that will ultimately result in the attainment of designated uses, such as monitored pollutant reduction in waterbodies, modeled or monitored reductions in pollutants reaching waterbodies, or improvement in aquatic life parameters (Perez, 2017). Numeric measures provide important consistency in goal-setting and communication. They may be incorporated into state statutes, however there is currently insufficient evidence to indicate that it is necessary for scaling up of successful watershed management. Summit participants recognized that when numeric measures are incorporated into state statutes, related policies must allow the flexibility to innovate and adapt as new information becomes available.

• Should incorporate complementary economic and social measures. These measures, such as jobs created, farm profitability, waterfront property values, increased trust, or increased diversity of stakeholder engagement, can bolster community support for watershed management and integrate watershed goals into broader community sustainability goals.

• Should be developed in a collaborative manner with input from local stakeholders who have knowledge of local conditions, culture, customs, and concerns.

• Should evolve as policies and management priorities change over time.

To be scalable, every effort should be made to develop a suite of common ecological, social, and economic metrics across states. While each state and local watershed may have its own independent metrics, a common suite of ecological, social, and economic metrics will support measurement of progress at larger scales (e.g., state, basin, and national).

THE FOLLOWING ADDITIONAL POLICY STRATEGIES HAVE BEEN FOUND TO INCREASE THE LIKELIHOOD OF DOCUMENTING MEASURED WATER QUALITY IMPROVEMENT.

• Focusing implementation and more intensive monitoring in smaller watersheds

• Close coordination between state water resource management agencies, local conservation districts, and the Natural Resource Conservation Service (NRCS), including the willingness and technical capacity to share water management practice data and water monitoring data at the small watershed scale.

• Critical areas are defined and treated with appropriate suites of practices. (Dressing, 2018; NRCS, n.d.; USEPA, n.d.)

Policies should include rewards for attainment of outcomes measures, including increased recognition for innovative approaches or financial rewards for achieving stretch goals. While everyone has a stake in successful watershed management, performance measures related to planning and implementation need to be monitored at regular intervals by states. Watershed planning at larger scales should help states prioritize performance monitoring and seek appropriate levels of public and private sector funding.

(C) Accountability

Watershed plans should include criteria related to accountability and oversight systems that will help identify problems and rectify them. State and federal governments, and the voting public, are ultimately responsible for a watershed management system that attains designated uses. Oversight systems must be adequate, clear and consistent, and must comprise of (a) clearly defined performance standards, (b) consistent monitoring to assess whether standards have been met, and (c) consequences to encourage better performance.

IN GENERAL TERMS, SUMMIT PARTICIPANTS IDENTIFIED THE FOLLOWING CONDITIONS TO FOSTER ACCOUNTABILITY:

1. Determine authority: It is critical to determine which stakeholders or agencies have the authority to manage activities, make decisions, and take the lead on implementation.

2. Maintain integrity: Those with authority must act with integrity when making decisions that affect others. This is crucial to building and sustaining trust and confidence among all stakeholders. Agencies with authority must follow proper procedures when making decisions and should be accountable for the actions that they take. Stakeholders must also be persuaded to maintain integrity, and this could be enforced using graduated sanctions. Graduated sanctions may take the form of formal regulatory sanctions, such as increasing fines as the number or length of violations increases; market-based sanctions such as increasing insurance premiums; or less formal sanctions such as reducing standing in certification or social recognition programs.

3. Be adaptable: Given the complexity and uncertainty that is often a part of watershed management, it is important for watershed policies to allow for adaptation based on changing local needs and based on input from local stakeholders.

4. Build trust: Although accountability and transparency are critical, there needs to be a balance struck with maintaining and building trust with farmers and stakeholders in agriculture and other related industries.

RISKS AND OPPORTUNITIES OF INCORPORATING ENVIRONMENTAL DATA INTO GOVERNANCE

Yahara Watershed Improvement Network (WINs) is an experimental water quality management program in Wisconsin that uses Adaptive Management to reduce phosphorus pollution. Watershed Adaptive Management is a Wisconsin voluntary compliance option approach wherein funds from regulated point sources are redirected to pay for conservation practices at nonpoint sources. Monitoring data and modeling are used to determine whether this approach is successful in reducing phosphorus in waterbodies. Neither monitoring nor modeling data can provide with certainty a comprehensive picture of water quality outcomes, wherein lies the risk for the point source involved. The point source risks regulatory enforcement if monitoring and modeling data show that Yahara WINs did not result in phosphorus reduction. However, innovative regulatory approaches like Yahara WINs also allow for partnerships and relationships to be formed between different groups of stakeholders. (Wardropper, Gillon, & Rissman, 2018)

To promote innovation and experimentation, policy and governance programs must take into consideration and plan for the inevitable risks that point sources might undertake.

An additional mechanism that can help maintain both adaptability and accountability is the use of intermediate, time-bound targets that serve as triggers for course correction. If an intermediate target is not reached in the specified time, a formal process for course correction is initiated. When all stakeholders in the watershed planning process agree ahead of time that a course correction will be considered at a predetermined trigger point, new information and learning can be incorporated into next steps (USEPA, 2008b).

Finally, because of the current regulatory differences between point and nonpoint sources of water pollution under the Clean Water Act, policy must emphasize shared accountability and shared risk between point and nonpoint sources. Managers of point sources that are testing out innovative management strategies for working with nonpoint sources should be shielded from shouldering the full risk while maintaining broader accountability for achieving watershed management goals.

**COMPREHENSIVE WATERSHED POLICY FRAMEWORK:
MINNESOTA'S ONE WATERSHED, ONE PLAN**

The vision of Minnesota's One Watershed, One Plan is to "align local water planning on major watershed boundaries with state strategies towards prioritized, targeted, and measurable implementation plans." It authorizes the Minnesota Board of Water and Soil Resources to adopt methods that allow comprehensive plans, local water management plans, or watershed management plans to serve as substitutes for one another or to be replaced by a Comprehensive Watershed Management Plan. Implementation of One Water, One Plan is accomplished through formal agreements among participating local governments on managing and operating on a watershed scale. Decision-making spans political boundaries and is supported by in-writing commitments from participants. All state agencies in Minnesota that have a stake in water management commit to a high-level water quality framework that includes agency participation in the development of water plans. This allows for enhanced collaboration and clarified roles to improve the ease and efficiency of state and local partners' collaborative work. (Minnesota Board of Soil and Water Resources, 2016)

d. Finance framework

Currently, most watershed management efforts are supported by a number of state and federal funding and financing sources such as the Environmental Quality Incentives Program (EQIP), Section 319(h) Federal Clean Water Act, Clean Water State Revolving Fund (CWSRF) program and others. It is widely acknowledged that the existing funding sources must be leveraged, expanded, and enhanced by new opportunities to support watershed management efforts across large scales. To scale up successful watershed efforts, alternative mechanisms of funding watershed management need to be explored.

