LAKES REU

Community Capacity Report

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Awareness and Concern is rated Favorable, meaning, "Most people are aware of the pollution problem, including most in the epistemic communities". 13

Knowledge is rated Somewhat Favorable, meaning, "Most people in epistemic communities and some in the general population know the source of the pollution". 14

Collective Memory and Vision is rated as Somewhat Unfavorable, meaning "Some people and epistemic communities remember ways water and land used to look and have a vision of what an improved watershed might add to the community". 15

Responsibility is rated as Somewhat Favorable, meaning "Most people do not take personal responsibility for addressing water pollution and/or engaging in pro-environmental behaviors in general, although most of the epistemic community does". 17

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Sense of Collective Responsibility is rated as Somewhat Unfavorable meaning "People – both general population and epistemic communities – have a shared awareness of pollution. General population and epistemic communities do not have a shared concern about pollution; the general population has a low sense of collective responsibility and epistemic communities have a moderate sense of collective responsibility" 28

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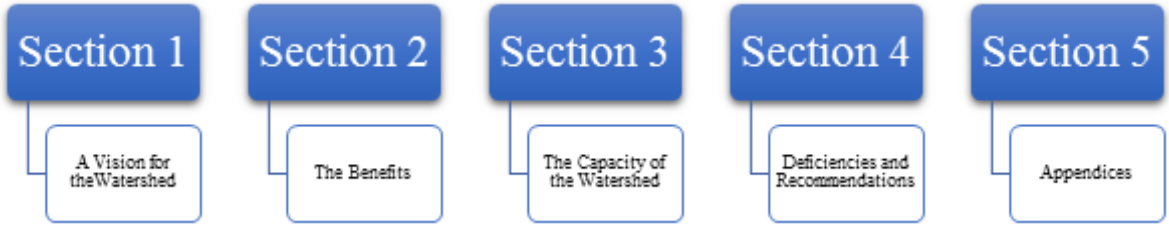
SECTION 1: INTRODUCTION, BACKGROUND, AND METHODOLOGY

This report is the culmination of five years of research by a number of individuals, organizations, and government agencies to address the water quality issues of the Red Cedar Watershed. The research is largely based on the projects of the LAKES REU (Linking Applied Knowledge in Environmental Sustainability – Research Experience for Undergraduates) program, with substantial data and analysis contributed by other partners. Each summer from 2014 to 2019, a group of undergraduate students from around the country conducted research in Menomonie on phosphorous pollution and related water quality issues in the watershed. The students were mentored by UW-Stout faculty in the fields of Anthropology, Biology, Economics, Geography, Geology, Mathematics, and Sociology. Their research and data collection, funded by a National Science Foundation (NSF) grant, are the foundation of this report; it is enhanced by additional UW-Stout faculty research and contributions of time, information, and expertise from many different project partners. The project partners included Dunn County, Barron County, County Land and Water Conservation Departments, Natural Resource Conservation Service (NRCS), WI Department of Natural Resources (DNR), The Tainter-Menomin Lake Improvement Association (TMLIA), Red Cedar Lakes Association, UW-Extension, the US Army Corp of Engineers (USACOE), the Red Cedar River Water Quality Partnership Group, West Central Wisconsin Regional Planning Commission (WCWRPC), and the City of Menomonie. This study and final report would not be possible without their tremendous contributions.

The development of this study and report was funded by the Red Cedar Basin Grant, a WI DNR Lake Protection Grant, in order to merge the collected social, economic, organizational, and biological data to develop a plan to improve water quality in the watershed. It also received additional funding from the USACOE to evaluate the community's capacity to manage and protect water quality within the watershed. Knowing the strengths and weaknesses of a community lays a foundation to engage and move forward with planning and implementing realistic goals and initiatives on water management, as well as other public issues.

This report is composed of five sections. The first section briefly describes some of the practices that contribute to outcomes like cleaner water, improved soil health and land use, and community engagement in environmental decision-making. It also explains the kind of attitudes and community atmosphere that would be useful to pursuing water quality goals in the watershed. The second section lays out the many benefits of building community capacity in the watershed for water quality and other goals. The third section is the community capacity assessment of the Red Cedar Watershed based on the evaluation criteria of Mae Davenport and Erin Seekamp's Community Capacity Model (2013). The model was adjusted to more effectively reflect and evaluate the Red Cedar Watershed. Section four builds on section three, presenting recommendations and guidance for moving towards improved water quality in the watershed.

The final appendices of the report contain the ratings of the watershed's capacities, background information, research methods and processes, references, and other relevant analyses and results not included in other sections of the report.



The idea of community capacity is rooted in realizing what a community already has, what it is lacking, and how it can use its current strengths, skills, and resources to deal with complex problems. A community capacity assessment can be useful in discovering the capabilities, skills, and resources already existing in a community and place them in a larger context in relation to each other and the watershed as a whole. It is important to make a distinction between community capital and community capacity. A community may possess capital without having the capacity to utilize it. Davenport and Seekamp (2013, p. xxx) clearly highlight this difference in their writing on community capacity:

> While community capital encompasses a variety of foundational resources or assets (e.g. physical, financial, technological) upon which a community can draw in times of need, community capacity is the interaction, mobilization, and activation of these assets toward social or institutional change. Stated differently, a community may possess a broad range of capitals needed to cope with problems…but lack the capacity to establish common goals, make decisions based on mutual learning, and act collectively.

A community can possess an abundance of resources but lack the organization, leadership, and direction to make changes to policy, invigorate personal responsibility and agency, and affect the root causes of complex environmental problems.

A community is a difficult thing to define; it encompasses a multitude of people, places, groups, ideologies, and interactions (M. Davenport, 2015). Thus, assessing a community can be challenging, especially when the goal is to address a complex problem like non-point source phosphorus pollution. Many different perceptions and values play into mobilizing a community to address a public problem (Osborn, 2014; Pradhananga et al., 2017). This is complicated further by the many diverse micro-communities residing within a watershed. In terms of people, a watershed is not one cohesive unit and contains a variety of individuals, organizations, and governance structures/agencies. The aim driving this community capacity assessment is the identification of the

watershed's assets, resources, and challenges, as well as its problem-solving skills and levels of awareness and concern about an issue (M. A. Davenport & Seekamp, 2013). Many valuable conclusions and recommendations can be drawn from these data and analyses; however, it is important to realize the limitations of this kind of assessment. Research conducted in Menomonie and about Menomonie is not necessarily able to draw conclusions about Chetek, Rice Lake, Birchwood, or other communities in the watershed. In that way, this study is limited and many of the results are specific to certain communities within the watershed. Some of the research was conducted on a watershed scale, and each section will explicitly identify the study area informing that part of the study as appropriate. The community capacity model utilized by this report was also designed for evaluating communities in terms of *watershed management*, not just municipal or even county, as these discrete lines of social delineation are relatively arbitrary. This model presents four important areas of community capacity and several subcategories within each area for more specific evaluation (M. A. Davenport & Seekamp, 2013). Each area- and the interactions between them- cover the many assets, skills, and resources needed to sustainably manage a watershed. Recognizing areas of strength and weakness within a community or watershed is the first step towards constructing a plan for the watershed to engage the community, utilize its assets, and address its weaknesses. While many of the sections of this report are specifically directed at Menomonie or Chetek, there are several sections and recommendations that should be seen as broadly applicable throughout the watershed. In fact, many of the recommendations from this report would be best implemented across the watershed.

As with any project of this magnitude, many different methods were employed in the collection and analysis of data. Here we provide a brief overview of the methodology, while the Appendix (Section 5) compiles the methodology in slightly more detail. Interviews were conducted with local political leaders, city and county government officials, conservation agents, business owners, community members, lakeshore owners, farmers, and non-operating landowners. Surveys were sent out to business owners, farmers, non-operating landowners, lakeshore owners, community members, UW-Stout students, faculty, and staff, local government officials, and county agents. Other methods of data collection and analysis included focus groups, geographical data collection, spatial analysis, participant observation, network analysis, photographic records, and economic modeling. The majority of data were collected over the past five years, so it is important to recognize and acknowledge that changes have taken place in the watershed during this time. The data and results from the research were reviewed and categorized within the community capacity model. The research falling under each category was summarized in order to give ratings according to our community capacity rubric (full rubric categorizations in Section 5).

SECTION 2: THE BENEFITS

Community capacity in watershed management is never simply about just having clearer water. Ultimately, the goals of watershed management hit on several different, yet vital, areas within a community. Watershed management is concerned with creating or preserving natural spaces that enhance and strengthen a community. It involves keeping the land and soil healthy and instituting practices and mindsets that will protect the land for use by future generations. It is about recognizing the uniqueness of an area, maintaining local plants and wildlife, and establishing policies that protect and preserve. Finally, it is an understanding of the history of the watershed, the ways water has shaped and molded the communities within the watershed, and how protecting the watershed now can influence the community in the future. All of these things contribute to cultivating a vibrant community that is invested in both the present and the future.

Building a community's capacity to address water quality can produce many direct and indirect benefits. A community becomes more capable of setting water quality goals and addressing other complex issues. It also is able to see tangible benefits such as improved water quality, healthy land and soil, investments in the local economy, community cohesion, collaboration, and better health and wellbeing. Building a community's capacity will often take different paths based on the community and local priorities. Even within a single watershed, the key issues and priorities of Menomonie (at the south end of the watershed) differ from the issues and priorities of Chetek (in the middle of the watershed), which in turn differ from Birchwood (at the north end of the watershed). The watershed is not a single unified community, but rather a collection of communities operating within distinctive spheres and having their own goals. Although each community is unique, there are opportunities for communities to recognize their commonalities (especially involving water), collaborate across boundaries, and share knowledge, ideas, and strategy. All of this is undertaken with the understanding that the benefits of building a community's capacity will not have the same effects in every community.

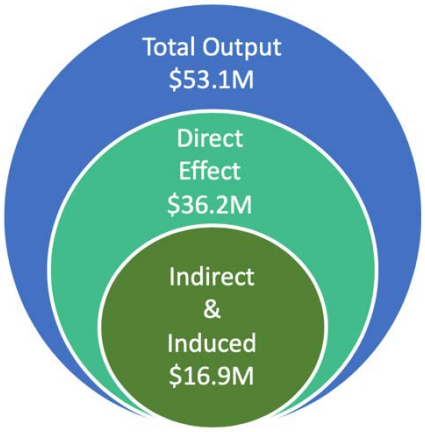


Figure 1: Total Annual Economic Impact for Dunn and Barron County summer tourism $53.1M

The key benefit of improving water quality in the Red Cedar Watershed is the resulting boost in the local economy, recreation, and tourism (Figure 1). Several economic impact studies were completed by the LAKES REU, demonstrating the projected outcomes of changes in water quality. Local business and industry stand to gain if water quality were improved even slightly, but also stand to lose if water quality worsened even slightly. A survey of Chetek businesses projected

a 185% increase in summer season sales revenue if water quality were to significantly improve and 168% decrease in revenue if water quality were to significantly worsen. Similarly, an increase or decrease in tourism (tourism in the Red Cedar Watershed is often related to lakes/rivers/waterways) to the area has a profound impact on local businesses and the local economy. A water-based tourism

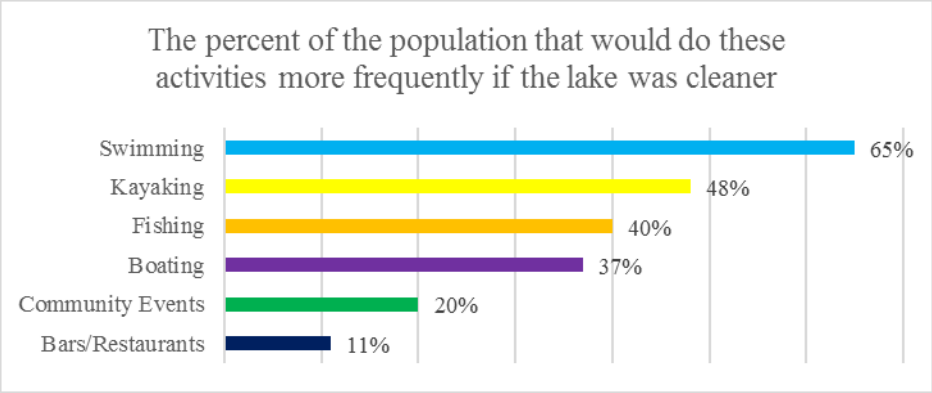


Figure 2: Projected Increases in Use of Lake if Water Quality Improved

increase of 10% in Dunn and Barron counties has the potential to bring an additional $13.2 million into the local economy and create 220 jobs. A 10% decrease in tourism in Dunn and Barron counties could trigger a corresponding loss in economic activity and elimination of jobs. The industries or businesses projected to experience the largest growth in a best-case scenario are real estate, bars, and restaurants, clothing and retail, and employment for government/education.

The value local residents receive from recreation opportunities increases with improved water quality as well. Around 78% of Menomonie residents travel to other lakes in Wisconsin for recreation purposes. The local economy is foregoing an opportunity for revenue when residents travel to other lakes in Wisconsin for recreation. A LAKES REU survey of Menomonie community members found that if the lake were cleaner 65% of community members would swim more, 48% would kayak more, 40% would fish more, 37% would boat more, 20% would attend more community events, and 11% would visit bars/restaurants more often (Figure 2).

An improvement in water quality could also influence more UW-Stout students to stay in town over the summer. Survey data suggests that roughly a third of students would be more likely to stay if the lake was cleaner in the summer. If the UW-Stout population during the summer were to increase by 1500 students, approximately $2.8 million would be invested into the local economy and 40 jobs created. Students stay in Menomonie during the summer for three main reasons – jobs, classes, and recreation.

Housing values also stand to gain from an improvement in water quality, particularly the values of lakefront properties/houses. In the summer of 2016, the LAKES REU completed a Hedonic-pricing model of house values in the Red Cedar Watershed. This research found that each

foot of added Secchi depth (a method of measuring water clarity, see appendix for more detailed description) in a lake adds approximately $6,050 in value (4%) to a median-priced $150,000 lakefront home. The lake premium (meaning the difference between the cost of a lakefront house and non-lakefront house) varies greatly throughout the watershed emphasizing the differences in water quality already existing. For example, the lake premium for a median-priced home is $68,000 (45%) in Cumberland in the north part of the watershed, and the lake premium is $36,000 (24%) for Menomonie in the south part of the watershed. Chetek, which resides in the center of the watershed, has a lake premium of $49,000 (33%). These lake premiums have the potential to increase if water quality were to improve significantly. Improving the water quality throughout the watershed would have a large impact on lakefront house values, as well as a similar (albeit lesser) impact on other houses in the communities. The effects of an increase in lakefront property values could have numerous indirect benefits, including attracting people and businesses to the community and increasing local government revenue through property taxes. The value increase in lakefront homes in the Red Cedar Watershed would translate to an additional $3.65 million in yearly property taxes.

Aside from the enormous potential for economic growth, improving water quality has numerous other potential benefits for the communities of the Red Cedar Watershed. One of the more important benefits is improvements in health, wellbeing, and quality of life. For instance, Lake Menomin has issues with cynobacteria corresponding to the proliferation of blue green algae. Cynobacteria can produce toxins damaging to ecological systems and the health of humans and animals. Human health concerns limit the use of lakes/waterways and cast water as a negative aspect of a community rather than a positive one. As mentioned above, improved water quality would allow for additional opportunities and enjoyment of recreation, tourism, and community events. It would also promote a sense of community and history around the water as the lakes and waterways improve and create an identity and narrative around the water, community, history, and change. A shared narrative is a realization of the history of the lakes and waterways as community centers, an understanding of the local/state/national water quality issues and their origin, and a sense of collective responsibility to address water quality issues. This kind of shared narrative creates an environment conducive for collaboration, community engagement, and personal action to protect water quality.

SECTION 3: CURRENT CAPACITY

Davenport and Seekamp (2013) lay out four different, mutually supportive levels of capacity useful in assessing a community's watershed management, and we used these categories in our analysis. The four different levels are member capacity, relational capacity, organizational capacity, and programmatic capacity (Figure 3). Member capacity observes community member's characteristics indicated by awareness of the problem, level of concern, personal responsibility, perceived agency, and civic engagement. Relational capacity is more concerned with the connections in the community, specifically the existence of social networks, the sense of community, and the collective sense of agency and responsibility. Organizational capacity looks at the organizations and collaborations in the community concerned with the number of members, quality and depth of leadership, the existence of formal networks, collaborative decision-making, conflict resolution, and respecting diverse perspectives, values, and experiences. Finally, programmatic capacity evaluates money/staff, education/outreach support, monitoring and expertise, accountability of programs, policies, and personnel, and cross-organizational cooperation. These four capacities are distinct, but overlap in significant ways, highlighting the importance of a holistic approach in addressing the complex water problem affecting the Red Cedar Watershed.

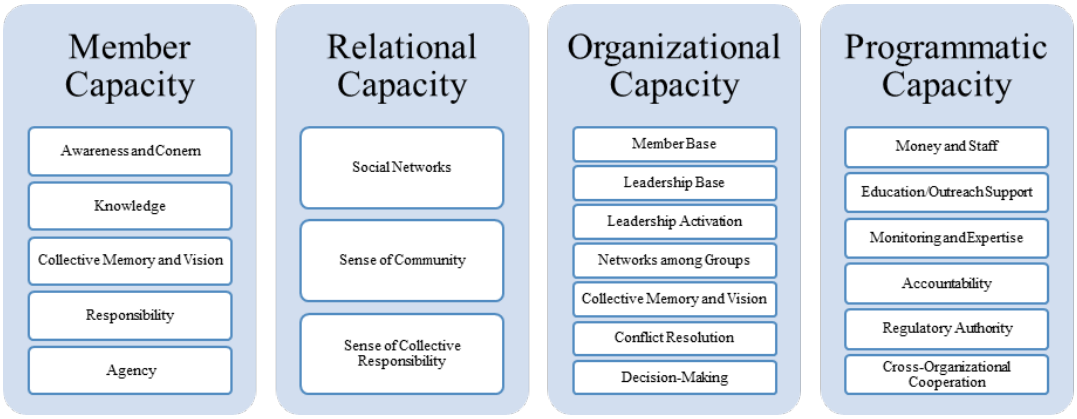


Figure 3: The Four Levels of Community Capacity

The rubric to evaluate the current state of the Red Cedar Watershed was based on a similar rubric designed by Davenport and Seekamp (2013). This rubric contains the four main capacity categories and their respective subcategories. The different ratings for each subcategory were adjusted to fit the Red Cedar Watershed more closely. A copy of the complete rubric is located in Appendix A. The ratings commonly consider the population as two groups, general population and epistemic communities. General population refers to the communities in general- individuals who live and work within the watershed. Epistemic communities refer to the groups of individuals actively engaged and knowledgeable about water quality issues who make decisions about and prioritize what we know about water quality and how we know what we know. Within

the watershed, this group typically includes county agencies such as Land and Water Conservation, NRCS and DNR agents, NGOs, university faculty, and city/county officials. The use of the word "epistemic" as a description for this group of individuals was based on the use of the word in Peter Haas's work on how "networks of knowledge-based experts – epistemic communities – play in articulating the cause-and-effect relationships of complex problems" (1992, p. 2).