SUMMIT PARTICIPANTS OFFERED THESE RECOMMENDATIONS RELATED TO FINANCING THE SCALE-UP OF WATERSHED MANAGEMENT:

• Explore new and underutilized public and private funding sources to pay for watershed projects

• Increase use of financing mechanisms like State Revolving Loan Funds and green bonds that offer flexible ways to borrow money

• Increase use of incentive-based and mitigation-based economic instruments that can be used to modify land management practices through market forces

• Build organizational capacity that will allow entities to pursue underutilized sources of private funding and use a mix of funding and financing options that will offer sufficient, stable, long-term, and diverse funds for watershed management

Chen (2016) describes alternative funding mechanisms as "an umbrella concept that supplements traditional funding sources and financing methods, and embraces any strategy involving new funding sources, new financing mechanisms, and new financial arrangements." A framework similar to this is used in this section where new and underutilized funding sources, underutilized financing mechanisms, and underutilized economic instruments are explore as alternative mechanisms of watershed management financing.

A common emergent theme across all sources of funding and financing is the need to blend public funds with private capital in ways that are proportional to the public and private goods provided by better watershed management in specific watersheds, and that maintain accountability to taxpayers and shareholders. While all the funding and financing sources described in this section can be combined, this section provides some specific examples of how some communities are rewiring funding and financing systems to harness more resources for watershed management and associated community benefits.

New and underutilized funding sources	Stable, long-term public funding sources	Ballot measures
		Special assessment districts
	Underutilized private funding sources	Impact investing
Underutilized financing mechanisms	State Revolving Funds	
	Green bonds	
Underutilized economic instruments	Incentive based approaches	Insurance premium discounts
	Mitigation or credit-based approaches	Water quality trading and related approaches
		Permittee-responsible Mitigation
		In-lieu fees

Table 1. Finance framework to scale up watershed management in the Midwest

(A) New and underutilized funding sources

Funding is defined as the money that pays for a project; for example, taxes, grants, and so on. New funding sources are described as "new measures that generate additional revenue resources to pay for projects" (Chen & Bartle, 2017; USDOT, 2010).

ACCORDING TO SUMMIT PARTICIPANTS, FUNDS THAT SUPPORT SCALING UP EFFORTS WOULD NEED TO SATISFY THESE THREE CRITERIA:

- Sufficient funds: Summit participants agreed that funds currently available for watershed management would not meet the demands of scaling up efforts. They recommended pursuing sources that would provide access to additional funds.

- Stable and long-term funds: Short-term or irregular funds make it challenging to retain watershed personnel and can derail scaling up efforts. To address this, summit participants suggested pursuing funding mechanisms and arrangements that would ensure stable and long-term funding.

- Diverse funds: Summit participants advocated for the leveraging of both public and private capital to expand the pool of funds available for scaling up efforts.

1. Stable, long-term public funding sources: In this section we explore two public funding sources that have the potential to provide stable and long-term public funding as a foundation for scaled-up watershed management, namely ballot measures and local governance structures with taxation authority, that use public funds to support watershed efforts. Note that stable, long-term public funding sources are necessary, but not sufficient to scale-up watershed management.

   a. **Ballot measures:** Ballot measures at the state or local level (counties, cities, or towns) are "instruments of direct democracy that allow voters to directly shape public policy in the voting booth" (Woolworth, 2017). They provide access to large-scale, reliable funds that can be leveraged to secure additional investments, and allow communities to raise funds for initiatives that address local needs (Public Sector Consultants Inc., 2016; Woolworth, 2017). The success of ballot measure campaigns depends on whether the community's needs are addressed and whether voters have a clear understanding of how the funds will be spent (Public Sector Consultants Inc., 2016). Although ballot measures are relatively common and well-established, they often require significant time, money, and expertise to secure (Woolworth, 2017).

   SUMMIT PARTICIPANTS HIGHLIGHTED THE FOLLOWING EXAMPLES OF BALLOT MEASURES:

   - **Minnesota's legacy fund**: In 2008, Minnesota's voters passed the Clean Water, Land and Legacy Amendment to their Constitution, which increased the state sales tax by three-eighths of one percent from July 1, 2009 until 2034. One-third of this additional sales tax revenue is given to the clean water fund to "protect, enhance, and restore water quality in lakes, rivers, and streams and to protect groundwater from degradation" (Legislative Coordinating Commission, 2017).

- **Minnesota's trust fund**: In 1988, Minnesota's voters approved a constitutional amendment establishing the Environment and Natural Resources Trust Fund. The fund receives 40% of the net proceeds from the Minnesota State Lottery and can receive private donations. This fund provides "a long-term, consistent, and stable source of funding for activities that protect and enhance Minnesota's environment and natural resources for the benefit of current citizens and future generations" (Legislative Coordinating Commission, 2017).

- **Missouri Conservation Sales Tax**: The Missouri Conservation Sales Tax was established by vote in 1976 after being placed on the ballot by citizen petition. Missouri's Department of Conservation receives no general revenue from the state. The Department's 2019 budget request states that 61% of its revenue comes from the Conservation Sales Tax. With a 1/8 of 1 cent sales tax on all taxable items, the Conservation Sales Tax has generated over $100 million each year since 2012 (Missouri Department of Conservation, 2017; Thorne, 2016).

- **Clean Michigan Initiative**: Michigan voters have repeatedly supported environmental initiatives at the statewide level, such as the establishment of the Michigan Natural Resource Trust Fund and the Clean Michigan Initiative bond. In 1998, voters authorized the state to borrow up to $675 million to "finance environmental and natural resources protection programs that would clean up and redevelop contaminated sites, protect and improve water quality, prevent pollution, abate lead contamination, reclaim and revitalize community waterfronts, enhance recreational opportunities, and clean up contaminated sediments in lakes, rivers, and streams," which would be repaid through the state's general fund. Of the electorate, 63% voted for this proposal, which directed $50 million to nonpoint source pollution control grants (Katz, 2002; Public Sector Consultants Inc., 2016).
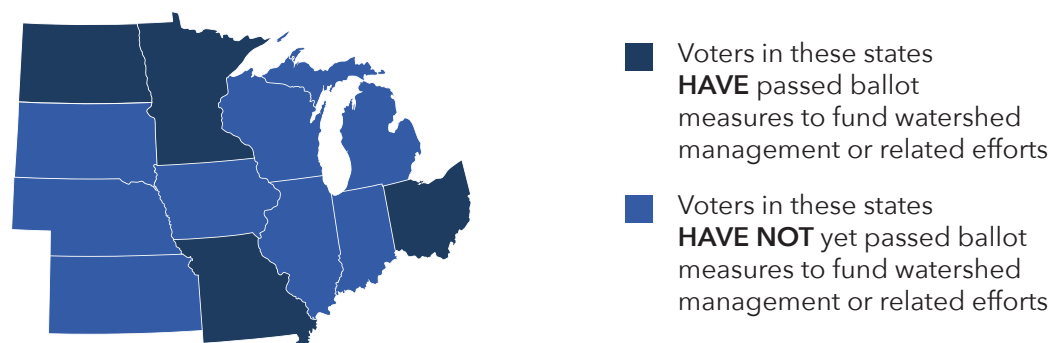

■ Voters in these states **HAVE** passed ballot measures to fund watershed management or related efforts

■ Voters in these states **HAVE NOT** yet passed ballot measures to fund watershed management or related efforts

Figure 4. Snapshot of midwestern states where voters have passed ballot measures to fund watershed management or related efforts

b. **Special assessment districts:** Special assessment districts are geographic areas in which property and business owners pay a special tax to fund projects that will benefit them. Watershed management districts are an example of special assessment districts where governance occurs at the watershed scale rather than the municipal scale. Different watersheds have significantly different needs, and establishing watershed management districts allows for funds to be used to address the specific needs of watersheds. (Chen and Bartle, 2017; Public Sector Consultants Inc., 2016)

Special assessment districts do not need voter approval, but require legislative approval. They are funded by taxes, are able to set their own tax rate, develop policies on a watershed basis, and govern based on the needs of the local community. The advantages of establishing special assessment districts, like natural resources districts and watershed districts, are examined using three illustrative examples in the states of Nebraska, Minnesota, and Florida. (Chen & Bartle, 2017; Public Sector Consultants Inc., 2016)

- **Nebraska's Natural Resources Districts (NRDs)**: Nebraska's 23 NRDs are subdivisions of the state government whose boundaries align with naturally delineated river basins (Jenkins, 2009). These districts are unique to Nebraska and the rest of the country (Lower Elkhorn Natural Resources District, n.d.).They have a broad responsibility for protecting natural resources. Nebraska's NRDs are primarily funded by local property taxes and are governed by locally elected boards. They often work in partnership with state and federal agencies, counties, and private organizations and have produced long-lasting results in the past 40 years (Nebraska Association of Resources Districts, n.d.).

- **Ohio's Conservancy Districts**: Ohio's Conservancy Districts are political subdivisions of the State of Ohio that can be formed by local landowners or communities to solve water management problems such as flooding, improving drainage, providing irrigation, reducing runoff, conserving and developing water supplies, and treating wastewater. These districts operate under the jurisdiction of a conservancy court which has representation from every county within the district. Conservancy districts may charge user fees, levy special assessments, and issue bonds. (Miami Conservancy District, n.d.; Ohio DNR, 2009)

- **Minnesota's watershed districts**: The Minnesota Board of Soil and Water Resources defines watershed districts as "local units of government that work to solve and prevent water-related problems." Since watersheds do not conform to political boundaries, "effective water resources management requires institutions which unite a watershed in planning and management" (Hearne, 2007). Water management policies are most effective when they are developed on a watershed basis; therefore, the boundaries of Minnesota's watershed districts follow those of a natural watershed (Minnesota Board of Water and Soil Resources, n.d.-a). The purposes of watershed districts are "to conserve the natural resources of the state by land use planning, flood control, and other conservation projects by using sound scientific principles for the protection of public health and welfare and the provident use of

natural resources." Minnesota's watershed districts have planning and regulatory authority and are also able to levy taxes to generate revenue for watershed projects (Minnesota Board of Water and Soil Resources, n.d.-b).

- **Florida's water management districts**: In Florida, the management of water resources is shared between the Florida Department of Environmental Regulation and the state's five regional Water Management Districts (Margerum, 2011). The districts are funded by taxes, and each district sets its own tax rate. Restoration projects undertaken by water management districts are funded by a variety of sources, including the state, counties, federal agencies, and taxes on agricultural operations (National Research Council, 1999). The state also allocates funds to the water management districts to purchase lands critical for water quantity, water quality and recreation (Margerum, 2011). Florida's water management districts were reviewed favorably by the Water Management District Review Commission in 1995 (Water Management District Review Commission, 1995).

ENGAGING SOIL AND WATER CONSERVATION DISTRICTS IN DESIGNING INVESTMENT OPPORTUNITIES

Conservation districts are "local units of government established under state law to carry out natural resource management programs at the local level" (National Association of Conservation Districts, n.d.). They work with cooperating landowners and operators who are willing to manage and protect land and water resources on public and private lands. There are around 3,000 conservation districts in the United States funded by a diversity of sources, including state appropriations, county and other local governmental appropriations, public and private grants, local income-generating projects, individuals, corporations, businesses, foundations, donations, and other sources such as fees for services ("Conservation district funding," n.d.). They coordinate these funds to develop locally driven solutions to natural resource concerns (National Association of Conservation Districts, n.d.).

Summit participants highlighted conservation districts since they are the only unit of government with the primary responsibility to lead conservation programs on a local scale. Also, since conservation districts are established by state law, their funding sources vary by state and this offers them some flexibility to pursue different funding opportunities. Conservation districts could potentially play a role in designing investment opportunities for conservation programs. They have unique insight into local needs and have expressed interest in increasing capital flows to their districts (Encourage Capital, 2017).

2. Underutilized private funding sources: As mentioned earlier, summit participants suggested that in order to scale up watershed management efforts, a significantly larger amount of investment is required than what is currently available, and private funding sources may be the best available option. Private funding sources would not replace public funding sources, but could supplement them (Credit Suisse AG, World Wildlife Fund, & McKinsey & Company, 2014).

a. **Impact investing:** Private sector investments are intended to return principal or generate profit while also driving a positive impact on natural resources and ecosystems (NatureVest & EKO, 2014). Many recent studies have concluded that there is increasing interest in the private sector to invest in environmental markets to achieve both environmental and social impacts as well as financial returns (Baumann, Havemann, Werneck, Negra, & Nair, 2017; D. Chen, Coady, Huwyler, Stein, & Tobin, 2014; Credit Suisse AG & McKinsey Center for Business and Environment, 2016; Credit Suisse AG et al., 2014; NatureVest & EKO, 2014). Baumann and colleagues (2017) identified financial investors, corporations, foundations, and donors, as the four investor groups that are most relevant to investments in the environment.

The challenge in attracting private sector investors is that environmental investments involve novel, innovative investment strategies which might not appeal to conventional investors (Baumann et al., 2017). Another limiting factor is the lack of accessible, investable projects (Encourage Capital, 2017). Therefore, if private sector investment in watershed management is to be feasible, innovative investment strategies, delivery structures, and partnerships that ensure profits for investors need to be developed (Baumann et al., 2017). It will also require collaboration between the financial and environmental communities to identify environmental impact metrics that are scientific and measurable, as well as financial metrics (Baumann et al., 2017; Credit Suisse AG & McKinsey Center for Business and Environment, 2016).