MEMBER CAPACITY

Member capacity is the first level of capacity addressed in the model and includes subcategories of community member's knowledge and beliefs, awareness and concern, collective memory and vision, sense of personal responsibility, and feelings of agency regarding watershed management. This type of capacity focuses on the individual, their responses to issues, and perceptions of water quality. It also asks questions of personal involvement and agency in water quality issues. Each section begins with a statement giving the subcategory, the capacity rating determined by the research and analysis, and a definition of that rating.

Awareness and Concern is rated Favorable, meaning, "Most people are aware of the pollution problem, including most in the epistemic communities".

Many of the communities within the watershed are generally aware of local water quality issues and concerned about the implications of them. There are a number of different water quality issues affecting the watershed, and the level of awareness and concern varies by the specific issue and location within the watershed. The level of awareness and concern is determined by several factors, one of the most important is proximity to issues. Lakeshore property owners and individuals residing near waterways tend to be acutely aware of the issues local water is facing:

> "If you are gonna live on a lake, you have to be worried about these things – you have to be worried about invasive species, you have to be worried about water quality, you have to be worried about lake stewardship, you have to be worried about the watershed, because those are all of the things that are going to impact your lake." – Lakeshore Property Owner

Awareness and concern about water quality issues can get hung up on the unknowns about water quality. Several watershed landowners questioned the accuracy and reliability of the information they were receiving about water quality.

> "I don't know if I would necessarily call it untrustworthy information, but I think it's really important that a lot of the information you receive that we ask questions about it and make sure that it's based on good hard evidence or scientific evidence."
> - Watershed Landowner

These discussions and hesitations can hinder the proliferation of accurate information about waterways in the watershed and agency efforts to change the current state of water in the watershed. As the watershed spans more than 1800 acres, it can be difficult to create a shared concern and awareness for the different water quality issues existing in the watershed. Deficits of awareness and concern seem to be the attribute of an "out of sight, out of mind" mentality rather than a blatant disregard for other areas of the watershed. However, a general collective concern for water does exist and water quality is a prominent environmental issue.

> "Yes, I think there's an awareness in the community of the need to address it, and the benefits that the community can hopefully realize with that." – Menomonie City Official

The awareness and concern about water quality issues is important as it informs and inspires individuals within a community to learn more, assume responsibility, and take action. It could be considered an important first step.

Knowledge is rated Somewhat Favorable, meaning, "Most people in epistemic communities and some in the general population know the source of the pollution".

It is generally accepted by everyday citizens in the watershed that numerous water quality issues exist. However, the current knowledge and perceptions about water reveals contradictory narratives about water quality in the watershed. There is a consensus on the deterioration of the water over time, and the need to address it. However, that consensus sometimes lacks specificity or clarity and the unknowns about water quality start to overwhelm the facts about the watershed.

> "We want our lakes to be clean and pretty, we don't want the dog to drink the water and get sick. Or is it truly hurting the environment? I don't know the answer to that." – Lakeshore Property Owner

> "Well it would be nice to fix it. I just don't know how and how much it is going to cost and how long it is going to take." – Chetek Community Member

Responsibility (discussed in more detail further on in this section) and knowledge exist on a spectrum containing attitudes ranging from extremely concerned to apathetic. It can be difficult to reconcile the diverse attitudes that exist concerning water. The ideas for how to address water quality issues are diverse but can tend to have singular focuses on specific aspects of the overall problems.

> "You get so many different people that have got really different ideas on how to do it." – Lakeshore Property Owner

Waterways in the watershed change in overall appearance from year to year, depending on the temperature, amount of rain, and other factors. Many community members discussed these changes and how they can give a false perception of improvement or decline.

> "The last couple of years haven't been bad because of the amount of rain we have had, they haven't gotten really bad. But on drier years, it has been really bad." – Chetek Business Owner

The changing conditions from year to year can mask the ongoing problems with lakes/waterways. To the outward eye, the lakes/waterways may seem to have significantly improved, but looking at the data and water quality standards can convey a completely different picture.

> "In my opinion I don't think it is getting worse visibly, but then you look at some of the data, and it started showing nutrient load, and that seems to be actually growing." – CLPA (Chetek Lake Protection Association) Member

One of the characteristics of the lake commonly overlooked is the origins of Lake Menomin and the effect that has on waterways. Lake Menomin is an impoundment not a natural lake and suffers from the ailments that generally accompany man-made lakes.

> "Yeah, I think they do [realize Lake Menomin is an impoundment], but they're failing to realize the side effects of dams…I don't think they realized what the ramifications of a dam really are." – Dunn County Agent

This type of information is generally known by epistemic communities and agencies who work closely with water issues and concerns; however, it is not always known by other individuals and groups within the watershed. Bridging these knowledge gaps is a key component of building and establishing a community capacity around water. The networks and relationships built around water quality are key in spreading accurate information and involving many different stakeholders in the conversation. Feelings of being on the margins of the discussion about water quality and lacking knowledge about the core issues with waterways can stall efforts committed to improving water quality. Unfortunately, inaccurate information can often spread farther and faster than accurate information, especially if there is a vibrant established social network.

Collective Memory and Vision is rated as Somewhat Unfavorable, meaning "Some people and epistemic communities remember ways water and land used to look and have a vision of what an improved watershed might add to the community".

The memories and vision surrounding the lakes and waterways in the watershed are varied and often conflicting. Many community members reflect fondly on their memories of the lakes and

waterways in the watershed and the ways they were incorporated into the community, family life, and recreation.

> "The kids would swim here. They'd come down to the boat landing and swim out to the bay and it was beautiful." -Menomonie Community Member

> "For 27 years we rented boats and canoes down here and there wasn't any scum or anything". - Menomonie Community Member

> "When I was a kid, I spent my summer on the lake boating, waterskiing, all that kinds of stuff." – Chetek Business Owner

Despite many positive memories about the history and use of the lake, a significant number of negative memories about the lake also exist. Conversations about the lakes, especially Menomin and Tainter, focused more on the color of the lakes rather than the presence of cyanobacteria and the eutrophic nature of the lakes. This reinforces the conclusion about conflicting narratives and lack of knowledge regarding some aspects of the water quality problems and their solutions.

> "It was the same . . . Growing up I remember jumping off the end of the dock and at least a good foot of the water was hot like bathwater because it was so green . . . Of course, as kids it didn't bother us, we'd swim in it either way." – Menomonie Community Member

> "My family's been on the lake since the 50s, and it was green then, so it's not a new problem." – Menomonie Community Member

The lakes/waterways of the watershed are still in use today but have experienced a significant decline in use over recent decades. The Tinman Triathlon took place in Menomonie for over 20 years with the swim portion of the Triathlon occurring in Lake Menomin. The triathlons final year was 2006 due to concerns about negative effects from swimming in Lake Menomin. Other water activities (such as swimming/boating) took place in Lake Menomin for years but have drastically declined in recent years. Menomonie's decision to build a public pool (the Wakanda Waterpark) near the lake perhaps best encapsulates the shift from the larger community using the lake for recreation towards the current pattern of use of the lake by only certain segments of the population and for specific activities.

> "It doesn't seem to be a well-used lake other than the few fisherman. I mean there is a lot more activity during the winter with the ice fishing than I really notice during the summer." - Menomonie Business Owner

Instead, most residents use the waterpark during the summer for water recreation, and there is an underlying sense of apathy to attitudes about the lakes and waterways and the benefits they could

provide for the community. Chetek has a bit of a different attitude about the lakes, because they are central to the local economy and tourism for the area. While the lakes and waterways around Chetek are viewed as important to the community, the general population does not always put a lot of thought into how to maintain their current water quality.

> "No. No, I don't think they thought about it [lake health]. You know, I think they really just figure it'll always be this way." – Chetek Community Member

Despite apathy and declining use, many community members see the lakes and waterways as a positive for the community and an opportunity for the future. The interviews brought to light themes of reimagining the use of the lake, as well as making connections between community, business, economy, and government.

> "So it's [Lake Menomin] an opportunity and I just don't think like businesses and people see it that way." - Menomonie Community Member

> "We could keep that bay immaculately clean, we turn that island into a retreat for kids – let them camp overnight there, put canoes and kayaks in there for [everyone] . . . that is a diamond in the rough right there." – City of Menomonie Official

This envisioning of lakes and waterways is extremely important in securing and maintaining individual involvement in water quality issues. Many of the older members of the community who have lived in the area for decades remember the connections and memories shaped by local waterways in the past and want to see future generations making the same connections.

> "Just getting involved 'cause I mean the better that is, the better our community is; and I mean truly I want it to be there for my kids down the road and their kids and grandkids and stuff like that." – Dunn County Fish and Game Club Member

An important part of inspiring change is having a shared vision of both the past and the future and making it a reality. A vision dies quickly when it is not accompanied by practical efforts and steps. This leads our capacity analysis into the next subcategories, talking about responsibility and agency in the watershed.

Responsibility is rated as Somewhat Favorable, meaning "Most people do not take personal responsibility for addressing water pollution and/or engaging in pro-environmental behaviors in general, although most of the epistemic community does".

While there is awareness, concern, and knowledge existing within the watershed, the idea and execution of responsibility is slightly more complicated. Community members have a sense of

responsibility to care for the waters, but it operates under several complex nuances. This understanding was communicated most frequently by county agents, public officials, and members of the community who worked closely with addressing water quality issues.

> "The watershed…this watershed effects everybody in it and out of it …This is a major water resource and it affects everybody, not equally, but certainly everybody who lives in the area. It just does. Sometimes it's hard to get people to understand that and believe that, but it's true." –Dunn County Board Member

There was also a frustration in getting all community members to value a lake as part of a community and not pushing all concerns on to lakeshore owners.

> "And so, if you want the lake to be a priority to people, you have to connect them to it somehow." – TMLIA Member

There were also frustrations about not having the resources to provide education and information to encourage broader involvement.

> "That's the problem, is that there's not enough money, there's not enough time, and there is not enough care." – Menomonie Community Member

These types of concerns boil down to a desire to have everyone in a community identify their role in protecting water resources. This idea was echoed many times by different people in water related roles throughout the counties and communities.

> "There isn't anything that we can do as human beings that doesn't impact the lake." – Chetek Community Member

> "Nothing. Even if you just put your big toes in the water at the end of your dock, you're impacting the lake." – Chetek Community Member

However, for member responsibility to be truly activated, attitudes about the lake frequently need to be realigned with individuals' needs to see the benefit of contributing to permanent water quality solutions. Here in the Red Cedar Watershed, these are attitudes often focus on only one aspect of the lake or are limited by personal experience/perspective.

> "As long as the fish are happy, I'm happy. I don't care if the water is blue or green or purple as long as I can pull fish out of it." – Chetek Community Member

> "I think – really I think from my point of view, my home is more of an emotional value so probably more apt to be involved because I find tranquility in my fishing, my quality of life is improved." – Lakeshore Property Owner

> "My business has tripled in the last eight years and [the lake] has effected me zero. Zero effect. So I really couldn't care less." – Menomonie Business Owner

Despite these issues surrounding apathy in taking responsibility, residents within the watershed are generally willing to contribute *financially* to water quality if the amount and goals are clearly articulated for them. This is illustrated in Figure 4.

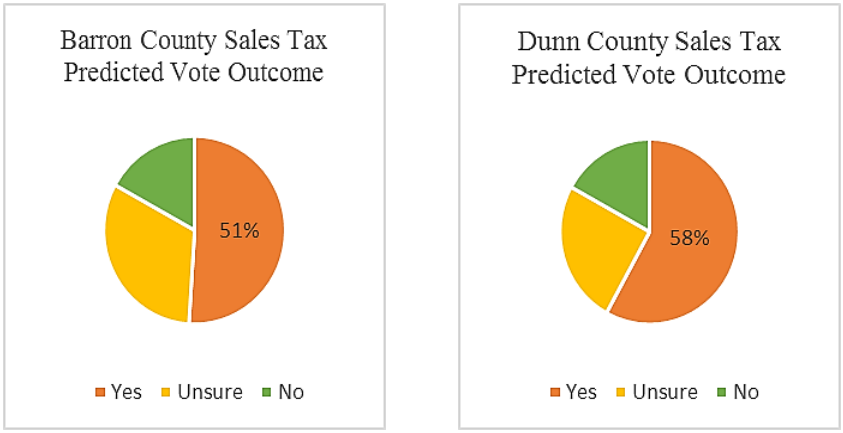


Figure 4: Willingness to Pay
Would Menomonie or Chetek residents vote to pass legislation to increase the sales tax or property tax by 0.1% at the county levels?

Agency is rated as Somewhat Favorable, meaning "Epistemic community believe problem is within their control, but most people do not".

Although there is awareness of issues, concerns about efficacy and agency are about how much can be done to change current water trends. Many of the individuals in the communities of Menomonie and Chetek see water quality as an issue far beyond their control and influence.

> "Well, it's not getting any better, unless they do something, and I'm not sure what they can do." – Chetek Community Member

As much as the community and individuals feel a responsibility to contribute to better water quality, there is a sense of fatalism and uncertainty regarding whether water quality can be improved. This opinion was expressed on a number of different levels, including uncertainty about the current mitigation solutions, their effectiveness, and the cost of funding them.

> "I'm not sure if they'll ever know [what's wrong with the lake]." – Menomonie Community Member

> "Well, the dredging is controversial in itself…So there's that type of action that's being taken, and it comes with a price, and such. Long term effects [are] yet to be seen." – Menomonie Community Member

> "And now we have pumps, aeration. One pump burned out already. Did that help any? Nobody knows." – Menomonie Community Member

Community members can see the strategies and practices that are being implemented, but question whether a solution is worth the cost that accompanies it. Overall, community members expressed a degree of skepticism and confusion over current state, county, and local governance projects and initiatives. This skepticism and confusion can affect the community in a number of ways including loss of enthusiasm, time, and effort in water quality initiatives.

> "I don't know, will it help? That's the question. 140,000 for the dredging, where do you stop? It's fine, at least they're trying, but there's no evidence of any kind of clarification of the waters. From the straw, from the pumps, now dredging. [Wolske Bay in Lake Menomonin] will coagulate some of the algae and slime, but what about the other bays? And people are scratching their heads saying what's going on here?" – Menomonie Community Member

There are also mixed feelings about the impacts one individual can have on the watershed. While a sense of responsibility does exist, the magnitude of the problem can be daunting for an individual wanting to contribute but seeing their effort getting lost in the size of the problem.

> "My property is just under an acre, there's over 2000 acres in that watershed, so me doing something has a very minimal impact – does have an impact, but a very minimal impact compared to [others]." – Lakeshore Property Owner

Despite the lack of agency among the general population, epistemic communities are highly engaged with water quality issues in the watershed and optimistic about having an effect on the water quality within the watershed. An understanding of the problem and its consequences sets the stage for making an impact in whatever avenues they are able. There is also an understanding of the magnitude of the problem and the level of involvement and cooperation needed between general population and epistemic communities to set water quality on promising course.

Accordingly, while feelings of apathy among the community members may seem negative, there are points of optimism in the narrative. There is path forward for people wanting to build a community appreciation for water resources, a unity in supporting water policies, and discussion about finding solutions. Simply suggesting new ideas and raising questions have invigorated community members.

> "If we could dredge it and get rid of some of that silt and get rid of some of the phosphorus that's tied up in that, that doesn't keep getting released and get the water cooler and get some weed growth back." – Chetek Community Member

> While some suggestions and ideas may ultimately be unworkable, the simple act of starting conversations and learning more about the problem illustrate a potentially positive step forward in activating agency. "For me, I think so much of it is just education and being able to talk about it in a way that emphasizes the things being done and the steps that are being made." – Menomonie Community Member
>
> "Well education, I mean information is the biggest one, I think. Actually getting clear information and data about what's happening and why it's happening has been really important in getting farmers and citizens invested in those efforts [water quality]." – Dunn County Board Member

Education and knowledge are crucial in creating a community of engaged individuals who feel empowered to make changes in their lives, businesses, and communities to work towards better water quality in the watershed. As such, while agency is not currently favorable among non-epistemic community members, there is a space for expanding it if education and outreach were significantly expanded, as will be discussed below in the Programmatic Capacity section.

RELATIONAL CAPACITY

Relational capacity includes subcategories of social networks, sense of community, and sense of collective responsibility. This type of capacity focuses on relationships, interaction, and networks within the watershed. A connected, unified, and cooperative community is more able to inspire behavior change and influence the future of a water quality within a watershed.

Social Networks is rated as Somewhat Unfavorable, meaning "Social Networks have many disconnects among different communities in watershed and people are generally suspicious of one another"

Relationships are crucial to the building of community capacity, they "drive information flow, build trust, and power cooperation and collaboration" (Davenport, 2015, p. 7). Strong social networks accommodate discussion over differing viewpoints, promote civil discussion, and locate areas of shared identities. These processes are essential in building networks concerned with water quality, bringing together individuals, government, and organizations, and establishing a shared sense of responsibility for local environmental problems. The ultimate goal of having strong social networks within the watershed is to have a structure containing individuals, organizations, resources, skills, and knowledge that can be accessed to resolve water quality issues.

The immensity of the watershed makes creating a unified vision of water and water quality strategy for the watershed complicated. Obstacles arise quickly in the search for common ground

to establish connections and vision; one of the larger obstacles is the tensions between different networks of the watershed. A divide exists between the north and the south, and although there has been progress bridging this divide.

> "…and I can say growing up in this area there's been a lot of animosity between those who live around the lake and everyone else who lives north of the lake, and that has been a hard barrier to come through." – Dunn County Agent

> "I think for many decades it was the blame game where we said, we pointed a finger at the communities up North and said 'Hey, you're wrecking our water!' and they would say 'Hey, our water is clean, you have the problem!' And in about the last 7-10 years we have been really trying to change that conversation because everyone now is kind of on board and becoming more educated that it is a regional watershed problem." – Menomonie City Council Member

There is a recognition of the need for connections and relationships encompassing the watershed. Despite the difficulties and effort needed to establish a watershed-wide network, the network of concerned activists and government agents is quite tightly connected (see Figure 6). In building and reinforcing such a network, it is important that similarities are identified and highlighted in overcoming tensions between different areas and specific forms of water pollution. Many members of the watershed who are actively engaged in improving water quality recognize the growing connections across towns and counties.

> "We are now so interconnected that we just cannot choose to ignore one another, so what are we going to do?" – Menomonie County Board Member

> "They want to do the right thing. I think the problem comes when people start looking too close at differences and start ignoring all the similarities." –TMLIA Member

Epistemic communities frequently commented on the importance of relationship building and emphasized simple things like spending time with people in order to understand their point of view and addressing their particular situations. Many county agents feel that relationship building and personal interactions rate as the most valuable aspects of their work. They identify that it tends to yield better returns than an enforcement or regulatory approach.

> "So we spent a lot of time on that, that learning process and a lot of it was just . . . a lot of the work is really relationship building and trust building." – County Agent

> "And so I guess what I probably spend more of my time on is building relationships, building trust where people can actually move projects forward in the community around the lakes." – State Agent

A voluntary approach to working on conservation within the watershed contributes other benefits to the community. It provides conversation material between individuals (especially farmers) as they are able to take pride in and credit for the changes they are making on their land and in their operations. It is a similar process with lakeshore owners, as they make changes to their lake fronts they are able to share those changes with others as part of a narrative of their impact on the lake. It also begins conversations about lease agreements, and what kind of land practices should be written into lease agreements for Non-Operating Landowners (NOLs) in the watershed.