To attract investors, environmental organizations will need to identify projects that are scalable and replicable, determine barriers to investment, and proactively develop attractive investment opportunities that can lead to positive environmental impacts at scale. People coordinating these projects will need to develop business acumen and financial literacy. Assistance from an in-house conservation finance expert or an external financial specialist might be required to succeed in these efforts (Baumann et al., 2017; Credit Suisse AG et al., 2014).

Government agencies also have a critical role in promoting private sector investment in the environment. They can help attract private investments by enacting legislation, enforcing policies, developing rules for environmental impact, implementing monitoring systems, creating incentives for environmental performance, and supporting the development of financial instruments (Baumann et al., 2017). The benefit to government agencies is that they will be able to deliver on environmental outcomes and goals (Caggiano & Male, 2017) and have partners to share risk on more innovative projects. A recent report called NRCS and Investment Capital (Encourage Capital, 2017) found that it would be feasible for the NRCS, in the short- and long-term, to use a portion of its funds to leverage private capital.

Summit participants recognized the potential of private sector investments in funding future watershed efforts, but also realize that most watershed professionals do not have the expertise and knowledge to pursue these investments. They recommended taking steps to build capacity for watershed professionals around conservation finance.

COST-BENEFIT ANALYSIS: COMPARING ALTERNATIVE COURSES OF ACTION

Cost-benefit analysis or social cost-benefit analysis is a systematic decision-making tool that is used to identify, value, and compare the costs and benefits of projects, policies, or policy proposals. It is often used to compare multiple options and to make sound investment and policy decisions (Buncle et al., 2013; Schneider, Root, & Mastrandrea, 2011).

Proponents of cost-benefit analysis argue that it leads to better and more transparent decisions (Heinzerling & Ackerman, 2002). Governments can use cost-benefit analysis to determine which environmental projects are worth undertaking and which policies are worth implementing (Babcock & Kling, 2015; Egan, Herriges, Kling, & Downing, 2015). It can also be used to determine whether a project should be funded using public or private funding sources.

There are, however, a number of challenges to using cost-benefit analysis to make environmental policy decisions. One challenge is that the economic benefits of environmental policies are nonmarket in nature. Unlike most privately purchased commodities, clean water, for example, does not have an observable market price that can be used to determine its value since access to clean water is not traded in a market. Therefore, determining the value of clean water for cost-benefit analysis requires the use of nonmarket valuation methods, which can be prone to large uncertainties (Babcock & Kling, 2015; Kling & Phaneuf, 2018).

Cost-benefit analysis tools need to be improved and optimized to increase their value in supporting investment and policy decisions.

SPECIAL CASE: PUBLIC OR PRIVATE UTILITIES AS A FUNDING SOURCE INVESTING IN WATERSHEDS CAN RESULT IN COST-SAVINGS FOR UTILITIES

Utilities can be either private or government-owned. Water utilities have to comply with standards in the Clean Water Act and the Safe Drinking Water Act, which could require them to construct and maintain expensive water-treatment facilities. To avoid these costs, many utilities are investing in the protection of their watersheds by investing in practices like decreasing agricultural runoff and increasing watershed forest cover. Protected watersheds provide ecological services that improve water quality, which leads to reduced treatment and filtration costs for utilities.

An increasing number of conservation organizations and water utilities are recognizing their shared interest in protecting watersheds and are collaborating to ensure the ecosystem services provided by healthy watersheds are protected and maintained. (Boyce & Lyman, 2018; Espinola, 2018)

(B) Underutilized financing mechanisms:

Financing refers to borrowing money to pay for a project (USDOT, 2010) and new financing mechanisms are "new methods for borrowing money in flexible and/or potentially cost-effective ways to pay for a project" (Chen, 2016). Summit participants highlighted two underutilized financing mechanisms, namely revolving loan funds, and green bonds that are especially promising in the context of watershed management.

1. Environmental State Revolving Funds (SRFs)

SRFs are "state-run entities capitalized by federal funds and state matching funds that offer loans with below market interest rates to local jurisdictions." Loan repayments "revolve" back into the pool of funds to fund other local eligible projects (Chen, 2016; Chen & Bartle, 2017; USEPA, 2010). By providing low and no interest, short-term financing, revolving loan funds are supporting conservation projects (USEPA, 2010, 2017).

The Clean Water State Revolving Fund (CWSRF) was established by Congress in 1987, and is a significant source of funding for a wide range of watershed protection and restoration efforts (USEPA, 2010, 2017). It helps fund infrastructure and water-quality improvement projects at the community, municipality, or state level, and recipients can be farmers, nonprofit organizations, individual homeowners, or commercial businesses (USEPA, 2017). While CWSRF projects have typically been used to finance wastewater treatment projects, in 1992 CWSRF started providing loans for agricultural NPS projects (USEPA, 2008a). Since then state-level loan programs for NPS projects to implement agricultural BMPs have proliferated (USEPA, 2001). Loans taken via SRFs are often used as bridge loans. They provide short-term financing by giving groups money to complete projects that otherwise might not have been possible (Martin & Hall, 2017).

SPONSORSHIP LENDING AND THE CLEAN WATER STATE REVOLVING FUND

The Clean Water State Revolving Fund (CWSRF) serves as a low-interest funding source for NPS projects. NPS projects often do not have a revenue stream, therefore, repaying these loans can be challenging. "Sponsorship lending" helps address this issue. It involves the pairing up of traditional publicly owned treatment works projects with NPS projects. For example, a municipality that wants to implement a stand-alone publicly owned treatment works project can receive a loan at normal CWSRF interest rates. But if the municipality decides to implement both a publicly owned treatment works project and an NPS project, it can receive a loan at much lower interest rates. Therefore, even though the loan amount for two projects is higher than for one project, the repayment amount for two projects is the same as for one project. (USEPA, 2017)
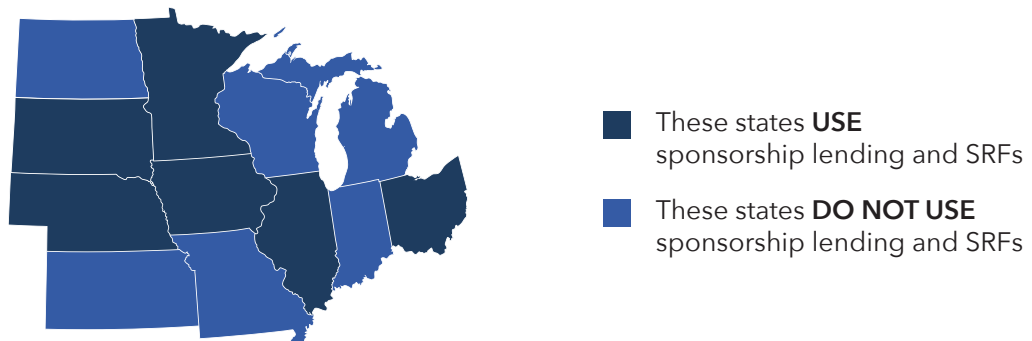