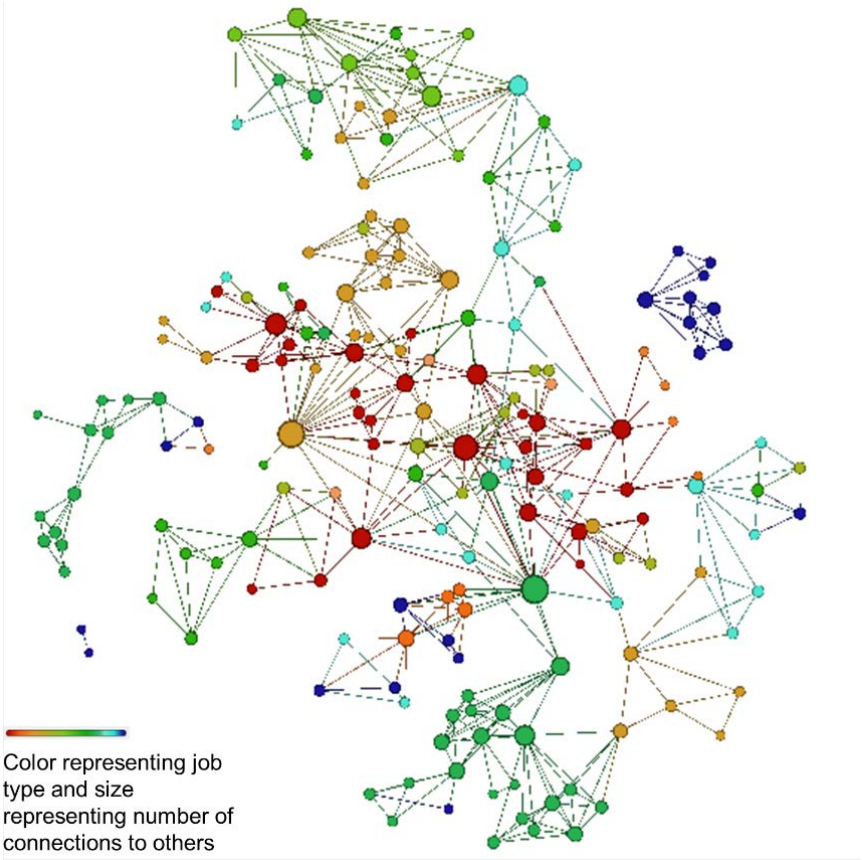


Figure 5: Red Cedar Watershed Social Network

"Well I would say it's a team effort. You know, teamwork makes the dream work." – UW-Extension Agent

The interconnectedness of NOLs is quite weak, however, as are the connections among farmers and between farmers and water quality activists and government agents. In the above social network map (Figure 5), there were only 3 farmers. Furthermore, when looking at the map of farmers and who they trust for farming advice in the watershed, many are disconnected from one another, and if they are connected it does not mean they necessarily share information positively regarding agricultural Best Management Practices (BMPs) (see Figure

6 where the size of the circle designating each person in the farmers' network is an indication of how many BMPs they use on their land).

Figure 6: Red Cedar Watershed Farmer's Social Network

However, what we can see in Figure 7 is the interaction between number of connections a farmer has and whether or not they attend conservation agriculture educational events about BMPs. The number of connections a farmer has does not need to be high in order for them to start to utilize BMPs, if they pursue educational opportunities like no-till conferences. In terms of increasing the use of BMPs in the watershed, having numerous connections and attending (or interest in attending) educational opportunities has roughly the same results.

> "The percentage of implementation [of conservation agriculture] increases the more knowledge and resources that farmers have." – Dunn County Agent

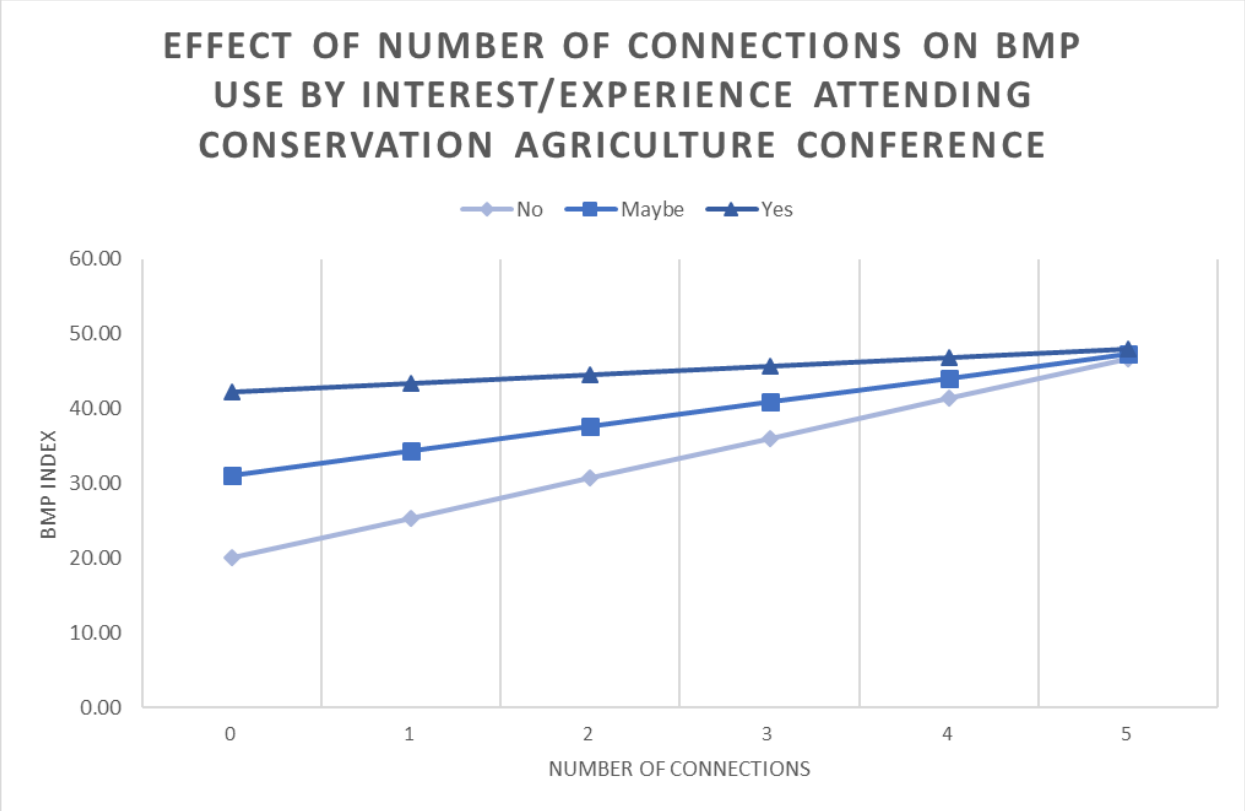


Figure 7: BMPs and Conservation Agriculture Interaction

Epistemic communities within the watershed communicate important information about the how phosphorous interacts with its environment, how water quality issues can be addressed, and how individual stakeholders can be involved. They serve an important role in social networks, providing sound scientific research and refuting incorrect assumptions and theories. As such, as described above regarding agency, empowering these educational events for farmers through soil health field sites, no-till conferences, and farmer led councils, working in concert with engaged and approachable government agencies, will likely improve the efficacy of social networks in the watershed.

> "So there is this beginning cultural mindset, mind-shift change out there in the ag community." – State Agent

Sense of Community is rated as Somewhat Favorable, meaning "Moderate sense of community among general population and epistemic communities".

A sense of community does exist within and among the communities in the watershed, but there are distinct differences in the scope, location, and strength of ties. Strong community ties exist in certain areas of the watershed; however, the ties are not all focused around or even include water.

The Chetek community is tied to water in a way that other communities in the watershed do not experience as its community is closely tied to water by the tourist industry and summer resident population. The lakes in Menomonie are tied to the history of the community but are not as present in conversation about the local economy, water recreation, or tourism. In the past 5-10 years, there has been a concentrated effort to involve all stakeholders in the watershed. This is a huge step towards getting everyone in the watershed to prioritize and value water quality efforts. This step has a different look and feel, depending on which community is in focus. The Menomonie community has made water quality a priority in local governance, where water quality issues and initiatives are regularly discussed at agency meetings, county board meetings, and city council meetings.

> "Because we have an active board who's made environmental issues one of their top concerns, then people are more motivated to do something at the individual level because they felt like they are part of a community that is supportive of that." – Dunn County Agent

In Chetek, the sense of community is seen in the many lake associations addressing water quality issues on the lakes in the northern part of the watershed. The Chetek community faces different challenges in having a large summer tourist population.

> "All of those beautiful lake homes? Nobody lives in them. They are summer homes. That changes your view of the lake. It's like two different communities in the summertime." – Chetek Community Member

The fluidness of the population creates a different atmosphere in that area of the watershed and demands a unique strategy for addressing water quality issues. This dynamic was mentioned in interviews quite frequently.

> "Being in a tourist town – it's kind of a love-hate relationship. The businesses, they need the tourists. They pour a lot of money into our local economy, help our business people get through the whole year, but you have to share your town." – Chetek Business Owner

> "We all know that the lakes bring a substantial amount of revenue in, and without it we would be Dallas or New Auburn or something like that in the area." – Chetek Business Owner

> "I think that tourism is what keeps this town going and without the lakes we wouldn't have that. So, it is important to do whatever we can to keep the lakes cleaner, and the fishing good." – Chetek Chamber of Commerce Member

It is not impossible to create a sense of community under these circumstances, but it does present challenges such as how to involve seasonal residents, how to create a vision of the lakes appealing to both permanent and seasonal residents, and how to build strong social ties and make water quality a priority. The lake associations and lake district in this area have to seek creative solutions and ideas for engaging and addressing water quality concerns.

> "I'm hoping that out of that new sense of connectedness we can have other conversations about things that concern us all – the health of the lakes, tourism in our area…We need to be all together in this because it affects all of us. We need to get back to the table." – Chetek Community Member

It is promising that both communities as well as individuals throughout the watershed see the value of having all stakeholders represented in the conversation. The importance of working together was brought up frequently, as well as the value of having everyone at the table and able to discuss and provide input.

> "We go to the community, bring stability, there's no finger-pointing and bringing all the issues and talking about together in more of a structured outcome…and those are principles to live by. Those are principles of true partnerships, for people…it's listening to one another." – State Agent

Disagreement was also recognized as being a part of the process and valuable if handled correctly. It brings different ideas to the table and raises questions as to how things have been done in the past and how they will be approached in the future.

> "Because we don't always agree, but that's the important part of the process cause we come from different backgrounds and so we can voice our opinions and sometimes you come up with an answer you didn't think was going to be there for that." – Menomonie Business Owner

These communities care about the water around them and realize how water quality reflects on the communities where they live and work.

> "Just as a city in general, the condition of the lakes are a reflection of the community and how it perceives itself. If the lakes stink and are full of crap and useless, the surrounding community feels and feeds from this. Menomonie feels as stagnant as its most prominent feature." – Menomonie Community Member

Although a sense of community exists- and has enormous potential- it is not without its share of obstacles. Some of these obstacles are defeatist/fatalist views of the lakes, the lack of a watershed-wide sense of community, and a perception of limited opportunities to influence water quality. These ideas were vocalized often in interviews.

> "I think that we have been able to promote other things aside from using our lake as a main attraction because it just obviously isn't." – Menomonie Business Owner

> "It could be a huge point of tourism for the community, but when you only have a month to use it and then it gets gross and nasty, then it's difficult to be able to promote it all summer long." – Menomonie Business Owner

The lakes (especially in Menomonie) are consistently viewed as something to be worked around rather than something that can contribute to the local community and economy. The lakes were infrequently mentioned in discussion concerning local business practices and growth opportunities, showing how local water bodies are not always included in that narrative.

> "It would impact our schools and our services, and our everything, but not a lot of people get that." – TMLIA Member

A broader sense of community would require a more comprehensive narrative bringing together the vast aspects of a community that water touches. Some of the community ties that exist do not include water or give it very little weight as a community issue. The creation of a more comprehensive narrative is dependent on the network and channels of information within the watershed. Thus the establishment and development of trusting relationships is crucial to a community narrative that recognizes the cost of water pollution and prioritizes watershed water quality efforts.

Sense of Collective Responsibility is rated as Somewhat Unfavorable meaning "People – both general population and epistemic communities – have a shared awareness of pollution. General population and epistemic communities do not have a shared concern about pollution; the general population has a low sense of collective responsibility and epistemic communities have a moderate sense of collective responsibility".

Different perceptions and ideas about water and personal efficacy affect a community's involvement and unity. There are also significant differences between the sense of responsibility felt by the general population and the sense of responsibility felt by epistemic communities. A utopian sense of collective responsibility would be the inclusion of every stakeholder in water quality discussion, in addition to community access to education and opportunities to contribute to both planning and execution of water quality initiatives/projects. This watershed is currently far from that utopian state.

Many individuals who work closely with water quality, generally through local government, county and state agencies, or non-profit organizations, are currently active in the watershed, but experience frustration in stakeholder participation and in overcoming fatalist attitudes.

> "In order to get the job done you need acceptability and the will, you need cooperation, you need the political body to kind of put its act together and get it done. That includes the willingness to raise money, spend money. That includes the willingness to give up perhaps what we consider to be sacred property rights and all that sort of stuff." – Dunn County Board Member

> "They all have to be in the same playing field [referring to lake associations, municipalities, government]. They can't just be looking at 'my lake, my lake, my lake', but the whole watershed…they're all focused on their own priorities that they forget about the whole watershed." – Dunn County Agent

Despite the difficulties in building a sense of collective responsibility, epistemic communities remain hopeful about the future. Local activist groups, like the Tainter Menomin Lake Improvement Association, have worked hard to expand the relational capacity through developing an annual conference and providing regular educational opportunities to various schools and other organizations (as will be highlighted in the Organizational Capacity section below). The attitudes and perceptions about the lakes are generally accurate, as described above, and it is important to encourage that transition and continue to provide accurate information and education to all stakeholders.

> "We're hoping this is going to be sustainable into the future and we can keep building our communities and having the landowners work on the problem and have them take ownership as much as we're trying to enforce it and trying to work with them as well so everybody is a part of the problem…a part of the solution." – Dunn County Agent

> "Can it be solved? I think in time it can, but it's getting everyone to work together."– Dunn County Agent

> "So it takes everybody and everybody's skill set, but literally we've been working on this project for 26 years." – State Agent

At times, there have been significant obstacles to creating social networks, developing a sense of community around water, and establishing a sense of collective responsibility. Many individuals, groups, and organizations can be commended on their persistent efforts to keep water quality as one of the key focuses throughout the watershed. Their efforts have provided the foundation to build a sustainable water quality effort into the future, despite the setbacks and obstacles faced, yet the most effective growth has been among its epistemic communities.

ORGANIZATIONAL CAPACITY

Organizational capacity is the third level of capacity contained in the model and includes subcategories of member base, leadership base, leadership activation, networks among groups, collective memory and vision, conflict resolution, and decision-making. This type of capacity focuses on different types of organizations within a watershed and their contributions to addressing problems such as water quality issues. Organizations have important roles in any community; they are able to formalize relationships, provide leadership, serve as liaisons, contribute resources, and provide opportunities for cooperation and collaboration. Within organizations, there are different levels of participation and responsibility, this level of capacity differentiates between members and leadership within an organization. The leadership base is the invested individuals often holding positions of leadership or positions of responsibility within an organization. The member base is individuals who participate in meetings, events, or activities but are not involved in leadership or administration of the organization.

Member Base is rated as Somewhat Unfavorable, meaning, "Members of local organizations do no more than donate membership funds, especially those organizations addressing water pollution".

Concerns about longevity and participation are prominent in organizations within the watershed. Many of the individuals serving in leadership roles for organizations have hesitations and concerns about the levels of member involvement. Many organizations have members contributing funds but inactive in leadership roles or organization events. Organizations also talked about their constant efforts to attain and sustain their memberships. It often requires creativity, time, and energy to connect with certain groups within the watershed.

> "We as a movement are trying to think of ways to engage citizens. And that doesn't happen very easy." – West Wisconsin Land Trust Member

> "And so, the strategy of our chapter has been to do a lot of educational, informational sorts of things as a way to get our name out there and get people interested in this sort of stuff and find people who might become regular participants in the group." – Prairie Enthusiast Member

Maintaining membership is one of the biggest challenges for organizations in the Red Cedar Watershed. Organizations compete with other organizations, family priorities, and other obligations for time and energy to devote to issues. Community members join an organization and stick around for several years but eventually drift away from the organization or its objectives. It is difficult to sustain a membership if results are not clearly visible, line up with specific expectations of members, or fit within their already established social environment. One of the most successful

ways organizations keep members is by building relationships and community within the organization environment. The community, personal interactions, and shared efforts are some of the most powerful draws to continued engagement.

> "But at the end of the day, the guys and the gals that are there, it's camaraderie as much as it is the cause. I'm there for the cause but the camaraderie helps keep me there." – Dunn County Fish and Game Club Member

> "All the people who stay involved, well they're enthusiastic about wildflowers and birds and insects . . . They especially like the satisfaction of coming back to a place where they've done some work and now it seems better." – Prairie Enthusiast Member

While individuals care about and have a passion for causes, the human element of organizations is often what inspires people to stay engaged and involved. This adds another level of needed creativity to organizations, as they have to find ways to foster an environment that draws people and promotes community while staying focused on an organization's objectives and mission. At the same time, organizations are trying to promote a diverse membership, understanding the value of having a membership defined by diversity.

> "There's a lot of power in having a diverse group of people together." – Chetek Community Member

One of the benefits most often associated with membership in an organization is recognized altruism: being able to contribute to your community and give back to the people around you. Along with that was a desire to model what being an engaged citizen means in terms of your family, community, and environment.

> "I wanted my children to be involved . . . I think it's important for them to see the role modeling of giving back to your community, in whatever capacity." – Dunn County Fish and Game Club Member

Organizations also face the obstacle of obscurity in trying to keep the community informed of their priorities and activities. This can be difficult as individuals rely on different modes of news and community information. Organizations face choices about how and where to communicate their objectives and limited funds able to devote to marketing and advertising.

> "Well, we try to keep everybody informed about what we're doing. We run letters in the paper, we send out flyers . . . and people were, I think more and more people became aware of what we were doing." – CLPA Member

> "I really do think they are doing a great job, but I think sometimes with groups like that, the information stays within the group [referring to a lake association]." – Menomonie Community Member

One of the few bright spots in a discussion of about membership base is the membership of the Farmer Led Councils. These councils are funded by grants awarded by the Wisconsin Department of Agriculture, Trade and Consumer Protection to support projects preventing runoff from farm fields and protecting water. To receive this funding, an application is submitted by a group of at least 5 farmers producing in the same watershed along with additional support from county agencies, nonprofit organizations, and other institutions. There are currently three farmer-led councils within the watershed, and one of them has been meeting since February 2013. These councils have maintained their memberships, new groups have formed, and councils have applied and reapplied for funding, with success. Despite changes from year to year in participation, industry, and methods, the councils remain active and engaged in protecting land and water.

Leadership Base is rated as Favorable, meaning "Multiple leaders exist in the watershed, many eager to delegate authority".

The leadership base within the watershed is broad and active. Many agencies and organizations within the watershed have the people and skills to provide leadership and expertise to a number of potential endeavors. Unfortunately, the issues of maintaining a member base also affect the use of potential leadership in the organization. Balancing different goals within the organization while actively seeking out new members can put leaders in difficult positions.

> "I spend a great deal of my time just responding to people's needs and less time actually thinking about what we should be doing." – West Wisconsin Land Trust Member

While this use of leadership is important, it can overwhelm other vital aspects of leadership and prevent new ideas and initiatives from advancing. This deficiency is not meant to underrecognize the strong leadership base within the watershed, but rather to acknowledge at least one of the many issues they are up against in their day-to-day operation. The leadership within the watershed on water quality issues is strong, however it can lack depth in the sense of too few engaged members or other leaders to delegate tasks or divide responsibilities. This imbalance between responsibilities and number of leaders often leads to burnout and periods of instability within organizations.

Many community members recognize the benefits of being involved with organizations (especially conservation organizations) but are hesitant about time and activity commitments. Leadership is vital to the longevity of an organization, but often leadership develops in the membership stage of involvement in an organization. Membership is the vehicle by which memory

and vision are perpetuated and new leaders often develop and hone leadership skills through participation as members. Both leadership and membership are important to the sustainability of an organization. One without the other leaves deficits within an organization and can increase fatigue and burnout on the leadership side and stagnancy and ineffectiveness on the membership side. As such, while the leadership base is favorable, this is tenuous dependent on other capacities' deficiencies, such as leadership activation.

Leadership Activation is rated as Somewhat Favorable, meaning "Leaders in governmental positions and local non-profit organizations generally are aware of pollution and prioritize addressing that pollution; the few focused on the problem take on disproportionate responsibility making burnout a possibility".

Leadership within organizations is a constant struggle. While leaders exist and take initiative within their organizations, they face an uphill battle in maintaining membership and energy within the organization.

> "Being on the board takes a lot of energy, and a lot of time." – CLPA Member

Many of the interviews conducted with organization leadership revealed several themes, the most prominent theme being the immense amount of work and chance of burnout. As mentioned above, many leaders take on a large proportion of the work, sometimes without seeing any benefits.

> "I've been involved with different organizations for 40 years, and it's always, 10% of the people do 90% of the work and you can never get volunteers. – CLPA Member

> "I started working here, and they're always looking for board members, because that's always a hard part is getting board members." – CLPA Member

Leaders also mentioned that often the work and energy they put into their organizations is not always appreciated. It is not so much searching for glory as seeking validation and recognition that working toward things like better water quality is justified and important.

> "But no, overall, it's the apathy I think is the people that are off the lake, and they, well because they're not on the lake, and they're not involved, I don't think they see it. I don't think they appreciate anything we do." – CLPA Member

This combination of factors can make leadership a challenge but does not nullify its importance. The continuation of an organization is heavily dependent on strong, functional leadership and its ability to transfer leadership effectively. So far organizations have been able to address this challenge moderately well, especially lake associations, even though splits and divisions have been

prominent, making leadership activation a constant challenge of few people taking a majority of the work, especially in the southern part of the watershed.

Networks among Groups is rated as Somewhat Favorable, meaning "Organizations generally do work together on many things, especially those working on water pollution".

Communication and collaboration are both utilized efficiently within the watershed. Most organizations are forming partnerships, supporting each other's projects and events, or providing feedback. This openness between organizations provides opportunities to adjust community objectives and vision to include water quality as a priority. Water is a prominent aspect of many of the communities throughout the watershed and thus touches daily life in a way that is not always acknowledged.

> "The realization that, you know, we can't entirely protect land from people. We need to start protecting land with people and the industry term would be community engagement." – West Wisconsin Land Trust Member

The complex connections and interactions existing in a community do not happen within a vacuum; they affect and influence the natural environment within and around a community. Organizations can benefit from having a holistic understanding of the community and environment while maintaining their specific mission and goals. Sometimes collaborations can occur when one organization lacks the funding, skills, or membership to complete a project, but the results benefit both organizations and the community in general.

> "And that is what we need, we need all of these groups to come together, because they are all leaders within the community, to say this is important, and here is why it's important, and here is why it's important if you want to get there, and here is how we are going to do it." – Chetek Business Owner

> "You know, they're a great source of ideas because they can't always act on things that they think would be a good investment of time and money to protect something important, but they know we can. So, we put our heads together and we sometimes collaborate on different acquisitions or protection projects." – West Wisconsin Land Trust Member

Networks among groups highlight the connections existing within a community. These connections can benefit efforts to protect history, people, and natural resources while creating a shared vision for the community and water quality. It also contributes to sustaining this vision over the long-term and investing in a future for an organization.

> "To make sure that we are creating a generation of kids and people that care…that will also help sustain our work." – West Wisconsin Land Trust Member

Over time organizations change in many ways – leadership, membership, goals, mission, etc. – these changes are inevitable, but require some thought as to how to adapt appropriately for the organization, its members, and the community.

More weight has been recently placed on the shoulders of non-governmental organizations (NGOs), as funding for governmental organizations and agencies has limited the amount of time, money, and resources they can provide. Governmental agencies remain involved but rely on NGOs to step up and bridge some of the gaps created by funding and staffing deficits. Unfortunately, NGOs are limited in several different ways and are not always able to cover as much as ground as local government and agencies. Volunteer organizations can have issues maintaining volunteers, gaps in resources, lack of authority, and other setbacks that limit their abilities in dealing with public problems like water quality. This is not to diminish their importance within a community, but to have a realistic expectation of what NGOs can and have accomplished.

> "I think they're [NGOs or local organizations] the one that are going to have to spearhead the projects like that because our manpower, government wise, is not getting any bigger. It's shrinking so this is going to rely on the NGOs as well as other partners to get that job done; and from the NGOs standpoint, they're all going to have to play well together." – Dunn County Agent

Bringing together organizations can be a sign to the community of forward movement and the importance of many different priorities. It can also highlight the different missions, goals, and activities existing within a community.

> "But I'd like to try to find a project that we can all do together, and because that's just good publicity." – CLPA Member

> "And, to the extent we can, you know work in a broad geography, so not concentrate all our projects in one area, but try to kind of spread the love around and do a diverse portfolio of projects in different counties too." – West Wisconsin Land Trust Member

The networks among groups has the potential to be a positive reinforcement of the ways government and private organizations work together for the progress and good of the community. The Red Cedar Watershed is moving in the right direction on this front, although room for improvement remains.

Collective Memory and Vision is rated as Somewhat Favorable, meaning "Organizations have some mechanisms for keeping institutional history and plans to ensure longevity (including a plan for leadership succession)".

Collective memory and vision holds an organization together, linking the past, present, and future. An organization is defined by its past, and often recognized by its past work, events, and activities in an area. The past lays the foundation for what an organization is in the present and what it could be in the future. While maintaining the history of an organization is vital, an organization survives by their willingness to adapt and change, when needed, to see their mission and vision into the future.

Several organizations within the watershed have been active and involved for many years and have established legacies in terms of the work they do. However, many organizations face challenges in maintaining their work and legacy due to aging memberships and lack of interested engagement by younger generations. Often, generations have slightly different visions of both the past and the future and can conflict on the best way to move forward.

> "But sometimes those generations butt heads a little bit and overcoming that is a challenge." – Dunn County Fish and Game Club Member

These generational differences within organizations add another dimension to the challenge of remaining viable into the future. It is not impossible to bridge the gaps between generations, but it often requires intentional discussion to compromise and reach a consensus. In a way, generational differences can be building blocks in bringing people together, inspiring honesty, and giving everyone a voice at the table if handled in a civil, respectful way.

> "You know I think in this day and age when discourse seems to be not very civil it's wonderful to be part of a conversation with people who have very different opinions and it to be civil and focus towards a goal that is a real joy." – Prairie Enthusiasts Member

> "Because we all have something to bring to the table, but nobody has everything, so you have to get all these people together to make it happen." – Dunn County Agent

Every individual can be an active, engaged, learning stakeholder within the watershed if given the right influence and atmosphere. It remains important to organizations to create the kind of environments that encourage open discussion and the introduction of new ideas or ways of addressing goals; however, conflict resolution has not always been a strength in the watershed, as elaborated on in the following section.

Conflict Resolution is rated as Somewhat Unfavorable, meaning "No official or informal conflict resolution laws or norms exist in general, and specifically not regarding water pollution".

One of the key examples in conflict resolution arises concerning discussion about the creation of a lake district around Lake Menomin and Lake Tainter. There are many opinions about lake districts within the watershed, and the discussion has elicited strong feelings both for and against the creation of a lake district. Most discussion has been hindered by misconceptions about the function and operation of a lake district. These misconceptions can create barriers to action and overwhelm civil conversation. Disagreements between leaders can also heighten misconceptions and focus attention on the differences rather than the commonalities. Sometimes these differences result in the creation of organizations having similar goals but employing different methods (for example, the existence of two lake groups in Menomonie).

> "Misconceptions is a big one [barrier]. Rumor is your enemy. All it takes is one person to have an incorrect opinion about something and it turns into somebody's truth." - CLPA Member

> "There were too many unknowns and they didn't have the right answers. People didn't understand fully how [a local initiative] worked." – Chetek Chamber of Commerce Member

Responses like these suggest the need for additional education or information within the community. Questions have arisen over other pollution mitigation strategies and projects. Doubt has been expressed regarding the results of certain methods and their effectiveness in terms of finances and reducing nutrients in the water.

> "I don't know, will it help? That's the question. 140,000 for the dredging, where do you stop? It's fine, at least they're trying, but there's no evidence of any kind of clarification of the waters. From the straw, from the pumps, now dredging. That bay will coagulate some of the algae and slime, but what about the other bays? And people are scratching their heads saying what's going on here?" – Menomonie Community Member

> "Well, the dredging is controversial in itself…so there's that type of action that's being taken, and it comes with a price, and such. Long term effects [are] yet to be seen." – Menomonie Community Member

Individual community members often feel uninformed about the process and reasons underlying actions taken to protect or improve water quality. While information may be out there, it is not as accessible as it could be.

Decision-Making is rated as Somewhat Favorable, meaning "Decision making is inclusive regarding projects/initiatives and policies".

There are many examples of positive decision-making in the watershed. The farmer-led councils, the successful public passage of the Dunn County Shoreland Ordinance (even though it was undermined at the state level), storm water ponds, the annual watershed conference, lake protection grants, and demonstration farms are all the results of decision-making processes involving numerous individuals, organizations, and agencies. This is not to say decision-making is always easy and never has issues; rather it says that a dedicated, committed group of people shares a vision for the watershed. Many of the examples above have grown beyond their original purpose to do even more for water quality and community building. However, it can be a long process putting the pieces in place and involving stakeholders in water quality projects/initiatives.

> "So, I think Dunn County is in a really good position to make some big changes in water quality, it's just a really slow process to enact change." – Dunn County Agent

The watershed has many individuals who will guide a decision and ensure that the process of making and executing a decision are carried out. It will need to continue to lean on its previous successes at being adequately inclusive in decision making and open to adaptive directions of inclusive initiatives to strengthen other less successful capacities.

PROGRAMMATIC CAPACITY

Programmatic capacity is the fourth level of capacity contained in the model and includes subcategories of money and staff, education/outreach support, monitoring and expertise, accountability, regulatory authority, and cross-organizational cooperation. This type of capacity brings the former three capacities (individual, relationships, and organizations) together to take action in unifying the community and making changes in water resource management.

Money and Staff is rated as Somewhat Unfavorable, meaning "Organizations, agencies, and other actors are understaffed and under-resourced".

Money and staff can be a community's greatest asset, but it can also be a community's greatest obstacle. Funding raises many questions for small communities attempting to address complex water quality issues. Agencies and organizations in the Red Cedar Watershed have acquired funding and worked with what they have in significant ways despite obstacles. Yet even with successes, continuity and longevity tend to be the primary concerns with water quality funding.

> "But there aren't huge pots of money out there to address these issues [with water quality]." – City of Menomonie Official

> "So I think it's the limited access to funding that has been a challenge for a lot of the groups who are involved with this, but it has caused them to be more creative how to get funding to do the projects that they want to do." – Menomonie City Council Member

> "The things I worry about are funding, and the sustainability of our funding [in reference to Farmer-Led Councils]." – County Agent

County agencies wrestle to maintain their current services against a perpetually decreasing budget, yet this is a larger problem in Barron County than in Dunn County. County governments face this challenge as they must adjust budgets to the changing demographics and needs within the county. Consequently, most government agents feel they do not have the funds to effectively improve water quality (see Figure 8). These agencies are also responsible to uphold any of the stipulations or rules that accompany federal money, which adds further constraints to the funds being actionable as government agents spend a lot of their time addressing the bureaucracy of managing funds and less than efficient and effective amount of time utilizing those funds.

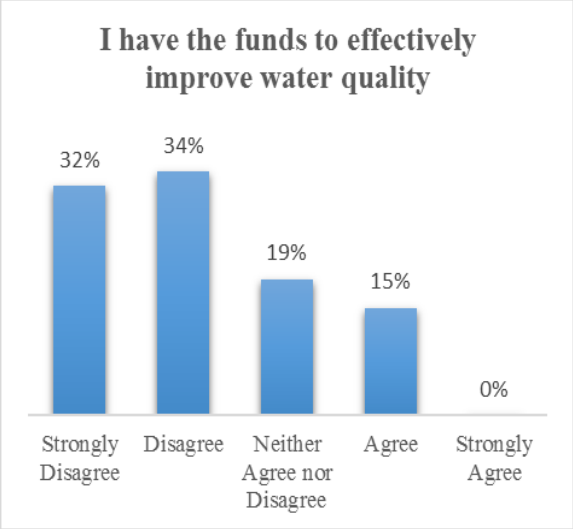


Figure 8: Perceptions of Funding to Influence Water Quality

> "The other choices are slim to none [in regard to funding for water quality solutions]. In order to find funding, we have to substantially reduce other appropriations for other things." – Dunn County Board Member

> "Unfortunately, any of the funds that come through government always come with strings attached and that's what makes it tough to work with." – Dunn County Agent

> "There's still a lot of small farmers. But our resources are all going to the big ones." – State Agent

Staffing for agencies and organizations is in a similar predicament to funding. The amount of staffing is directly related to the amount of funding available, thus difficulties in funding are reflected in difficulties staffing all the different departments and initiatives within the county. Many county staff and NGO staff reflected upon the opportunities they would have if they had access to additional staff members.

> "It would be very beneficial to have more staff time involved in this project. We would be able to potentially go further, expand it into other watersheds." – Dunn County Agent

> "That's the barriers though, money, time, and geography I think." – West Wisconsin Land Trust Member

County agencies and staff are essential in bridging gaps between different sectors of the community. They offer access to funding, resources, and technical help that may not be available from other sources. Despite their vital role in the community, county agencies face decreases in funding while maintaining an increasing workload.

> "These county departments, conservation departments, are underfunded…They're always facing threats of decreased funding." – County Agent

> "So, what we're trying to do now is encourage the counties, rather than just shotgun grants all over the place, maybe cluster them in a neighborhood." – State Agent

The current focus locally is put on working with individuals rather than taking a strictly regulatory or enforcement position. Voluntary compliance is recognized by government agents as more effective at maintaining relationships, implementing best management practices, and laying the groundwork for addressing future issues.

> "To be honest I hate the word enforcement because if I have to enforce something, I'm not really working with people anymore." – Dunn County Agent

> "Work with them not bastardize them, not cut them down for what they're doing." (in reference to farmers) – Dunn County Agent

As such, recently, county agencies have emphasized the importance of relationship building with producers, as relationships and trust are more effective in introducing conservation practices and addressing water quality issues. However, this method of conservation requires additional staff time and often dollars to reach its potential.

> "The government funding sources tend to want to pay for practices and not for people. It's just the philosophy. A lot of what we're talking about is people work. The problem isn't that we don't have enough money to cost-share the practices, it's all this relationship building and people work…I mean, going out and knocking on doors, talking to people. Increasingly, there is not money for that. The money is all to pour concrete and put up fences and put up gutters and plant stuff and put in structures." – State Agent

County agencies and staff are responsible for the work that goes into relationship building, enforcement/regulation, and cost-sharing/planning practices. With these three different priorities, it can be challenging to allocate time and energy effectively while meeting county and state obligations and actively building relationships and trust in the communities in which they work.

> "Those county conservationists are really focal gatekeepers, they talk with the farmers, they're aware of the programs out there…they're really the keys in all of this." – City of Menomonie Official

> "Sometimes, again, this work was so much of the work we…just takes too long. And its relationships and it is trust and it's following through with what you said you were going to do and it's when you build partnership teams, bringing resources to those teams, setting an expectation for others to bring in their resources and getting that in a positive environment where you do produce outcomes." – State Agent

> "We went from, like, three quarters voluntary programs to one quarter regulatory. Now, almost all our staff are regulatory…So, we really don't have the capacity to go out and work with farmers on a voluntary basis the way we used to and, and some of us are just trying to do the best we can." – State Agent

There has been some success in the watershed in attaining staff to do this important work. Dunn County Board did fund a Water Quality Specialist position within the Land and Water Conservation Department to focus on water quality issues throughout the county, greatly expanding the county's capacity in building relationships. Steps like these have provided energy and guidance to the community despite confusion about the best ways to move forward.

> "It all goes to show that we all care about the watershed and the lake…I think it is a testimony to the community and that people care. But what to do next is a question that everybody struggles with, and how to do it." – City of Menomonie Official

Education/Outreach Support is rated as Somewhat Unfavorable, meaning "Organizations, agencies, and other actors inadequately communicate their activities to the general public and don't always explain how people can take action".

In the past, there have been disconnects between agencies hoping to initiate changes in behavior and the populations they are hoping to influence. It can be hard to align priorities and reach out to communities in a way that is productive for them. Education programs and trainings are some of the best ways to bridge these gaps and start discussions about the best ways to manage land and

water. However, many property owners do not utilize educational programs, or they do not exist, resulting in a lack of actionable knowledge.

> "I didn't buy the lake property to hurt the lake. So if you tell me that something we're doing is hurting the lake, we'll address it. But help me understand it and figure it out and not make me feel intimidated." – Lakeshore Property Owner

It is important for agencies and organizations within the watershed to offer education programs and support that align with community goals and priorities, as shown with the farmer network data above. When educational programs have been effectively implemented, fitting the needs of the given stakeholder group while simultaneously building networks across groups and with government agencies, tremendous growth in community capacity in the Red Cedar Watershed occurred. Honesty and trust between local governance and community members is of paramount importance. It develops accountability between constituents and their government and open communication about what is and is not working in terms of addressing issues in water quality.