These states **USE** sponsorship lending and SRFs

These states **DO NOT USE** sponsorship lending and SRFs

Figure 5. Snapshot of midwestern states that use sponsorship lending and SRF

2. Green bonds

Green bonds are tax-exempt bonds that fund projects with positive environmental benefits such as those related to renewable energy, energy efficiency, sustainable water management, and so on. (International Capital Market Association, 2016; Jaskulak, 2017; World Bank, 2015). Green bonds are a new type of investment financing vehicle and the market has seen impressive growth in the last few years. Nearly $100 billion worth of green bonds were issued globally in 2016. In the United States, municipalities are emerging as one of the fastest growing segments of all green bond issuers (Jaskulak, 2017). As of 2015, state and local governments have issued about $7.5 billion in green bonds (Campbell, 2016). The advantages of green bonds are that they attract new capital market investors interested in environmental projects, they improve bond issuers' environmental performance, and they enhance bond issuers' reputation for environmental sustainability. The drawbacks are that they require additional monitoring and reporting and that they are a less-developed market than traditional municipal bonds (Chen & Bartle, 2017).

PAY FOR SUCCESS BONDS

Pay for success bonds, a type of green bond, are an "arrangement where private investors and/or philanthropic interests provide the funding for a new public service project." If the project achieves its predetermined outcomes, the government repays the private investor the cost of the project plus an interest rate. These bonds are ideal for funding innovative projects that governments might consider too risky. This a new way to borrow money where governments compensate private investors for assuming the risks of testing new approaches. (Public Sector Consultants Inc., 2016)

Case study: Green Bonds Case Study: D.C. Water
The D.C. Green Bond is an example of how outcome-based financial tools can transfer the risk of an innovative infrastructure approach from agencies to impact investors (Living Cities, n.d.).

 The District of Columbia was required by the USEPA to address water quality problems arising from combined sewer overflows (Living Cities, n.d.). The District of Columbia's water utility, D.C. Water, had to build a $2.6 billion deep tunnel system to transport and treat combined storm water and sewage (Queen et al., 2016). To pay for this, D.C. Water used green bonds. This was a pioneering approach and was the first green municipal bond for water investments in the U.S. market (Climate Bonds Initiative, n.d.). When the $300 million green bond was issued it was met with overwhelming market demand, and the offer was raised to $350 million and the interest rate lowered (Climate Bonds Initiative, n.d.; Queen et al., 2016). This allowed D.C. Water to access more, and significantly cheaper, capital, to finance the project (Queen et al., 2016).

The project represents the first environmental pay-for-success project applied to green storm water infrastructure and is an example of how outcome-based financial tools can transfer the risk of an innovative infrastructure approach from agencies to impact investors (Living Cities, n.d.; North & Gong, 2017). The project built in incentives for environmental impact, therefore the payout depends on the level of environmental benefits achieved (North & Gong, 2017).

C) Underutilized economic instruments

Economic instruments or market-based instruments "rely on market forces and changes in relative prices to modify the behavior of public and private polluters in a way that supports environmental protection or improvement" (Bernstein, 1997). These instruments fall into two categories: incentive-based approaches and mitigation or credit-based approaches.

1. Incentive-based approaches: Incentive-based approaches directly or indirectly use financial means to prompt polluters to reduce the risks that their facilities, processes, or products pose. This approach typically provides financial rewards for polluting less, and/or imposes costs for polluting more (Anderson, 2002).

Insurance premium discounts: This is an incentive-based approach that allows for reduced insurance rates for parties that adopt practices that reduce environmental risks and enhance environmental resilience. For example, farmers can be encouraged to use cover crops by offering them a per acre premium reduction on their crop insurance (Jordan, 2017).

INCENTIVE-BASED APPROACH TO REDUCE ATRAZINE RUNOFF

An incentive-based approach was used to manage atrazine, an herbicide, to meet water quality standards in the Little Arkansas Watershed. The goal of the project was to aid farmers who volunteered to implement best management practices (BMPs) to reduce atrazine runoff. The project involved two adjoining sub-watersheds. BMPs were implemented on one, and not the other. Farmers in the sub-watershed where BMPs were implemented received incentives for using reduced rates of atrazine, applying atrazine early rather than right at planting time, incorporation, split application, or using no atrazine at all.

From 2006-2017, 1,148 farmers implemented BMPs, and water quality monitoring showed a 41.4% reduction in atrazine runoff. The incentive received by farmers to implement BMPs was around $3.01 per acre. (Moore & Graber, 2018; Rich, 2017)

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2. Mitigation or credit-based approaches: Mitigation or credit-based approaches provide "regulated parties flexibility in meeting a performance standard and create an incentive to develop new, more cost effective methods to reduce pollution" (Brown & Sanneman, 2017).

    a. **Water Quality Trading and Related Approaches**
       Water quality trading is a type of mitigation and credit-based approach that provides flexibility to regulated parties to meet performance standards and creates incentives to reduce pollution. Summit participants recognized water quality trading

and other mitigation and credit-based approaches as market-based mechanisms that are viewed favorably by both environmental and industry groups. They also acknowledged that, along with water management regulations, it is a potentially powerful and effective means to attaining water quality improvements (Selman, Greenhalgh, Branosky, & Jones, 2009; USDA & USEPA, 2015). These approaches provide flexibility in how regulations are met and can potentially lower regulatory costs (Selman et al., 2009). Other benefits include the potential to encourage private investment capital, providing additional resources for conservation, and serving as a catalyst for developing innovative, practical solutions for improving water quality at a lower cost (USDA & USEPA, 2015).

Based on an entity's size, location, scale, management, and overall efficiency, costs to reduce pollution may differ. Water quality trading allows entities with high pollution reduction costs to buy pollution discharge reductions from entities that have low pollution reduction costs. By reducing their pollution discharges below regulated levels, entities that have low pollution reduction costs can sell their excess reductions to entities with high pollution reduction costs. Water quality trading is most commonly applied to nutrients such as nitrogen and phosphorus. (Selman et al., 2009)

WATER QUALITY TRADING HAS MANY FORMULATIONS (SELMAN ET AL., 2009):

• Trades between two regulated point sources are the most straightforward. For example, trading between two sewage treatment plants to meet permitted discharge levels.

• Trades can also occur between a regulated point source (usually controlled by regulatory discharge permits) and an unregulated nonpoint source (usually not controlled by regulatory discharge limits [e.g., agriculture]). This enables point sources with high compliance costs to purchase pollution reduction credits or "offsets" from nonpoint sources with lower pollution reduction costs. In this case, nonpoint sources are typically the sellers since they are under no regulatory obligation to reduce their discharge.