> "So anyway, got me to thinking about it and we can't be afraid as government to ask people take sacrifices…and the result of your sacrifices is going to result in better life experience for all of us." – Dunn County Board Member

Monitoring and Expertise is rated as Somewhat Favorable, meaning "Some monitoring and analysis of both ecological and social aspects of water pollution exists, but no adaptation according to analyses."

Monitoring is an ongoing struggle within the Red Cedar Watershed. Although some bodies of water are monitored consistently, there is difficulty in finding and keeping citizen volunteer monitors to monitor the bodies of water within the watershed not tracked by other agencies/organizations. Both Barron and Dunn County perform transect surveys every year and keep track of the use of conservation methodologies to the best of their ability. Other organizations contribute to monitoring water bodies within the watershed, especially the Citizen Lake Monitoring Network. However, monitoring within the watershed tends be somewhat tenuous and can vary greatly from year to year. There was a brief period where UW-Stout professors and students were monitoring several of the lakes in the watershed for research, but funding and support can vary from year to year complicating having complete data about the watershed. This is also limited by the amount of time and staff a county has available from year to year to complete any additional monitoring. So while this is rated as somewhat favorable currently, that may decrease in future years if not addressed sustainably now.

Accountability is rated as Somewhat Unfavorable, meaning "Organizations, agencies, and other actors are not accountable to the general public, but might have a norm of transparency.".

Frustrations have been voiced about water policy and projects that seem to lack community input or feedback. This frustration comes from many different sources including misinformation, lack of involvement, and differences of opinion.

> "I told [city council] they need to clean it up and make it somewhat available for the customers, fisherman, camping facilities, things like that. Apparently, they don't listen. I've been to several meetings." – Menomonie Business Owner

Some of the frustration stems from simple confusion about what is actually happening and whether current projects are having results.

> "And now we have pumps, aeration. One pump burned out already. Did that help any? Nobody knows." – Menomonie Community Member

Engaging the community in water quality issues can be a tricky process. Misinformation tends to spread as quickly if not more quickly than the truth. It is complicated by the fact that no two people engage with public information in the exact same way; and attitude and behavior change are both processes requiring time and effort.

> "I've been in this business long enough to know that it takes time to engage the public. It takes time to adopt conservation practices, so what we do, things move very slow." – Dunn County Agent

However, the reason for a somewhat favorable rating despite obstacles is the way county agents and government officials do their best to publicize water protection information. There is currently a level of accountability desired of public officials by the community and a level of accountability desired of the community by public officials. A mutual level of trust and ambition is beneficial both for the growth of the community and protection and improvement of water quality.

> "There gets to be a point where there's a general assumption that people who are in the community will do the common good." – Dunn County Agent

Regulatory Authority is rated as Somewhat Unfavorable, meaning "Organizations, agencies, and other actors do not have authority to implement, monitor, or enforce policies".

Regulations tend to be most effective when they are introduced or enforced in conjunction with education, support, strong social networks, and access to knowledge and resources. The state of Wisconsin as a whole has moved towards emphasizing regulation over voluntary compliance in the

last several years, albeit without effective regulation able to change land use in large watersheds like the Red Cedar. This shift limits some of the functions of county offices wanting to focus more on working with individuals to bring them into compliance.

> "We went from, like, three quarters voluntary programs to one quarter regulatory. Now, almost all our staff are regulatory…so we really don't have the capacity to go out and work with farmers on a voluntary basis the way we used to and…and some of us are just trying to do the best we can." – State Agent

One of the biggest challenges with policy and regulation is the need to address a spectrum of people each having their own priorities and systems of operation. A great deal of effort goes into creating or adapting a policy to be fair, just, and address the root causes of water pollution. There is no one policy able to address every part of a complex issue like water pollution. Government officials and community members are faced with the daunting task of creating multiple policies to include any/all important aspects of the issues.

> "It's just a lot of tiny little pieces that have to fit together instead of one big piece that will fix everything. There's no silver bullet." – Menomonie Community Member

> "Well, I think we are all struggling to try and find a policy that will fit. I don't think there is one in a rightful sense. There are a whole series of policies, you know?" – Dunn County Board Member

Many acknowledge that enforcement of regulation regarding land and water is complicated and often is not even necessarily the best path forward. The number of regulations is overwhelming and difficult to implement equitably.

> "There's much more regulation out there than can be implemented or enforced." – Dunn County Agent

> "I mean these are very good runoff rules and I wish the state legislature would put some teeth behind them, put some money into it and staff Land Conservation Departments in a way that they could inspect farms." – Dunn County Agent

County staff have neither the funds nor time to investigate compliance issues or enforce regulation. Enforcement does not achieve county objectives of encouraging behavior change (regarding conservation) and emphasizing voluntary compliance.

> "We tend to really work on a voluntary basis and contribute cost sharing funds and technical assistance and generally that is able to take care of the issue." – Barron County Agent

Additional complications in enforcement come from the cooperation needed between different agencies to resolve compliance issues.

> "To enforce a statewide performance standard, it's going to involve both DNR and the county in order for that to happen. So they could be in violation of a performance standard, but if the two parties don't agree to work on resolving it then it doesn't happen." – Dunn County Agent

> "We have authority to go the other route, we can take legal action but we try to use that as a last resort." – City of Menomonie Official

Ultimately, the goal of having regulations and policy is to involve everyone in protecting natural resources. However, different attitudes exist in regard to the purpose and goals of regulation and enforcement and contradict each other. There is a spectrum of responses to government involvement, but three take precedence in the watershed. The first accepts policy and regulation as tools to work with in taking care of personal property and protecting public resources. A second response works alongside policy and regulation but for different reasons. The goal is to prevent further regulation or oversight by cooperation with the current level of oversight.

> "From what farmers [on the council] have told me, a big part of why they are involved is because they want to do their part to try and hold off more regulation." – Dunn County Agent

> "I think everybody has to work together at a level…(yet) the government coming in telling people what to do, you're going to get, I think, a lot of resistance." – Dunn County Agent

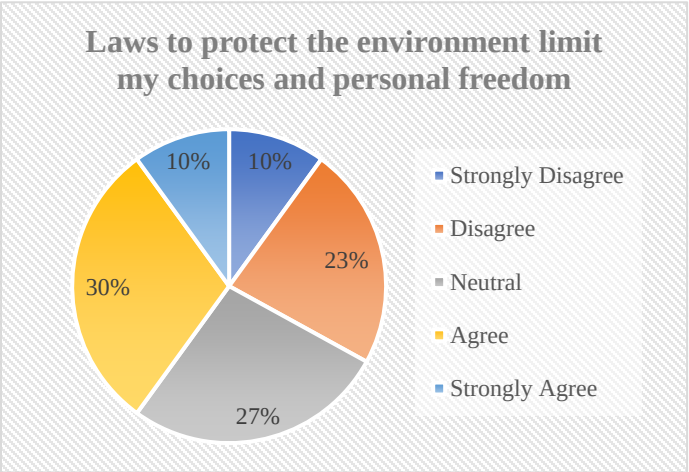


Figure 9: Perceptions about Laws Protecting the Environment

The third response is opposed to regulation and oversight on the grounds of personal property rights and private agency, which reflects the general farmer mentality in the watershed (see Figure 9). There is a segment of the population viewing government intervention as unnecessary in private land and water resource management. Again, this contradicts with the other two responses, making regulation in a uniform manner less feasible.

> "Just in general conversation through town, the ones who don't want to do it, aren't willing at this point to look at it…they just say 'it's my land and I'll do what I want'." – Menomonie Business Owner

Cross-Organizational Cooperation is rated as Favorable, meaning "Cross-organizational initiatives and resource pooling are the norm and exist regularly at a scale appropriate to the problem".

Many community members and policy actors were positive about the amount of collaboration and cooperation taking place in the watershed. Agencies within the watershed communicate and collaborate about the best ways to manage land and water resources. This collaboration allows a holistic view of the watershed and models positive interactions for all stakeholders in the watershed. This kind of water-centered relationship building is vital, but it must retain its focus in order to remain effective. A shared focus relies on the creation of mutual goals and open communication between organizations about the aspects of cooperation that are working and the aspects that are not.

Despite an overall willingness to cooperate, some divisions of governance could benefit from more collaboration. There are benefits for the community when local government is on the same page across departments. With it comes a realization that water touches every aspect of the community and is relevant to all areas of governance.

> "We have work to do as a city – the townships…we need to work better together and see that the health of the lake is all of our concern. You take away our lakes, why would people come here? There is no reason. You take the lakes away…we don't have much of a town." – Chetek Community Member

It may require adopting a new attitude about governance and relationships between different branches. It may also be difficult at first getting everyone under the same roof and having an efficacious discussion.

> "There needs to be a way to provide leadership in the whole watershed to do this and pulling all of these governmental agencies together and getting them under one tent to talk is almost impossible." – City of Menomonie Official

> "They get kind of, 'well this is how we've always operated, and this is our domain, and why should we be talking to the highway department or the public health department?' It requires a paradigm shift in terms of how you think about things from an organization standpoint, if you have a major problem like we have." – Dunn County Agent

Experiences by many in the Red Cedar Watershed suggest that even the smallest amounts of communication and collaboration can yield large differences in protecting and preserving the water quality of the watershed. Thus, it is of utmost importance to invest time and reflection in making changes and evaluating the effectiveness of local government operation, especially in promoting more educational and outreach programs that both convey knowledge about things like BMPs and buffer strips while simultaneously build a sense of community and positive relational networks.

SECTION 4: STRENGTHS, DEFICIENCIES, AND RECOMMENDATIONS

As discussed in the previous section, several of the capacities and the areas they assess tend to hinder collective action towards improving water quality. Identifying and discussing weaknesses in the community starts the discussion about the *nature* of the current deficiencies and how they can be molded into benefits for the community and water quality goals. This next section will go over each of the deficiencies in the watershed, tying them to recommendations from the research whereby those engaged can use the strengths to address the deficiencies. Research outcomes offer suggestions for mechanisms to be tweaked and/or developed that can benefit community building and improve water quality. The capacities rely on each other and influence each other, and improvements to one area can build other capacities. Water quality initiatives are best implemented when they address multiple capacities simultaneously rather than focusing on one at a time.

The strongest components of member capacity in the watershed are found in the areas of awareness and concern. Collective memory and vision was the weakest area of member capacity. Narratives about the watershed are diverse and often contradictory; these contradictions confuse the truth of what is happening in the watershed and what can be done about it. In this way, weakness in collective memory and vision contributes to hampering responsibility and agency within the watershed. It is imperative for the watershed to have one central narrative surrounding water quality and that it correctly identifies the root causes of water pollution, the effect poor water quality has on the community, economy, and environment, and the potential to improve water quality. Clear scientific information and data about water quality would be able to encourage a sense of responsibility and agency if used to show that everyone has a stake in water quality and there are things everyone can do to have an impact on water quality. This is best done by looking at how relational capacity can be built, especially through programmatic capacity and current strengths in organizational capacity.

Relational capacity is the watershed was found to be favorable in the areas of sense of community but has deficiencies in social networks formation and sense of collective responsibility. The deficiencies are especially relevant among certain groups in the watershed, including bridges to the farming community. Personal relationships between farmers and county agencies are important for the growth and support of conservation agriculture in the watershed but require a willingness to consider different methods of farming and abandon outdated practices. Despite deficiencies in this area, there have been promising changes taking place with the formation of Farmer-Led Councils, the adoption of conservation practices, and relationship building between the farming community and local agencies. It is important that these efforts continue, which requires the support of conservation and farming agencies, cost-sharing or other funding opportunities, and education/trainings offered to farmers. Other problems have arisen in the watershed with divides between the north and south parts of the watershed. Waterways have meanings and connections in

their communities and differences in these understandings of water have prompted blaming and miscommunication in the past. Efforts to communicate have started moving various communities on a solid path to bridging issues and creating a holistic understanding of the watershed and water quality issues. Sharing success stories of government agencies working effectively with farmers may also help bolster organizational capacity, thus helping to create virtuous cycles.

Organizational capacity strengths are leadership, leadership activation, networks among groups, and collective memory and vision. The most prominent deficiency involves the member base of organizations. Membership in organizations in the watershed is more theoretical than actual. Members contribute money while time and effort are often lacking. Engaging membership is not always easy but is essential to the preservation and continuation of an organization and its mission. Organizations play an important role in bringing together diverse populations in support of a common goal. They could be a useful channel in sharing a central narrative across the watershed, using connections and support for other local organizations as a starting point. Plans need to be developed to handle conflict resolution in a collaborative, public way while emphasizing civil conversation. Discussion about methods to improve and fund water quality devolved to the point where misconceptions and faulty information took center stage in several cases. These reactions slow any forward progress and build walls between different groups.

Despite the challenges of funding, changes in priorities, and decreasing time to devote to relationship building, programmatic capacity is a strength because county/city officials, local agencies, and organizations have consistently kept water quality as a priority and focus in the city, county, and watershed. There have been efforts recently to grow education and outreach by providing water quality education to youth and youth organizations and lake associations, as well as offering conservation education for producers. Funding for water quality projects and initiatives has been identified and acquired and education/outreach remain priorities. Cross-organizational cooperation is especially strong in the watershed as groups like the Red Cedar Water Quality Partnership facilitate the meeting and conversation of individuals and organizations across the watershed. The Red Cedar Conference also draws people together to talk about people, land, and water in the watershed; it starts conversations about difficult topics and provides key information about the state of water quality in the watershed. The continuation of activities like the partnership meetings and conference are of vital importance to the watershed and fostering an environment where ideas are shared, and everyone is acknowledged and given responsibility as a stakeholder.

RECOMMENDATIONS

1. Develop and share a central narrative about water and water quality problems, focusing on the history of the watershed, ideas for direct action, and a shared vision of the future.
2. Continue to promote open communication and networking between organizations. Introduce water quality issues and partnerships where appropriate to benefit the community and water quality goals.
3. Engage youth organizations and public education in introducing age-appropriate water quality education and activities.
4. Provide financial support to county agencies and staff so they can foster relationships with producers in the watershed and support the adoption and continuation of conservation agriculture practices.
5. Evaluate tax policy and consider tax policy changes to fund water quality initiatives in the watershed.
6. Use new and advancing technologies when possible and applicable, to coordinate and concentrate conservation practices in problem/high impact areas, without commitment to any single technology.
7. Prioritize water quality in public, formal discussions about community development and economic growth and public policies (considering the impact economic improvement or decline can have on the local economy).
8. Recognize support exists currently for voluntary compliance in the watershed rather than regulatory authority, planning accordingly for adequate staff time for such relationship building necessary for voluntary compliance.

Some of these have already begun coordination under the TMDL Implementation group that coalesces around the implementation plan, "A River Runs Through Us" . Projects that attempt to accomplish these recommendations include Farmer Led Councils and other county led initiatives (e.g. soil health demonstration farms), but the implementation group may also consider having a central coordination body outside government as well. There is also currently no forum for vetting, integrating, and advancing new technologies in any overt way on a regular basis; a central coordination body could be vital for such initiatives. This would go beyond a Lake District or a county Land and Water Conservation Division and would likely be unique on the socio-political landscape in Wisconsin. Integration of businesses, for example, in a coordinated narrative-building campaign for collective economic growth has not yet existed, and it could get impetus from such a central coordination body rather than relying on local Chambers of Commerce or lake associations to organically work together.

No single recommendation can address every deficient area of capacity. Even so, it is important to see each recommendation as capable to address *multiple* areas of capacity. In order

for a holistic solution in building a cleaner, more sustainable watershed we cannot have initiatives be seen as discrete efforts at checking off the list of capacities. Each recommendation has potential to have direct effects in specific areas (geographically and topically) and a number of more indirect effects beneficial for the watershed. This is especially the case if leaders in the Red Cedar Watershed improve the watershed's current relational strengths to address deficiencies elsewhere. If relational capacity is promoted across all initiatives, the watershed capacities can be made to grow in concert with each other.

Figure 3: Capacities and Recommendations

Table showing which capacities each recommendation has the potential to contribute to		Recommendations							
		#1	#2	#3	#4	#5	#6	#7	#8
Member	Awareness & Concern	X	X				X	X	X
	Knowledge	X	X	X		X	X	X	X
	Collective Memory & Vision		X						X
	Responsibility		X	X		X	X	X	X
	Agency			X		X		X	X
Relational	Social Networks	X		X			X	X	
	Sense of Community	X	X	X	X		X	X	X
	Sense of Collective Responsibility		X	X	X		X	X	X
Organizational	Member Base		X				X		X
	Leadership Base		X				X		X
	Leadership Activation	X						X	
	Networks among Groups	X					X		X
	Collective Memory & Vision		X				X		X
	Conflict Resolution	X					X		
	Decision-Making	X				X	X		
Programmatic	Money & Staff			X	X		X	X	
	Education/Outreach Support	X	X	X			X	X	X
	Monitoring & Expertise			X	X	X		X	
	Accountability	X			X	X			X
	Regulatory Authority			X		X		X	
	Cross-Organizational Cooperation	X		X			X	X	X

APPENDIX A: CAPACITY RUBRIC AND RATINGS

Figure 4: Capacity Ratings

Community Capacity Model Ratings					
		Unfavorable	Somewhat Unfavorable	Somewhat Favorable	Favorable
Member	Awareness & Concern				X
	Knowledge			X	
	Collective Memory & Vision		X		
	Responsibility			X	
	Agency			X	
Relational	Social Networks		X		
	Sense of Community			X	
	Sense of Collective Responsibility		X		
Organizational	Member Base		X		
	Leadership Base				X
	Leadership Activation			X	
	Networks among Groups			X	
	Collective Memory & Vision			X	
	Conflict Resolution		X		
	Decision-Making			X	
Programmatic	Money & Staff		X		
	Education/Outreach Support		X		
	Monitoring & Expertise			X	
	Accountability		X		
	Regulatory Authority		X		
	Cross-Organizational Cooperation				X

Community Capacity Model Rubric						
	Capacity Definition		**Unfavorable**	**Somewhat Unfavorable**	**Somewhat Favorable**	**Favorable**
Member	Community members' knowledge and beliefs, awareness and concern, sense of personal responsibility and perceived control associated with water resource problems and their consequences (altogether contribute to engagement in pro-environmental behaviors)	***Awareness & Concern***	People are generally not aware of the pollution problem, especially those people in positions of affecting public projects/initiatives and policies (i.e. "epistemic communities")	Some people are aware of the pollution problem, and few in epistemic communities;	Some people are aware of the pollution problem, including most in the epistemic communities;	Most people are aware of the pollution problem, including most in the epistemic communities
		Knowledge	People do not know where the pollution comes from	Few people but some in epistemic communities know the source of the pollution;	Most people in epistemic communities and some in the general population know the source of the pollution;	Most people in epistemic communities and general population know the source of the pollution
		Collective Memory and Vision	Most people and epistemic communities do not remember ways water and land used to look and do not have a sense of what an improved watershed might add to the community	Some people and epistemic communities remember ways water and land used to look and have a vision of what an improved watershed might add to the community	Most people and epistemic communities remember ways water and land used to look and have a vision for what an improved watershed could add to the community	Most people and epistemic communities remember ways water and land used to look have a vision for what an improved watershed could add to the community
		Responsibility	General population and epistemic communities do not take personal responsibility for addressing water pollution and/or engaging in pro-environmental behaviors in general;	General population and epistemic communities do not take personal responsibility for addressing water pollution and/or engaging in pro-environmental behaviors in general;	Most people do not take personal responsibility for addressing water pollution and/or engaging in pro-environmental behaviors in general, although most of the epistemic community does;	Most people and the epistemic community take personal responsibility for addressing water pollution and/or engaging in pro-environmental behaviors in general;
		Agency	General population and epistemic community believe problem is outside their control	General population and epistemic community believe problem is outside their control	Epistemic community believes problem is within their control but most people do not	Epistemic community and most people believe problem is within their control
Relational	Interpersonal relationships and social networks within communities that promote knowledge exchange and sense of community (collective sense of responsibility for water resource consequences)	***Social Networks***	Social networks have many disconnects among different communities in watershed and people generally suspicious of one another;	Social networks have many disconnects among different communities in watershed and people generally suspicious of one another;	Some crucial disconnects exist among different communities in watershed, although most groups of people are connected to one another, and level of trust across groups is generally favorable;	Almost all groups of people are connected to one another and people give others benefit of the doubt;
		Sense of Community	Very low sense of community among general population and epistemic communities	Low sense of community among general population and but moderate sense of community in epistemic communities;	Moderate sense of community among general population and epistemic communities	Strong sense of community among general population and epistemic communities
		Sense of Collective Responsibility	People do not have a shared awareness of pollution, epecially those people in positions affecting public projects/initiatives and policies (i.e. "epistemic communities"); General population and epistemic communities do not have a shared concern about pollution; very low sense of collective responsibility among general population and epistemic communities	People- both general population and epistemic communities- have a shared awareness of pollution; General population and epistemic communities do not have a shared concern about pollution; low sense of collective responsibility among general population and moderate sense among epistemic communities	People- both general population and epistemic communities- have a shared awareness of pollution; General population and epistemic communities do not have a shared concern about pollution; low sense of collective responsibility among general population and moderate sense among epistemic communities	People- both general population and epistemic communities- have a shared awareness of pollution; General population and epistemic communities have a shared concern about pollution;moderate to strong sense of collective responsibility among general population and epistemic communities

Community Capacity Model Rubric						
	Capacity Definition		**Unfavorable**	**Somewhat Unfavorable**	**Somewhat Favorable**	**Favorable**
Organizational	Strong leadership, meaningful member engagement, formal networks, and collective memory (engage in collective decision making processes and effective at conflect resolution)	***Member Base***	Members of local organizations do no more than donate membership funds, especially those organizations addressing water pollution	Members of local organizations do no more than donate membership funds, especially those organizations addressing water pollution	Members of local organizations, including those organizations addressing water pollution, show signs of expanding the involvement of their members in initiatives/programs	Members of local organizations, including those organizations addressing water pollution, have regular rotating committee involvement among members
		Leadership base	Very few leaders exist in watershed	Few leaders exist in watershed	Some leaders exist in watershed, willing to work together	Multiple leaders exist in watershed, each eager to delegate authority;
		Leadership activation	Leaders in governmental positions and local non-profit organizations generally do not prioritize and/or are not aware of pollution;	Leaders in governmental positions and local non-profit organizations generally are aware of pollution but do not prioritize addressing that pollution;	Leaders in governmental positions and local non-profit organizations generally are aware of pollution and prioritize addressing that pollution; the few focused on the problem take on disproportionate responsibility, burnout a possibility	Leaders in governmental positions and local non-profit organizations generally are aware of pollution and prioritize addressing that pollution; they work together and delegate authority, avoiding burnout
		Networks among groups	Organizations generally do not work together on anything, but especially not regarding water pollution;	Organizations generally do not work together on anything, but those working on water pollution do work together	Organizations generally do work together on many things, especially those working on water pollution	Organizations generally do work together on many things, especially those working on water pollution
		Collective Memory and Vision	Organizations have no mechanisms for keeping institutional history and no plan to ensure longevity (including a plan for leadership succession)	Organizations have some mechanisms for keeping institutional history but no plan to ensure longevity (including a plan for leadership succession)	Organizations have some mechanisms for keeping institutional history and plans to ensure longevity (including a plan for leadership succession)	Organizations have adequate mechanisms for keeping institutional history and clear plans to ensure longevity (including a plan for leadership succession)
		Conflict Resolution	No official or informal conflict resolution laws or norms exist in general, and specifically not regarding water pollution	No official or informal conflict resolution laws or norms exist in general, and specifically not regarding water pollution	Formal conflict resolution policies exist including with regards to water pollution, but informally people are hesitant to do so	Formal conflict resolution policies exist including with regards to water pollution, and informally people are eager to resolve conflicts productively
		Decision-making	Decision making by very few people regarding projects/initiatives and policies	Decision making by very few people regarding projects/initiatives and policies	Decision making inclusive regarding projects/initiatives and policies	Decision making inclusive regarding projects/initiatives and policies
Programmatic	Transboundary coordination, resource pooling and innovation for collective action, and integrated biophysical and social systems monitoring and evaluation (water resource and civic engagement programs should be flexible and adaptive)	***Money & Staff***	Organizations, agencies, and other actors are severely understaffed and underresourced	Organizations, agencies, and other actors are understaffed and underresourced	Organizations, agencies, and other actors are have moderate staffing and resources	Organizations, agencies, and other actors are well-staffed and resourced
		Education/Outreach Support	Organizations, agencies, and other actors don't communicate their activities to the general public and don't explain how people can take action	Organizations, agencies, and other actors inadequately communicate their activities to the general public and don't always explain how people can take action	Organizations, agencies, and other actors communicate their activities to the general public but are unclear about how others can take action or communicate in unhelpful ways (via wrong communication methods, unclearly, in a threatening or legalistic way, etc...	Organizations, agencies, and other actors communicate their activities to the general public and explain clearly, concretely, and kindly how people can take action
		Monitoring and Expertise	No monitoring, analysis, or response to analysis of effectiveness of programs exists	Strong monitoring and adaptation according to monitoring regarding some issues but not regarding water pollution; monitoring and analysis exists regarding ecological data but not social, and there is no adaptation according to ecological data and analysis;	Some monitoring and analysis of both ecological and social aspects of water pollution exists, but no adaptation according to analyses	Monitoring and analysis of both ecological and social aspects of water pollution exists, and adaptation of programs according to analyses is regular, iterative, inclusive, and highly responsive
		Accountability	Organizations, agencies, and other actors are not accountable to the general public or transparent about their actions	Organizations, agencies, and other actors are not accountable to the general public, but might have a norm of transparency	Organizations, agencies, and other actors are not accountable to the general public but are transparent	Organizations, agencies, and other actors are accountable to the general public and transparent in their actions
		Regulatatory Authority	Organizations, agencies, and other actors do not have authority to implement, monitor, or enforce policies	Organizations, agencies, and other actors do not have authority to implement, monitor, or enforce policies	Organizations, agencies, and other actors have authority to implement and monitor, but not to enforce policies	Organizations, agencies, and other actors have appropriate authority to implement, monitor, or enforce policies
		Cross-organizational cooperation	No cross-organizational initiatives exist and no resource pooling exists regarding water pollution	Organizations work together and pool resources on issues in the watershed, but irregularly	Cross-organizational inititives exist and resource pooling occur regularly but on a small scale	Cross-organizational inititives and resource pooling are the norm and exist regularly at a scale appropriate to the problem

APPENDIX B: METHODS DESCRIPTIONS

This section provides a more detailed look at the methodologies utilized in conducting the LAKES program research. As the LAKES grant encompassed a variety of different projects with individual methodologies and research approaches. The following paragraphs will briefly summarize the logic behind the use of methodologies as well as looking holistically at how each project tied into the overall theme of the LAKES grant. The projects are broken down by main topics addressing the basic research questions informing the study, the methods used to answer those questions, general outcomes (survey completion rates, number of interviews, etc.), and an overview of how the individual projects fit into the broader scope of the whole project.

Farmer-Led Council Research

The goal of this research was a better understanding of the farmer-led council initiative, its approach to water quality issues, and its influence in the watershed. Farmer-led councils have been developed in several counties in and near the Red Cedar Watershed since 2013. Researchers were interested in the results of these councils as understood by farmers and conservation workers. Interviews were conducted with county employees and farmers. Researchers also attended county board, city council, and conservation organization meetings and job shadowed county conservation agents on farm visits. The interview transcripts and survey results were coded and analyzed for themes. The Farmer-Led Groups still continue to meet and request new funding. They have provided education and networking opportunities for farmers and county staff members seeking to build relationships. Their development was the result of a dedicated group of farmers, county staff members, and a UW-Extension coordinator.

Contingent Valuation Study (Willingness to pay for a cleaner lake)

Typically, contingent valuation studies investigate willingness to pay by asking a series of yes and no questions as to whether an individual would be willing to pay for a certain policy. The LAKES contingent valuation study asked about an individual's willingness to pay a variety of different amounts towards an unspecified cleaner water policy. The research questions focused on perceptions about water quality and its effect on community and recreation and factors influencing willingness to pay for policies related to improving water quality. The survey was sent to 852 households in Chetek and Menomonie asking questions about recreation, willingness to pay, and perceptions about water quality. There were 178 surveys returned for a response rate of 21%. A random-effects probit model was used to analyze the responses. Further tables and graphs were created using the other questions from the survey.

Farmer Social Networks and Farmer Surveys

Farmer social networks were the focus of several research projects. The data was collected by surveys sent to all the active farmers in the watershed. There was a 23% response rate with 180 surveys completed and returned between 2014 and 2017. The surveys asked questions about farming practices, personal values, social networks, adoption of BMPs (Best Management Practices) and community engagement. The survey data was augmented by farm tours, pasture walks, interviews, and informal conversations. The data was analyzed using Qualtrics, SPSS, STATA, and Excel. These programs were used to create regression models, correlations, and run descriptive statistics. A social networking tool called KUMU was utilized to create social networks based on questions from the survey. Analyses of the social networks offer findings about how the networks form, connect, and change.

Community Members Research and Surveys

Several different research projects focused on community members and their different reactions, responses, and perceptions of water quality. Most of them had similar goals of assessing community perceptions of water quality, evaluating personal values and engagement, understanding connections and social networks, and gaining knowledge about how lakes and waterways have changed over time. These data were collected through participant observation, job shadowing, focus groups, structured and informal interviews, canvassing and survey mailings.

Oral History Research

Oral history research is concerned with collecting the first-person accounts of people who have lived during a certain time in a specific area. This research brought together personal narratives of the past and to shed light the attitudes and values of a community and its members. It is important to remember oral history relies on personal interpretation and memory and can be extremely subjective. The LAKES oral history research was completed using interviews with long-term community members, were involved with community, or recommended by other community members. In addition to the interviews, the research was enhanced by a review of previous literature, consultation with archivists, and participant observation in public meetings. The goals of this research were to understand the history of the lakes, gain knowledge of public opinion of the lakes and lake health, and assess the level of public engagement in the lakes.

Economic Impact Study of Lakes Menomin and Tainter

The economic impact study of Lakes Menomin and Tainter was completed to understand how cleaner lake water would impact the local economy. More specifically, it asked questions about how it would influence recreation and local businesses. The survey was sent to UW-Stout students, UW-Stout staff, Menomonie businesses, and Menomonie citizens to ask about their lake

use, engagement in the community, and business choices. Each group was sent a different survey. The emails were sent via mail, email, or given in person at community events/local activities. UW-Stout students had a response rate of 12%, UW-Stout staff had a response rate of 33%, and Menomonie businesses had a response rate of 15%. The results were used to evaluate the business environment, estimate lake use, and predict economic growth based on a cleaner lake.

Hedonic Pricing Analysis

Hedonic pricing analysis uses differences in real world market prices to isolate the effects of one factor. In this case, the analysis focused on the housing market to isolate the effect of water quality on real estate pricing. Data was collected on 464 recently sold houses in Menomonie, Chetek, and Cumberland and supplemented with information from GIS layers, real estate websites, the Department of Natural Resources lake quality assessments, and Dunn/Barron county tax records. These data were used to develop various regression models estimating lakefront premiums and the impact of Secci depth and other water quality measures on housing value.

Community Capacity Research

The community capacity research looked at the community as a whole and its ability to address issues, bring people, resources, and skills together, and create positive change. This research asked questions about what resources exist in a community, how those resources are being used, and how organizations contribute to community capacity. The research was based on reviews of relevant literature as well as past LAKES research. Participant observation was a large part of this research with attendance at city government, county government, and local organization meetings. Interviews were conducted with members and leaders of community organizations; the interviews were generally semi-structured and in-depth. The interviews and field notes were coded and analyzed for themes regarding the ways that organizations contribute to community capacity surrounding water quality. This report is based upon this component of the overall LAKES research project.

NOLs Surveys and Interviews

The watershed has a significant amount of land that is operated by someone other than the owner. This fact prompted a question into the attitudes and land management practices of non-operation landowners (NOLs). Data was collected by survey, interviews, a focus group, and a review of relevant literature. Surveys were sent to 921 non-operating landowners in Dunn and Barron counties, 208 surveys were completed for a response rate of 23%. Interviews were conducted with 8 NOLs and one focus group was held. The survey results were analyzed using qualitative coding and quantitative analysis utilizing STATA, SPSS, and Excel. The statistical data

was used to build regression models, interaction graphs, and correlations. The theoretical framework for this research relied on dichotomies of land as both a commodity and a community.

IMPLAN Modeling

IMPLAN modeling was completed in the summer of 2017 and updated with additional data in 2019. IMPLAN is a form of input-output modeling that uses multipliers and complex economic equations to predict how an overall local or regional economy will be affected by changes in the various individual sectors. This study was intended to answer the question of how the economies in Dunn and Barron counties would be affected by improved/worsened water quality. In addition, it isolated which industries would be affected most by changes in water quality, what will happen with employment, and what the total output effect will be on the regional economy. Cost estimates for water quality were based on surveys, the Wisconsin Department of Tourism Annual Direct Visitor Spending Report, the United States Department of Agriculture, Natural Resource Conservation Service, the Wisconsin Department of Natural Resources, and previous LAKES research. Spending patterns were estimated from survey response data and input into the IMPLAN framework to model the effect that water quality changes would have on the local economy.

APPENDIX C: PRACTICES

There are numerous best management practices (BMPs) available to protect waterways, enhance natural habitats, and assist in effective watershed management, and this section gives a brief overview of some of these practices. Different groups in the watershed can use their knowledge and skills to protect water quality; and it is important for every individual in the watershed to consider their own area of influence and steps that could be taken to protect land and water (Brody, 2003; Olson & Davenport, 2017; Pretty & Shah, 1997). The first set of practices to highlight are those commonly recommended for lake/river shore property owners. The areas within 30 feet of a lake or river are important habitat for a variety of plants and animals. As such, 30+ foot buffer zones around waterways support diverse wildlife, prevent erosion and runoff, and maintain natural vegetation (Barling & Moore, 1994; Lovell & Sullivan, 2006). They create healthy habitats for native plants, aquatic species, and wildlife. Practices that support waterways and protect waters include terraces, fish sticks, rain gardens, careful planning of building projects and landscaping alterations, use of native plants, and setbacks for buildings/furniture/boating and recreation equipment (Markham & Demorest, 2012). Not all properties require the same set of practices, but it is important to find out what practices would be most effective at protecting water on a specific property. Promoting these practices can protect waterways and encourage the growth of native plants and local wildlife. Additionally, it can build unity and solidarity over the use of common practices shared by many in a community (Reed, 2008).

Water quality can also be protected and prioritized by the creation of urban storm water policy and runoff guidelines for building or landscaping projects (Ellis, 1989). This could include comprehensive regulation for building sites and landscaping projects, strict guidelines for road salt, policies for the disposal of leaves and yard clippings, the installation of rain gardens to prevent runoff, restrictions on the use of lawn chemicals and fertilizers, and buffers on waterways adjacent to public land (Barbosa, Fernandes, & David, 2012; Field & Tafuri, 2006; Tsihrintzis & Hamid, 1997). In addition to instituting these practices, a community would need to cultivate a climate that supports water quality policies and works with county agents and city officials in finding solutions and addressing problem areas (Brown, 2005; M. Lubell & Fulton, 2007). This can be a challenging process, involving the cultivation of relationships between agencies and community members (Dhakal & Chevalier, 2016). This report highlights how such cultivation is crucial to the Red Cedar Watershed as well.

Agriculture has an important role in protecting the water and land of the Red Cedar Watershed. Runoff and erosion from farmland is the dominant contributor of phosphorus and nutrients to local waterways and farmers need to involved in discussions about conservation, water quality policy, and regulation (Kleinman et al., 2011; Ribaudo et al., 1999). There are many Best Management Practices (BMPs) appropriate for the different land and water solutions that arise in

agriculture. Some of the most common conservation practices are grass waterways, buffers, cover crops, no-till or strip till, managed grazing systems, barn runoff systems, nutrient management planning, and manure management (Prokopy, 2008; A. N. Sharpley et al., 2006). These practices keep soil and nutrients on agricultural fields rather than in waterways causing sedimentation problems and algal blooms (Bosch, Allan, Selegean, & Scavia, 2013; Sharpley et al., 1994). There are many farmers and producers in the watershed already utilizing BMPs on their land and satisfied with the results on soil quality, crop yield, and reduction in runoff and erosion. The use of agricultural BMPs in the watershed promotes a change in the conventional agriculture model while prioritizing soil quality and crop yield and protecting natural resources (Kremen & Miles, 2012).

Resource Concerns

Funding is a critical aspect of supporting and sustaining any environmental restoration project. Access to adequate funding often determines a project's success or failure and defines how community resources will be used and prioritized (Palm-Forster et al., 2017). Funding devoted to environmental restoration or rehabilitation can be tremulous and, at times, nonexistent (Lerner et al., 2007). Communities are pushed to be creative and competitive in order to receive any sort of federal or state money and are often required to meet complicated evaluation criteria and reporting standards (Poff et al., 2003; Vincent, 2006). While this is by no means impossible, it does add challenges to the process of securing adequate technical assistance and resources in reaching environmental goals. County and city budgets are limited and stretched in many different directions. While a community may be prioritizing water quality, they cannot always finance needed practices or address every problem area. Having the community committed to water quality and willing to pay additional sales or property taxes to fund water quality initiatives is a possible solution to funding concerns. It allows community members to support water quality when they may be limited in other areas of influence, resources, or skills. These funds could be used to cost-share BMPs, fund creek restorations, build rain gardens or retaining ponds, hire additional staff, provide education and technical support, or support organizations working on improving water quality (Mark Lubell, n.d.).

Staffing is another critical aspect of establishing and maintaining management practices throughout the watershed. As mentioned above, county and city budgets are limited, and that fact directly influences the number and variety of individuals employed in any given area or agency. A spectrum of knowledge and skills are necessary in managing different restoration projects, building relationships, supporting farmers and land owners, writing grants, and conducting education programs and trainings (M. Lubell & Fulton, 2007; Mark Lubell, n.d.). A community that has access to trained and qualified individuals has more options for water quality projects and preparation for adopting mitigation strategies. A community that is utilizing its county and city

staff will be able to see action on water quality initiatives as well as feel more confident in making changes intended to protect water quality (Lach et al., 2005).