• Trading programs between nonpoint sources wherein one or both of the nonpoint sources involved have been regulated.

The USEPA is supportive of water quality trading and in 2003 developed a Water Quality Trading Policy, which identifies general elements and provisions that are important for creating credible watershed-based trading programs. States, interstate agencies, and tribes must develop their own trading programs that meet Clean Water Act, state, and local requirements. In 2013, USDA and the USEPA signed a partnership agreement to support the development of environmental markets (USDA & USEPA, 2015).

The Water Resources Institute (Selman et al., 2009) conducted an assessment to identify factors that stakeholders thought were important for the successful implementation of their water quality trading programs.

USING A LITERATURE SEARCH AND QUALITATIVE RESEARCH METHODS, THE FOLLOWING FIVE FACTORS WERE IDENTIFIED:

- Strong regulatory and/or non-regulatory drivers, which helped create a demand for water quality credits;

- Minimal potential liability risks to the regulated community from meeting regulations through trades;

- Robust, consistent, and standardized estimation methodologies for nonpoint source actions;

- Standardized tools, transparent processes, and online registries to minimize transaction costs; and

- Buy-in from local and state stakeholders.

Watershed Adaptive Management vs. Water Quality Trading: Watershed Adaptive Management is an innovative policy approach in Wisconsin that fosters cooperation between pollution sources. Wisconsin's Watershed Adaptive Management Option and water quality trading both allow entities to work with nonpoint or point sources of phosphorus in a watershed to reduce the overall phosphorus load to a given waterbody. The differences between the two are that Wisconsin's Watershed Adaptive Management Option is currently solely focused on phosphorus compliance, whereas water quality trading is not limited to phosphorus and may be used to meet limits for various compounds. Water quality trading must achieve improved water quality by reducing pollutant load to an extent that is greater than would be achieved without trading. Therefore, water quality trading focuses on compliance with a discharge limit. Alternatively, Wisconsin's Watershed Adaptive Management Option focuses on compliance with phosphorus criteria for the receiving waterbody (WDNR, 2013) and is more directly linked to attaining designated uses.
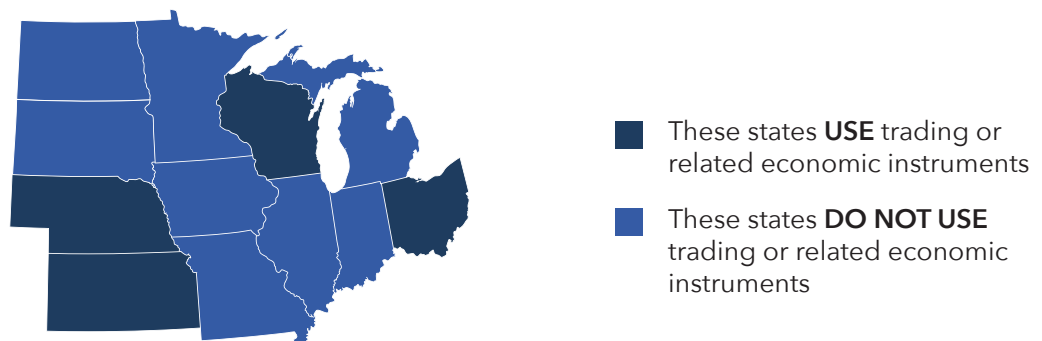

■ These states **USE** trading or related economic instruments

■ These states **DO NOT USE** trading or related economic instruments

Figure 6. Snapshot of midwestern states that use water quality or quantity trading or related economic instruments

THE YAHARA WATERSHED: WATERSHED ADAPTIVE MANAGEMENT AND FARMER-LED EFFORTS

The Yahara watershed in south central Wisconsin comprises about 370,000 people and 170,000 acres of productive farmland. The demands on the Yahara's water include supporting farms, urban and residential areas, and natural areas. Over time these demands have negatively impacted the Yahara's water.

In this case study, we highlight the success achieved in the Yahara watershed through Wisconsin's Watershed Adaptive Management Option. This voluntary compliance option supports all sources of phosphorus in a watershed, including agricultural producers, municipalities, wastewater treatment plants, and other sources, work together to reduce phosphorus pollution using a mix of rural and urban practices. The Madison Metropolitan Sewerage District (MMSD) began work on a Watershed Adaptive Management effort in 2012 when it collaborated with partners to initiate the Yahara Watershed Improvement Network (Yahara WINS), a 4-year pilot project. MMSD's goals were to reduce phosphorus loads to comply with requirements in its Clean Water Act discharge permit and to meet the water quality standards established by the Wisconsin Department of Natural Resources (WDNR). MMSD is one of the first wastewater treatment plants to use Watershed Adaptive Management to meet clean water standards. (Yahara WINS, 2017)

Municipal participants in Yahara WINS have signed an intergovernmental agreement to work collaboratively to address phosphorus. Yahara WINS pools resources from these municipality participants and funds practices that reduce phosphorus. Yahara WINS has offered grants for urban and rural phosphorus reduction since 2013 to fund projects that reduce phosphorus at the lowest cost per pound.

During 2016, documented phosphorus reductions by Yahara WINS and its partners exceeded the target for the year. They kept more than 29,000 pounds of phosphorus from area surface waters. Yahara WINS has now transitioned from a 4-year Watershed Adaptive Management pilot to a full-scale project. (Yahara WINS, 2017)

Yahara Pride Farms (YPF) is a farmer-led nonprofit organization that receives Yahara WINS funding to implement conservation practices. With the $80,000 it received from Yahara WINS, YPF offered farmers cost-share for five types of practices (strip tillage, low disturbance manure injection, low disturbance deep tillage and cover crop, cover crop assistance, and headland stacking of manure/composting), as well as bonus payments for combining of practices and implementing a practice for multiple consecutive years. In 2016, 37 farms participated in the YPF cost-share program. YPF reported in its 2016 annual report that since the group began in 2012 farmers had made changes to their practices resulting in more than 27,000 pounds of documented phosphorus remaining on the land and thus not entering surface water. In the year 2016, farmers accomplished a total phosphorus reduction of more than 11,000 pounds on more than 11,500 acres. (Yahara WINS, 2017)

This case study demonstrates the role that policy approaches (i.e., Watershed Adaptive Management) and human capital (i.e., farmer leadership) can play in the success of watershed initiatives.

b. Permittee-responsible Mitigation

Permittee-responsible mitigation includes restoration, establishment, enhancement or preservation activities undertaken by a permittee (for example, a developer) or a contractor hired by the permittee, to compensate for impacts resulting from a specific development project in a watershed. It tends to be associated with one-time actions and the permittee retains full responsibility for meeting all of the terms of the permit they receive. This program also allows permittees to perform mitigation activities at other sites within a specific geographic area, such as another watershed, if they can demonstrate that the offsite activities will result in greater benefit to the watershed when compared to implementing mitigation activities onsite (Brown & Sanneman, 2017; Hough & Robertson, 2009).

c. In-Lieu Fees

In-lieu fee programs "provide project developers who cannot easily or cost-effectively meet regulatory requirements onsite with the option to pay a fee instead" (Brown & Sanneman, 2017). The revenue is collected by an in-lieu fee sponsor, generally a public agency or nonprofit organization, and is invested in other mitigation efforts. In this case, the in-lieu fee sponsor is responsible for the success of their investments (Brown & Sanneman, 2017; Hough & Robertson, 2009).

Operationalizing the scale-up of watershed management in the Midwest

As detailed in previous sections, the last few decades have seen considerable progress in identifying strategies and practices to effectively manage individual watersheds. However, to have impact on a transformative scale, watershed management efforts need to be scaled up. This section presents a framework to operationalize the scaling up of watershed management in the Midwest and is intended to be used to strategically plan and manage the scaling up process. Along with the scalable unit and the necessary elements for successful watershed management, this section completes a theory of change for scaling up watershed management in the Midwest.

THE FRAMEWORK CONSISTS OF FOUR STEPS:

- **Step 1:** Create a vision and broad strategy for the scale-up
- **Step 2:** Develop an organizational structure to support scale-up
- **Step 3:** Test, evaluate, and refine scale-up strategies
- **Step 4:** Go to and maintain full scale watershed management

Step 1: Create a vision and broad strategy for the scale-up

The first step in any scaling up effort is to articulate a vision and outline strategies to implement the vision (Kohl & Cooley, 2006). This paper could be considered this first step of such a framework. By drawing on scaling up literature, watershed management literature, and watershed management best practices from applied research, this paper offers a vision and strategies to achieve the scale up of watershed management efforts across the Midwest.

The scale-up strategy described in this paper includes a list of what needs to be scaled up (Section 5), the elements that are critical to success in watershed management at smaller scales that need to be expanded to cover larger scales (Section 6), actionable strategies to establish these necessary elements at larger scales (Section 7, Steps 2 and 3), and recommendations to sustain growth over time (Section 7, Step 4).

Step 2: Develop an organizational structure to support scale-up

Note: Some activities outlined in Steps 2 and 3 are already being pursued independently by different organizations. At a minimum, these sections provide a guide for existing organizations. A more coordinated effort could increase the likelihood of broader and lasting success.

Scaling up watershed management in the Midwest will require support from many different constituencies. The Midwest has robust leadership at the state and multistate levels and across sectors addressing water resource management. However, summit participants agreed that no single organization has the capacity or resources to operationalize the

scale-up of successful watershed management across the region. To succeed, we suggest a new collaborative and cross-sector organization to work toward the shared goal of scaling up watershed management in the Midwest. For ease of discussion, we will call this organization the Midwest Watershed Collaborative. The Midwest Watershed Collaborative concept was inspired by existing collaboratives, such as the Source Water Collaborative and Chicago Wilderness. Similar to the Source Water Collaborative, the Midwest Watershed Collaborative could support pilot efforts and offer centralized services to organizations implementing the pilot efforts (Source Water Collaborative, n.d.).

Collaboratives show potential when organizations with different and complementary skills and resources and with high levels of mutual trust work toward shared goals (Kohl & Cooley, 2006). A successful collaborative organization increases the ability of already strong members to accomplish common goals. A Midwest Watershed Collaborative should have representation from public, private, and non-profit sectors and from community organizations. The advantages of including public sector organizations are that they have political legitimacy, although they often lack technical expertise, access to extensive financial resources, and the ability to operate with flexibility. Private sector organizations might lack political legitimacy but often have access to financial resources and technical expertise. Organizations from the non-profit sector operate with flexibility but they sometimes lack political legitimacy. Community-based organizations could have political legitimacy but might lack technical expertise. Therefore, a collaborative that has representation from diverse sectors can be a powerful and efficient way to mobilize the resources needed for the scaling up process (Kohl & Cooley, 2006). To be effective, collaboratives must have access to external funding. Strong, diverse collaboratives will be able to create the confidence needed to attract funding.

When forming a Midwest Watershed Collaborative, existing organizations and networks can be leveraged to house and/or lead the new effort. Such a collaborative must include key stakeholders and champions from the environmental and non-environmental sectors. Given the critical role that policy plays in watershed management, a collaborative must also include partners who participate in the political process, engage with policymakers, and can mobilize stakeholders to advocate for a collaborative in the political arena. Influential opinion leaders are especially important since their support and participation in a collaborative would provide legitimacy and urgency. Once a collaborative is established as legitimate, it would become easier to influence policy, attract funders, and increase public support (Kohl & Cooley, 2006). The leaders of a collaborative must have a vision, be persistent, and be well connected to important stakeholders (Hartmann & Linn, 2007).

Before a collaborative tests and implements scale-up strategies (i.e., Steps 3 and 4 of the scale-up framework), the elements necessary to support scale-up (i.e., human capital, social capital, policy framework, and finance framework) need to be established at larger scales. To achieve this, a collaborative would need to establish a transparent and efficient governance structure, and members would need to agree to assignments of tasks and responsibilities, as well as resource distribution and action plans (Kohl & Cooley, 2006). Although a collaborative would be a partnership between various institutions, members should be allowed to maintain autonomy in their area of expertise while also sharing responsibility for the success of the scale-up.

TO ESTABLISH THE ELEMENTS NECESSARY TO SUPPORT SCALE-UP, SOME OF THE TASKS THAT A COLLABORATIVE WOULD NEED TO UNDERTAKE ARE:

- **Develop a knowledge management system:** Knowledge management is the systematic process of "collecting, organizing, clarifying, disseminating, and reusing information and knowledge throughout an organization" (Frappaolo, n.d.). To manage knowledge effectively within a collaborative, members should create a culture of sharing knowledge by encouraging and rewarding it and by providing opportunities to learn and share. This sort of peer-to-peer learning between members of a collaborative can motivate and energize members (Massoud, Donohue, & McCannon, 2010).

- **Cultivate new leadership:** Scale-up efforts in other sectors have shown that success is directly related to leadership. Therefore, it is imperative to cultivate effective leadership at all levels of management (Massoud et al., 2010).

- **Organize outreach campaigns:** Concerted outreach campaigns aimed at the public, policymakers, partners, and other important stakeholders, including underserved groups, that clarify the need for and purpose of a collaborative would help mobilize support and build credibility. Stakeholders can be engaged via multi-stakeholder dialogues or by working through political parties, legislative committees, business, religious, labor, or other civil society coalitions. Support from the public and policymakers would also make it easier for a collaborative to secure funds (Greenwood & Boese, 2017; Kohl & Cooley, 2006).