Last, but not least, time is a crucial factor both in terms of implementation and in terms of continuity of practices. Water quality issues need commitments of time and energy from each individual stakeholder, organization, and business. It takes time and effort to change a complex problem that has been created over decades. A one-time investment of time and energy will never be enough to reverse the changes that have taken over decades. There is no quick solution to the problem of phosphorus pollution in the Red Cedar Watershed, and the changes made today may take years but are still worthwhile endeavors. Not only does it improve the world in the present, it also improves the world for the generations to come.

APPENDIX D: NON-OPERATING AGRICULTURAL LANDOWNERS (NOLS)

Perceptions of nature and land use practices intersect with notions of responsibility and citizenship, which are in turn interspersed with gendered expectations and norms. Whether we are shamed by neighbors for allowing dandelions to take over our yards or asked why the corn rows in our fields look messy, we engage in conversations about the proper use of land that reflect our status in society, and—as this paper argues—gender often shapes such statuses. Unfortunately, dominant land use practices, often prioritized as more productive and by policymakers and the industry (e.g. Prokopy 2008; Perry-Hill and Prokopy 2014), produce negative environmental impacts, including nutrient run-off that contributes to water eutrophication. Today, 46% of United States farmland is owned by those who do not farm it themselves (Minchenkov and Joshua 2015; Ulrich-Schad et al. 2016), a number that will continue increase with the expanding elderly population who retain ownership of agricultural land but retire from farming (Jackson-Smith & Petrzelka, 2014; Petrzelka & Marquart-Pyatt, 2011). Furthermore, an increasing percentage of these landowners are women, and gender norms might constrain their use of conservation practices that could mitigate water eutrophication. In this appendix, we offer an overview on the problem of NOLs' conservation agricultural use as it relates to gender, a description of the methods used, quantitative and qualitative findings, and a discussion of those results.

Rising trends of water eutrophication from unsustainable agricultural practices and increases in renting out farmland introduce an important two-part question: Why do some non-operating agricultural landowners (NOLs) prioritize conservation practices with their tenants (RQ1), and how does gender affect such prioritization (RQ2)? We address these questions, focusing on how NOLs view agricultural land, how dominant gender norms may condition those viewpoints (see also Carter 2017, Petrzelka 2014, and Wells and Eells 2011, among others), and how those norms may be related to the status derived from how a person's land appears to others. Certainly, race and class also powerfully shape norms related to agricultural land. Our emphasis on gender reflects a call by Petrzelka et al. 2018, among others, to focus on the particular salience of gender regarding NOLs and rural conservation agriculture more broadly. We argue that the interplay between status and masculinity has so far limited the use of conservation agricultural practices, with negative consequences for social, economic, and environmental systems.

Dominant ideologies, institutions, and practices through much of U.S. history have been built around and continually reinforce gender as an opposing binary of men and women. Traditionally, although this is changing, we attach ideas of submissiveness, physical attractiveness, dependency, and nurturing upon women. Alternatively, for men, we attach goals and norms of dominance, autonomy, and emotional restraint. Numerous studies show how these ideologies are tied to inequity in pay, disproportional experience of physical and emotional

violence for women, and an unequal gendered division of household labor, among other outcomes (e.g. Alksnis, Serge, and James 2008; Michalski 2004; Hochschild and Machung 2012).

American society has traditionally considered farming a man's occupation, and the division of labor in rural households frequently assigns farm decision-making and labor to men, while assigning women tasks such as childrearing, homemaking, and bookkeeping for a farming operation. Little (2002, p. 666) notes that a key issue surrounding farming and masculinity is "the importance of ideas of control over the land and environment." Other authors echo this finding and highlight that farming masculinity is tied to ideals of strength, individualism, tenacity, toughness, and working outdoors (Liepins Ruth, 2009; Pini & McDonald, 2008, p. 34). Peter et al (2009) argue the main hindrance to farmers adopting sustainable agriculture is "conventional masculinity" and that "the oppositional character of monologic masculinity fits poorly with the social and environmental interrelations and openness to change stressed by sustainable agriculture" (p. 231). However, other authors have critiqued current alternatives to the independent, masculine farmer and have shown how "new representations of farming masculinity aim to more deeply entrench conventional farmers' dependence on chemical inputs and agri-business products by promoting a process of deskilling, effectively alienating the farmer from the land" (Bell, Hullinger, and Brislen 2015; see also Saugeres 2002b, Kroma 2008, and Kroma, and Flora 2003 for more on images of conventional farming masculinity in agri-business industry marketing). These ideals of masculinity are not just relevant to farm owner-operators and may have a role in tenant-NOL relationships in terms of the commitment (or lack thereof) to conventional agriculture in lease agreements and farming practices on rented land.

Val Plumwood, a prominent ecofeminist, has written about how the logic of masculinity is driven by a logic of domination (1994). This domination is driven by a Western us-versus-them dichotomy that reinforces an "ideology of the control of reason over nature" (Plumwood 1994). Masculine control of the environment, rather than a sustainable relationship with it, as the goal, is overwhelmingly replicated in relationships to land and other people in farming, even in the realm of sustainable agriculture (Peter et al., 2009). This orientation helps to understand one reason why men do a disproportionate amount of landscape work, and why many so proudly link pristine lawns with responsible citizenship. We suggest here that farming practices have been similarly linked with gendered ideas of citizenship, with similar negative environmental consequences. To understand how land use practices are linked with social status and gender, we revisit a groundbreaking study on how we view our lawns in American suburbia.

In *Lawn People: How Grasses, Weeds, and Chemicals Make Us Who We Are*, Paul Robbins (2007) examines American lawncare as an avenue for status and citizenship that is unsustainable in both an ecological and a social sense. He argues Americans constructed the idea that having bright, tightly-cropped green lawns demonstrate they are good, productive, middle-class citizens. Robbins illustrates how the chemicals we place on our lawns and the time spent

carefully manicuring them constrains already financially-strapped working and middle-class families, decreases water quality, and creates a fictive idea of pristine nature. In so doing, American lawn care practices construct and reify the idea of dominance and control over nature, an idea that Robbins illustrates also carries a profoundly gendered role performance in the United States.

Over the past century, humans have transformed more land into agricultural land, land that is increasingly tilled to receive an annual rotation of Roundup Ready corn and soybeans. These practices have created shallow root systems, low biodiversity, and high levels of erosion, but the rows look neat and clean and orderly, a visual demonstration of being a productive and responsible farmer. Alternatively, and more recently, some farmers have begun conserving the soil on their land through cover crops (i.e., planting between seasons to increase diversity and improve soil health) and no-till (i.e., drilling seeds into the soil between residue from the previous year's crop without tilling). While these practices keep nutrients in the soil, reduce water pollution, and improve long term yields for the farmers, the rows are less neat (see Figure 1 for an illustration of these two types of land use). Conventional agriculture (the image on the left) we argue, suggests more control over the landscape and aligns well with traditional expressions of masculinity (as reflected in other scholarship on gendered control of agricultural land, e.g. Saugeres 2002a, Saugeres 2002b, and Burton 2004). This may be one reason why conservation agriculture has not been more widely adopted.

Figure 5: Conventional agriculture with tillage of row crops on the left; Conservation agriculture with no-till residue on the right

Extending the idea of a "Lawn Person" to rural agricultural practices, we propose the idea of a "Row Person." Like suburban homeowners, farmers enact a gendered form of citizenship, and show they are competent and responsible landowners to their peers, in part by creating landscapes of neat rows and carefully controlled weeds. As with lawns, this form of agriculture is tied to larger economic structures and a food system that encourages monocrop corn and soybean rotations, with similar negative environmental impacts (as framed in Burton 2004). We do not use this term to suggest a static identity, as such statuses change over people's life courses due to cultural norms, social relationships, public policies, etc. This concept merely provides space for inquiring how we might transition more farmland into sustainable, conservation-oriented practices by NOLs vis-à-vis critically exploring the "Row Person" as a gendered identity, as we propose here, to improve our eutrophic waterways.

From our stratified random sample of 904 NOLs, we collected and analyzed survey data from 208 NOLs—a 23% response rate. To get this rate, we conducted "five wave mailings" for the surveys (advance letter, survey, postcard reminder, survey, survey) according to the Dillman Tailored Design (Dillman et al., 2014) and called select NOLs (specifically women and absentee landlords) to ensure more representative numbers. Our sample was 73% men and 27% women. On average, participants were 65 years old, rented out 85 acres on average, and 78% made less than $30,000 from their farmland per year. Seventy percent had at least some college education, 75% were married, and 25% were single (unmarried, divorced, or widowed). These demographics reflect general distributions throughout the watershed of agricultural NOLs. Sixty-two percent of NOLs in this sample were residents in the watershed, while 38% had permanent residence outside the watershed. These demographics approach the actual distribution of 59% resident NOLs and 41% absentee NOLs in the watershed.

Measures

For our dependent variable, we created a BMP Index to assess the level of conservation agriculture occurring on NOLs' land, based on self-report.[1] Items in the BMP Index included grass waterways, fencing off livestock from streams, no-till or strip-till, midfield buffers, manure management, barnyard runoff management systems, cover crops, riparian buffers, and nutrient management plans. We asked NOLs how many BMPs occur on their farmland and included a range from "no use," "a few areas," "most areas," and "extensive use" for each BMP item. The BMP Index is the measure of BMPs used on a NOL's land, given the type of farming that occurs there (i.e. livestock and/or row crops). Those who reported no use of BMPs were those who

[1]Without geocoded data of actual BMP use for each NOL's land, we were left to self-reporting on surveys, which carries with it limitations of validity, but, we believe, no more than typical issues of validity found in survey instruments.

could use BMPs consistent with their type of farming but instead use none.[2] All other BMP Index numbers reflect the percentage they do use compared to what they could use (e.g. a BMP score of 55 indicates that they use 55% of the BMPs they could use on their farmland). Eighty-nine percent (89%) reported use of at least some BMPs, and on average NOLs use about 40% of possible BMPs on their land.[3]

Our independent variables included age, gender (0 = Man, 1 = Woman)[4], how frequently the NOL checks the farm site during a typical farm season (1 = Never, 2 = Once or twice, 3 = Once a month, 4 = Once a week, 5 = Daily), how important conservation efforts are for their farmland (1 = Not at all important, 2 = Not important, 3 = Unsure, 4 = Somewhat important, 5 = Very important), whether or not their permanent residence is in the watershed (determined by checking their address against a GIS delineated map of the Red Cedar Watershed; 0 = Absentee NOL, 1 = Resident NOL), how satisfied they are working with the county Land Conservation Division (1 = Highly dissatisfied, 2 = Dissatisfied, 3 = Neither satisfied nor dissatisfied, 4 = Satisfied, 5 = Highly satisfied; N/A = Not Applicable), and how they would describe their relationship with their tenant (1 = Very distant, 2 = Somewhat distant, 3 = Neither distant nor close, 4 = Somewhat close, 5 = Very close).[5] While the frequency in checking their farm site may seem similar to whether or not the NOL resides in the watershed, these are two different measures. It is possible that a NOL may live in the watershed and never visit their farmland. As such, we decided to include these as two separate predictor variables.

We also included an independent variable to measure political engagement, reflecting the emphasis Lois Wright Morton and others place on the engagement of citizens in producing more sustainable rural landscapes (Morton, 2011). We asked NOLs to list up to three organizations of any type they actively participate in and to identify whether they receive financial benefits, social benefits, and/or political benefits from being a member (0 = No political benefits and 1 = Political

[2]Without specific data about the parcels of land survey respondents were discussing, it is impossible to conclusively state whether "no use" means that the farmer does not use practices that could be used or that a BMP that is possible for their type of farming is not used because it would be inappropriate for their land. For example, a farmer with a corn and soybean rotation might not use mid-field contours because of lack of knowledge or interest in doing so, or they might not use it because their parcel is flat, and a contour is not necessary. Thus, the BMP index might not capture some nuance, but it is a helpful measure, nonetheless.

[3]It may be that the farmer tenant or the NOL is enrolled in one or more programs that incentivizes BMP use. We asked if the NOL claimed DATCP Farmland Preservation Tax Credit, which was not a significant predictor and left out of the regression models to limit the degrees of freedom in those models.

[4] We provided an option for a non-binary "other" category of gender that was not selected by any respondents. We did not inquire about non-heterosexual partnerships, nor did we ask whether a woman bought land on their own. These are all potential shortcomings to this study for those interested in such questions.

[5] We allow the respondents to discern their own meaning on this question. It may be that they are thinking about how close geographically they are to their tenant, whether they consider the tenant to be a friend, whether they are related, or the level of trust they feel toward their tenant. This has a problem of reliability and validity, certainly, and should be considered in the interpreting of results. However, as a way of abstractly capturing some kind of close connection between NOL and tenant, we decided to still utilize it in this analysis.

benefits). Survey respondents listed a range that included churches, environmental advocacy groups, hunting organizations, social clubs, and agricultural groups. With this variable we attempt to understand the impact a NOL's political/civic involvement could have on their tenant's BMP use, even if the involvement is not with an organization whose purpose is to provide information about conservation agriculture. All results are reported in aggregate, and all identities are kept confidential according to OHRP guidelines.

Table D1: Means, Standard Deviation, Minimum, and Maximum

Variable	Obs	Mean	Standard Deviation	Min	Max
BMP Index	186	39.85	24.7	0	100
Age	176	65.22	11.38	31	100
Close Relationship with Tenant	153	3.43	0.91	1	5
Frequency in Checking Farm Site	150	3.5	1.28	1	5
Conservation Important to NOL	179	4.55	0.72	1	5
Satisfied with Land Conservation Division	105	3.51	0.98	1	5

Results

Means, standard deviations, minimums, and maximums for the dependent variable and all non-binary independent variables are provided in Table D1. Ninety-four percent of NOLs report that conservation efforts on their land are somewhat or very important to them, and 17% of those NOLs believe that their tenants do not necessarily value conservation efforts for their land. Forty-six percent of NOLs reported being somewhat close or very close to their tenants. Only 12% reported being very distant or somewhat distant. 55% checked their farmland once a week or daily, and 27% never checked their farmland or checked it only once or twice a season. Of those who have worked with the county Land Conservation Division, 49% reported that they were satisfied or highly satisfied with their experience, and only 11% reported being dissatisfied or highly dissatisfied. 43% of the NOLs are involved in an NGO. Among those involved, only about 11% are engaged in that NGO for political reasons.

We see statistically significant, positive correlations between BMP Index and watershed resident, frequency in checking the farm site, satisfaction with Land Conservation Division, owner's conservation values, and the political engagement of the NOL, as shown in Table D2. To answer RQ1, we suggest that NOLs may prioritize conservation practices with their tenants due to residing in the watershed, checking their farm site frequently, being satisfied with Land Conservation Division, having higher conservation values, and having a higher level of political engagement in civil society. These correlations are explored further in our regression models.

Table D2: Correlations for BMP Index and Independent Variables from Regression Models

		Watershed Resident	Age	Gender	Closeness with Tenant	Frequency Checking Farm Site	Satisfaction with Land Conservation Division	Conservation Important to NOL	Political Engagement of NOL
BMP Index	Pearson Correlation	0.14**	-0.03	-0.05	0.13	0.19**	.23**	.23***	0.13*
	Sig. (2-tailed)	0.05	0.76	0.48	0.11	0.02	0.02	0.01	0.08
	n	178	161	184	151	146	101	171	186

*Correlation is significant at the 0.10 level (2-tailed)

**Correlation is significant at the 0.05 level (2-tailed)

***Correlation is significant at the 0.01 level (2-tailed)

Table D3 Tobit regression statistics for effects of conservation importance level for NOL, closeness of relationship with tenant, frequency of NOL checking farm site, satisfaction with Land Conservation Division, gender, age, whether NOL's NGO involvement is considered political engagement, if NOL resides in watershed, and interaction between gender and watershed residence on BMP use

	1	2
Conservation Important to NOL	14.63***	15.43***
Satisfied with Land Conservation Division	7.53***	6.65**
[1]Watershed Resident	4.08	-3.90
Age	0.02	0.03
[2]Gender	-12.46**	-36.29**
[3]Political Benefits from Organization	12.21	14.40**
Close Relationship with Tenant	8.53***	9.59***
Frequency in Checking Farm Site	-2.03	-2.62
Watershed Resident and Gender Interaction		32.51***
df	8	9
n	66	66

[1]Reference group: Not Watershed Resident

[2]Reference group: Male

[3]Reference group: Not Politically Benefiting from Organization

*p<.10; **p<.05; ***p<.01, two tailed tests

Source: LAKES REU NOLs Survey 2016

We created a regression model to single out the interactive effects of watershed resident with gender on BMP use. To maintain the predictive capabilities of fitting within the 0% to 100% spectrum of BMP use, we conducted a Tobit regression to examine the relationship between a non-negative dependent variable and independent variables. These are presented in Table D3. Since an R^2 for Tobit is less meaningful, we also ran an OLS regression model to provide corresponding coefficients and an R^2 (see Table D4). R^2 for the model in Table D4 is .40, explaining 40% of the variation in BMP Index levels (the associated F-test indicates this is significant at all alpha levels).