- **Influence policy:** An important subset of outreach campaigns, a collaborative and its members could advocate for policy changes that support nested watershed planning and management, along with the other necessary elements for successful watershed management. A Collaborative may choose to advocate collectively on some issues and in some states, while some members may be better positioned to influence policy individually. It would be critical for policy positions to remain grounded in sound science and robust testing, evaluation, and review.

- **Provide technical and financial expertise:** Individual members of a collaborative might not have expertise or might not be able to access services related to technology and financing that would be needed for the scale-up. Summit participants stressed the importance of accessing technology and technical expertise in order to scale up successfully. At scale, data management and tracking systems would be needed to manage and share data to help track and inform measures of success. A collaborative could assist with setting up data management systems and ensuring the use of data in making decisions and improving strategies. Apart from providing these centralized services, a collaborative could also offer relevant training to build the capacity of its members.

Step 3: Test, evaluate, and refine scale-up strategies

While there is substantial evidence for the vision and scale-up strategies we propose, it will be important to assess the current state of progress, begin more systemic strategies to expand adoption of necessary elements, and to test, monitor and evaluate scale-up efforts as a whole.

Systematically assess the state of necessary elements. Watersheds are managed differently in states across the Midwest based on the policy frameworks at the state and local levels, the accessible funding sources for watershed management, and the unique social contexts and issues in the states. Therefore, all necessary elements are established to different extents in different states. In order to determine which of the necessary elements need to be established, it is important to first conduct a systematic assessment to understand the current state of the necessary elements and to identify gaps. Some workshop participants suggested that establishing measures of maturity for watershed management systems at state and local scales may be useful in communicating relative progress toward achieving high levels of adoption of the necessary elements.

Implement strategies to expand adoption of necessary elements. Once the gaps in necessary elements for a watershed are identified, steps can be taken to implement strategies that address the gaps. Addressing the gaps in necessary elements allows for the scale-up framework to be integrated within existing frameworks of watershed management rather than developing new management frameworks from scratch.

Test, monitor, and evaluate the strategies to establish necessary elements in different contexts at the state scale and at multiple smaller sites. Tracking the effectiveness of scale-up strategies and making adjustments when intended results are not achieved would be another important task for a collaborative. Scaling up is not a linear, rigid process. It should be approached as an iterative, adaptable, and flexible process that uses feedback loops to improve and adjust scale-up strategies. Practitioners at state and local scales are currently engaged in de facto management experiments that can and should be used as learning experiences. Therefore, scaling up strategies at state and local levels must represent contexts that are likely to be encountered throughout the Midwest. Readiness measures, such as those proposed by Babin, Mullendore, and Prokopy (2016) should be considered when determining where to fill gaps.

THE AGRICULTURAL CONSERVATION PLANNING FRAMEWORK: TECHNOLOGY SUPPORTING SMALL-SCALE WATERSHED MANAGEMENT

The Agricultural Conservation Planning Framework (ACPF) is a concept for agricultural watershed management supported by high-resolution data and an ArcGIS toolbox, which are used to identify site-specific opportunities to install conservation practices across small watersheds. This non-prescriptive approach provides a menu of conservation options to facilitate conservation discussions on farms and in community halls. The framework is used in conjunction with local knowledge of water and soil resource concerns, landscape features, and producer conservation preferences to provide a better understanding of the options available in developing a watershed conservation plan.

THE ACPF IS MADE UP OF THREE DIFFERENT COMPONENTS:

1. A framework based on a sequence of conservation priorities from in-field to edge-of-stream practices that, in combination, can improve watershed health

2. Databases of field boundaries, land use, and soil data available for HUC12 watersheds across the Upper Midwest

3. A toolbox for use within Esri's ArcGIS (versions 10.3-10.6 and ArcGIS Pro 2.2) along with the provided databases and high-resolution topographic data to generate detailed output maps identifying a broad range of conservation practice opportunities available

The ACPF supports small-scale watershed management by analyzing hydrology at an actionable scale and generating a broad range of specific conservation practices that can be installed at the field level. This landscape-specific information gives landowners the ability and confidence to decide what actions are most effective in addressing local water quality and quantity concerns on their land. ("Agricultural Conservation Planning Framework," n.d.)

Systems for monitoring and evaluating scaling up strategies should be established early in the scale-up process (Hartmann & Linn, 2007; Kohl & Cooley, 2006). A robust and effective monitoring and evaluation system can help track performance against objectives, gather data to inform decisions, collect information that can be used to improve strategies, document success stories, and capture both intended and unintended outcomes of the effort. Virtually every member of a potential Midwest Watershed Collaborative already maintains monitoring and evaluation systems. While no single organization has all the necessary information to monitor and evaluate scale-up efforts, collectively this information could provide a strong foundation for testing and evaluating those efforts.

Using monitoring and evaluation data to inform decisions would maintain transparency and accountability within a collaborative that includes many members. A process to share monitoring and evaluation data within a collaborative must be set up so members can learn from each other's experiences. A collaborative should also consider sharing monitoring and evaluation data with the public to maintain transparency while appropriately protecting any sensitive information.

Step 4: Go to and maintain full-scale watershed management

In this step, the focus is on implementing Step 3 across the Midwest. A collaborative should encourage its members to take on roles and responsibilities that will assist in coordinating the overall scale-up effort. The collaborative and its members would need to periodically reassess and adapt the theory of change laid out in this paper as well as the strategies for scaling up.

While this paper has focused on scaling up successful watershed management systems, it is important to recognize that capacity can be lost as well. While some Midwestern states, such as Minnesota and Iowa, have increased their watershed management capacity over the past decade, other states have lost significant capacity over the same period. By promoting a shared understanding of the foundations and necessary elements of successful watershed management systems across the Midwest, any future collaborative and its members would be able to more effectively advocate at local, state, and national scales and maintain the capacity to achieve shared water resource management goals.

SECTION 8   # Conclusion

The vision and strategies presented in this report describe the potential for the successful scale-up of watershed management across the Midwest. The success of this vision depends on identifying a scalable unit, assessing the necessary elements for scale-up, developing an organizational structure to support scale-up, implementing strategies to expand adoption of necessary elements, and using data to redesign scale-up strategies throughout the process.

Defining the scalable unit in watershed management is critical to planning a scale-up process. This paper offers a two-part definition of a scalable unit, which includes the four necessary support elements: human capital, social capital, policy framework, and finance framework. All components of this framework need to be tested and evaluated in different settings, to gather insight and build expertise in scaling up watershed management efforts.

This report identifies potential roles that various stakeholders could play in this scale-up effort. We hope that all stakeholders recognize that successful scaling up efforts can lead to broad, transformational, and lasting change, and take up the responsibility of planning for and working toward scaling up watershed management.

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