Table D4 OLS regression statistics for the same independent variables as the Tobit model on BMP use

Conservation Important to NOL	15.05***
Satisfied with Land Conservation Division	6.12**
[1]Watershed Resident	-3.48
Age	-0.02
[2]Gender	-32.17***
[3]Political Benefits from Organization	13.78*
Close Relationship with Tenant	8.47**
Frequency in Checking Farm Site	-2.41
Watershed Resident and Gender Interaction	28.62**
R^2	0.40***
df	9
n	66

[1]Reference group: Not Watershed Resident

[2]Reference group: Male

[3]Reference group: Not Politically Benefiting from Org

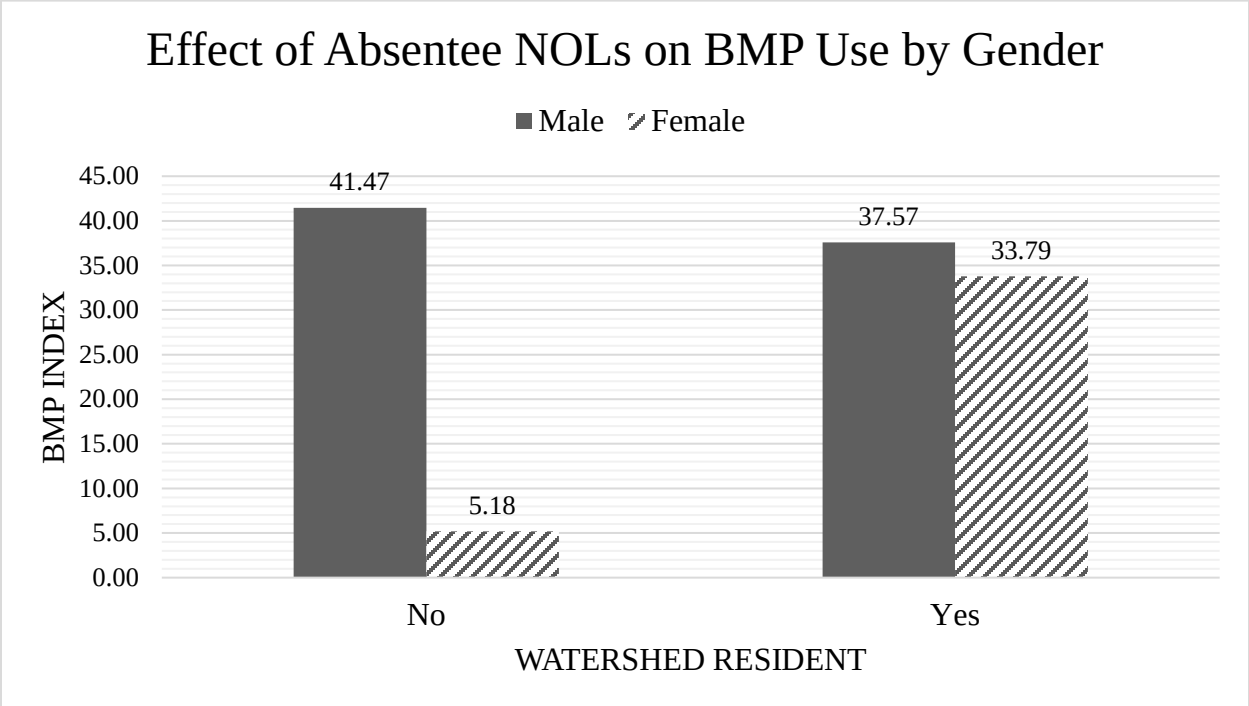
*p<.10; **p<.05; ***p<.01, two tailed tests

Source: LAKES REU NOLs Survey 2016

For a one-unit increase in conservation importance to a NOL, we see a 15.43 increase in BMP Index score in Table D3, significant at the .01 level. For a one-unit increase in satisfaction working with the Land Conservation Division we see a 6.65 increase in BMP Index score in Table 3, significant at the .01 level. There is no statistically significant relationship between age and BMP Index. For political benefits from organizational involvement, we see that those who gain a political benefit from the organization in which they are active have a 14.40 higher BMP Index in Table D3, statistically significant at the .05 level. A one-unit increase in the NOL's

closeness in their relationship with the tenant leads to a 9.59 increase in BMP Index score in Table D4, significant at the .01 level. Finally, in Table D3, a one-unit increase in the NOL's frequency in visiting their farm site leads to a 2.62 decrease in BMP Index score, but this is not statistically significant. Women have a 12.46 lower BMP Index score than men, significant at the .05 level, in Table D3. This reflects the literature and reinforces the call to focus more attention on women NOLs (e.g. Petrzelka and Sorenson 2014). As a more thorough answer to RQ1, this regression model indicates that NOLs may prioritize conservation practices with their tenants due to their closeness with their tenant, if they identify as a man, being satisfied with Land Conservation Division, having higher conservation values, and having a higher level of political engagement in civil society, controlling for other variables in the model. To answer RQ2, women likely prioritize conservation practices on their land less than men NOLs or might feel less able to push for BMP usage with their tenants.

Figure 6: The Interaction Effect of NOL Residence and Gender on BMP Use on Farmland



However, the interaction effect between gender and whether the NOL resides in the watershed is the more meaningful relationship identified here in answering RQ2. In Table D3, we see that the effect on BMP Index from the interaction between gender and whether the NOL is a resident in the watershed is statistically significant at the .01 level. This is best represented visually in Figure D2, which shows the calculated predictions, holding all other variables in the model at their means, for each of the four possible categories of NOL. We find a decrease in

BMP Index score for men who reside in the watershed and a large increase in the BMP Index score for women who live in the watershed. This suggests we need to rethink how women and men interact with their farmland when they reside in the watershed. To do so, we turn to our qualitative data to help tease out what might be occurring.

Two important themes emerge from our qualitative data in further answering RQ2: 1) preservation of family and land among women NOLs, and 2) the dominance over nature and family by men. Regarding the first pattern, we heard from many women NOLs that the land they own and operate is a continuation of the family they cultivated throughout their adult lives (in some cases, their entire lives). They discussed how preserving their ownership of the land, even if they do not farm it themselves, continues their commitment to what their family has meant to them and their rural landscape. For example, a woman NOL, "Margaret," [6] discussed how this connection to the land means a preservation of her family and community:

> **Margaret:** What does the land mean to me? It means lots and lots and lots of wonderful memories raising my children and farming with my husband—and my kids! Because we worked at it together. Memories would be a lot of it…and I think sometimes I'm ready to sell it and I would sell it to [my son].
>
> **Interviewer:** So, when you think about your land, you really associate it a lot with your family and with those memories?
>
> **Margaret:** Yes, yep.
>
> **Interviewer:** And did you grow up on a farm too as well?
>
> **Margaret:** Yes, I did. Yes, I grew up on a farm, too. So that makes life. I'm even more intertwined with the farming aspect of it because we had cows and stuff too, so it wasn't at that time though as much crop farming as people are doing now...
>
> **Interviewer:** Can you tell me a little bit more about growing up on a farm? What was that like? Do you have any memories that you can share?
>
> **Margaret:** Oh, let's see. Well, my mom and dad were both on the farm and my mom worked out some to try to help the income because it wasn't…we didn't have a very big farm. We probably milked about thirty or forty cows. But, I certainly have wonderful, good memories of …a lot of things that people used to do—like, in the evening you'd go to someone else's house and maybe play cards or maybe make homemade ice cream or things like that, and people don't do that stuff anymore…It's sad.

[6]Interview participants are given pseudonyms here to maintain confidentiality.

Interviewer: What do you mean by that?

Margaret: It's sad, but people…you don't even hardly know your next-door neighbors anymore and that's just not healthy. And we raised a lot of our own food…And then my dad got really sick and he had rheumatoid arthritis and we had to move off the farm. Although, I was already married when they moved off the farm. So, all my life, I've been on a farm.

Margaret's comments illustrate how much men's health and labor are key to whether families farm their own land or not and that local social connections are integral to how NOLs connect to their land. Many NOLs discussed how central the man is to farming and ensuring the land is productive. This emphasis on dominating the landscape as the legitimate farmland decision-maker in the household, or as the man renting the land, was illustrated particularly by one NOL, "Rosanna:"

Rosanna: What does my land mean to me? ...Well, this is my husband's; his grandpa homesteaded it…So, we've just always been – his dad, his grandpa, his dad, and now us. But my husband has passed away [in 2003].

Interviewer: So how has the nature of your land usage change [sic] before 2003 and then after?

Rosanna: It hasn't changed. He [renter] does a very good job keeping that up. (pause) Very good land. (pause) Not hills, not sand, it's just good dirt.

Interviewer: Have things changed for you, like your role as the manager of the land, or the owner?

Rosanna: Oh, I have nothing to do with it. My renter takes care of everything.

In our interviews, many women NOLs seemed very knowledgeable about most aspects of the farming done on their land, and they took pride in being a partner with their husbands. However, it was also clear that even those who valued aspects of conservation like "organic farming" did not try to require such things from their men farming tenants or change the conditions of the rental agreements from what their husbands decided previously (with or without their wives' input). Most women NOLs interviewed also emphasized that they trusted the land would be farmed well enough to preserve its heritage. However, outside of having enough money come in to pay taxes, they did not feel much need to tell the man farmer what to do. This link between staying with their land and the decision-making resting in the hands of the man tenant can be illustrated through a brief response from "Janice:"

> **Interviewer:** So, as far as your land that you rent out, what exactly does it mean to you? What does the land really mean to you?
>
> **Janice:** Tell you what it means, honey, it pays most of our taxes…It wouldn't pay for me to move to town. Then you've got all that big taxes and no income! So, as long as we have a place to stay and I have the taxes pretty well covered, it couldn't get much better than that.

In sharp contrast to these women, men NOLs seem more committed to the idea of directly shaping the land they own when it is visible (i.e., they live in the watershed) and their local friends can see and talk to them about it, too. "Jerald," a farmer who works with NOLs (both men and women), emphasized how much it matters, particularly to men NOLs, that the land reflects positively on them by how it looks to the community:

> **Jerald:** They want the crops to look good out there. They want to feel good about them. They, I mean, they think about them in the same way that my employees—and if you talk to my employees—if you were at the bar and they were talking about—they would talk about *their* combine and *their* chopper and *their* tractor and *their* planter. Now, that's *not theirs*, but they take ownership in it. Same way with these landowners, when they have crops out there, they [say], "Boy, *we* got a really nice crop."

This illustrates how agricultural masculinity is conveyed in public spaces, especially among men (and often to the exclusion of women within the public discourse). For men NOLs, especially from man to man perhaps, farming practices are linked to their identity and status, and, based on their observations of farmland over the past 50 years, neat rows with bare exposed soil may look successful. How their land looks to others may be particularly important to resident men NOLs who continue to reside in the communities in which they have farmed for years. Women certainly have an identity and social status that they perform within the community vis-a-vis their agricultural land, but this paper suggests that it very likely is a different status and identity compared to men.

Discussion

Following Plumwood's (1994) observation that the logic of masculinity is driven by a logic of domination, we argue this logic of order and control underpins Robbins' (2007) analysis of U.S. lawn culture. If we keep our turfgrass looking green and orderly, then we are fulfilling our roles as citizens in our suburban spaces. The staggering amount of time and money that predominantly men spend keeping their lawns looking as "pristine" as their neighbors' demonstrates their manliness and ability to responsibly control the landscape (and by extension the household), at least in the eyes of his neighbors.

We extend this logic to suggest that the perfect rows of conventional agriculture also illustrate masculine, responsible citizenship. The seemingly disordered display of extra vegetation from cover crops and no-till (i.e., residue between rows) makes one, perhaps, seem an irresponsible farmer, landowner, man, or citizen. Choices to avoid conservation agriculture may have nothing to do with straight rows, *per se*, but rather the normative influences of conventional agriculture over the past 50 years. Like norms of lawn care, adherence to dominant norms of "good farming" in conventional agriculture are powerful and serve as a source of pride and community status. In the traditional farming households we studied, men were assumed to carry the burden of making day-to-day decisions about and doing most of the agricultural work, making it difficult for women to exercise control over how their land will be farmed by their tenants. Thus, women NOLs' greater interest in conservation did not always translate to more BMP use (as evidenced by their low BMP indexes overall). In addition, men's reputation in the community is likely to be more tied to their farming abilities and adherence to dominant community farming norms, making men NOLs who live near their land and check on it frequently less likely to buck community norms and insist on newer conservation farming techniques.

This impact of community norms is hardly new; counting on a shift in norms toward more benign landscapes, like no-till and cover crops, certainly carries with it a potential conspicuous consumption mentality of domination through image. For example, in a study of the expansion of xeriscape in the Southeast and Southwest United States, (Mustafa et al., 2010) showed that as more neighborhoods normalized xeriscapes over turfgrass lawns, a classed, elitist mentality of privilege was maintained through those more sustainable landscapes. This may mean the expansion of conservation agriculture may be constrained, like xeriscape, largely among those farmers who are wealthiest. However, a shift to more BMP use on the land carries less of the xeriscape elitism as in the primarily urban Southwestern United States and, instead, has great potential to lessen nutrient run-off and its environmental costs *as well as* economic costs for less wealthy farmers if given the appropriate social cultural support systems, like gender.

While patriarchal gender norms generally encourage more risk-taking from men (e.g. Courtenay 2006), this increased risk taking usually occurs in terms of individual health behaviors. When it comes to land, men may be encouraged to be cautious and committed to the status quo through many mechanisms of masculine gender norms in the agriculture industry, among farmers, and in other mechanisms of gender role socialization outside farming (e.g. Bell, Hullinger, and Brislen 2015). Risk, in the context of farming, is constrained by a need to uphold tradition and focus on the profitability of particular farming practices. Taking a risk on new practices brings with it farm fields that are less visibly controlled and neat, potentially undermining the system of controlling nature that has been demonstrably profitable and responsible in the past. Farmers (86% of whom are men), who overwhelmingly continue to utilize tillage and conventional

agriculture and openly criticize the un-masculine mentality behind conservation agriculture, further reinforce this aversion to new risks (Bell et al., 2015). To change these practices, the vision of agricultural success will need to change beyond conventional tillage. Taking a different vision of responsible farming will require a tenant or NOL to push the conversation toward new conservation agriculture techniques, working against traditional ideas of productivity. For many men NOLs who continue to live in the rural communities where they spent their lives as farmers, changing traditional practices towards conservation agriculture seems to be more challenging than it is for women.

We encourage future research that expands on the results offered here, especially that which examines the potential diversity of men NOLs' identities. It is possible that recent shifts in gender norms have impacted conservation agriculture use for a younger generation of farmers. They might have a different view of masculinity and a greater range of masculine behaviors to uphold which might include conservation as an important value. Perhaps the divide will be increasingly generational rather than gendered.

Our results also suggest that we have reasons to be optimistic about the future of all NOLs. Most literature on women NOLs illustrates the tremendous pay-off for soil health and water quality in empowering them to require more BMPs on their land through programs like Women Caring for the Land networks (see https://www.wfan.org/). We see the same trend here—when women NOLs check their sites more frequently or live in the watershed, they seem to be more engaged and more likely have BMPs on their land. At the same time, we must also recognize the need to empower men NOLs to see the land they own as important to cultivate for sustainable use through knowledge, resources, and other mechanisms that help them move beyond traditional norms that are less sustainable, as John Gaventa (1982) illustrated in his book on power and empowerment in rural Appalachia further explored elsewhere as needing to encapsulating economic, social, political, and cultural empowerment (Luttrell & Quiroz, n.d.). In practical applications, this empowerment can, according to our findings here, include working more with Land Conservation Divisions and one another, developing a close and collaborative relationship with their tenants, and seeing their engagement in local organizations as a civic and political act. These four variables were statistically significant when controlling for gender, resident status, age, and frequency in checking their land. Creating networks where men NOLs can move beyond their Row Person mentality may be as significant as women NOL networks. Certainly, NOLs across gender groups must see the benefits of conservation agriculture as a new social capital for citizenship and personhood for us to collectively approach sustainability goals for soil health and water quality.

APPENDIX E: FARMER NETWORKS IN RED CEDAR WATERSHED

Farmer decisions to transition to conservation agriculture is a central focus to improving the water quality in impaired rivers, lakes, and impoundments, and the Red Cedar Watershed is needing the same level of farmer transition to BMPs as well. There are a number of factors that influence the transition to conservation agriculture for farmers, including their access to information, their environmental values, their awareness of their land use and its effect on water quality, and their social networks (e.g. Campbell, Koontz, & Bonnell, 2011; Floress, Prokopy, & Allred, 2011; Lokhorst, van Dijk, Staats, van Dijk, & de Snoo, 2010; McGuire, Morton, & Cast, 2013; Prokopy, Floress, Klotthor-Weinkauf, & Baumgart-Getz, 2008). This report highlights some similar findings as previous studies in the Red Cedar Watershed with a particular emphasis on the relative of expanding social networks for farmers.

Farmers also identify that transition to BMPs for them must consider both their conservation values and their overall productivity (Coughenour, 2003; Jussaume & Glenna, 2009; G. Roesch-McNally et al., 2017; G. E. Roesch-McNally, Gordon Arbuckle, et al., 2017; Thompson et al., 2015). Stewardship of the environment is important for BMP expansion beyond just their business attitude (Thompson et al., 2015). Activating those conservationist identities among farmers happens through performance based environmental management practices (McGuire et al., 2013; G. E. Roesch-McNally, Basche, et al., 2017; Thompson et al., 2015). For farmers, empiricism is prioritized over rationalization, and they prefer seeing the impacts BMPs have, especially in concert with other farmers (Dunne et al., 2015; Wood et al., 2014). As such, local relationships among farmers are necessary for sustainable agriculture, much more importantly than compared to conventional agricultural production (Carolan, 2005; Jussaume & Glenna, 2009; M. Lubell & Fulton, 2007; Wood et al., 2014). This reinforces the need to build social networks of farmers.

First, social network theory suggests that “birds of a feather flock together”, a term called “homophily” (McPherson et al., 2001; Smith et al., 2014). However, connections change as different homophilical networks interact with one another (McPherson et al., 2001; Rand et al., 2011). For farmers, as with most people, trust and mutual knowledge exchange is essential for changing behaviors (Baumgart-Getz et al., 2012; Carolan, 2005; Jussaume & Glenna, 2009; G. E. Roesch-McNally, Basche, et al., 2017; Wood et al., 2014), and support networks to farmers’ typical homophilical connections can help increase the BMP transitions (Carolan, 2006; Coughenour, 2003). In fact, expanding the weak ties among smaller scale farmers through more diverse social networks allows information about sustainable farming to be conveyed, even though the strong ties need to also exist for trustworthiness in implementation (this is true in both Kenya and in the United States according to Nelson, Brummel, Jordan, & Manson, 2014; Thuo et al., 2013). Networks that connect communities and municipalities, not just individuals, are

particularly important for watershed improvements, especially for agricultural communities compared to less isolated tourism communities (Church & Prokopy, 2017; Rathwell & Peterson, 2012).

Networks can fall apart in if they grow too diverse, or they could be limited in causing transitions to BMPs in the homogenization of information from less diverse networks (Bodin & Crona, 2009; Rand et al., 2011). These networks for building better conservation implementation also require public sector initiatives and agents that focus on building such networks, and such initiatives are subject to budget cuts and reallocation of funding (M. Lubell & Fulton, 2007; Mark Lubell, n.d.; G. E. Roesch-McNally, Basche, et al., 2017). These initiatives can further make farmers feel alienated from decision making and vertical knowledge structures if not properly funded or structured (Hoang et al., 2006; M. Lubell & Fulton, 2007), thus reinforcing the commodity chain constraints on a global level for conventionally farmed row crops with limited flexibility for farmers (Bartels et al., 2013; G. E. Roesch-McNally, Gordon Arbuckle, et al., 2017). Making sure farmers have diverse information that is empirically verifiable by them, at least enough to work outside larger global commodity chains, requires asking the question about avenues for farmers to increase their conservation knowledge, values, and resource base. This research attempts to answer the question of how effective social networks and knowledge systems could be for farmers' expansion of conservation agriculture use in the Red Cedar Basin.

Measures

Participants were recruited by obtaining a list of landowners from the Dunn County Land Conservation office and cross-referencing land usage with the Dunn County Platt Book, and surveys were mailed to 777 active farmers in the watershed. In-person delivery was chosen as the secondary method of distribution to allow researchers to develop a connection with farmers and provide an opportunity for interviews. In total, there were 321 nodes (survey participants or those identified by participants as their trusted sources of farming information) within the final social network graph. Out of 777 active farmers in the watershed, we received 180 responses between 2014-2017, a response rate of 23%. Utilizing a computational social network analysis with the open source software KUMU, we explored the relationship between the amount of BMPs used and the influence of a farmer's social network in terms of types of people they trust (or who trust them) and the amount of people they trust (or trust them).

For our dependent variable, we created a BMP Index to assess the level of conservation agriculture occurring in the farmer's production, based on self-report.[7] Items in the BMP Index

[7]Without geocoded data of actual BMP use for each farmer's land, we were left to self-reporting on surveys, which carries with it limitations of validity, but, we believe, no more than typical issues of validity found in survey instruments.

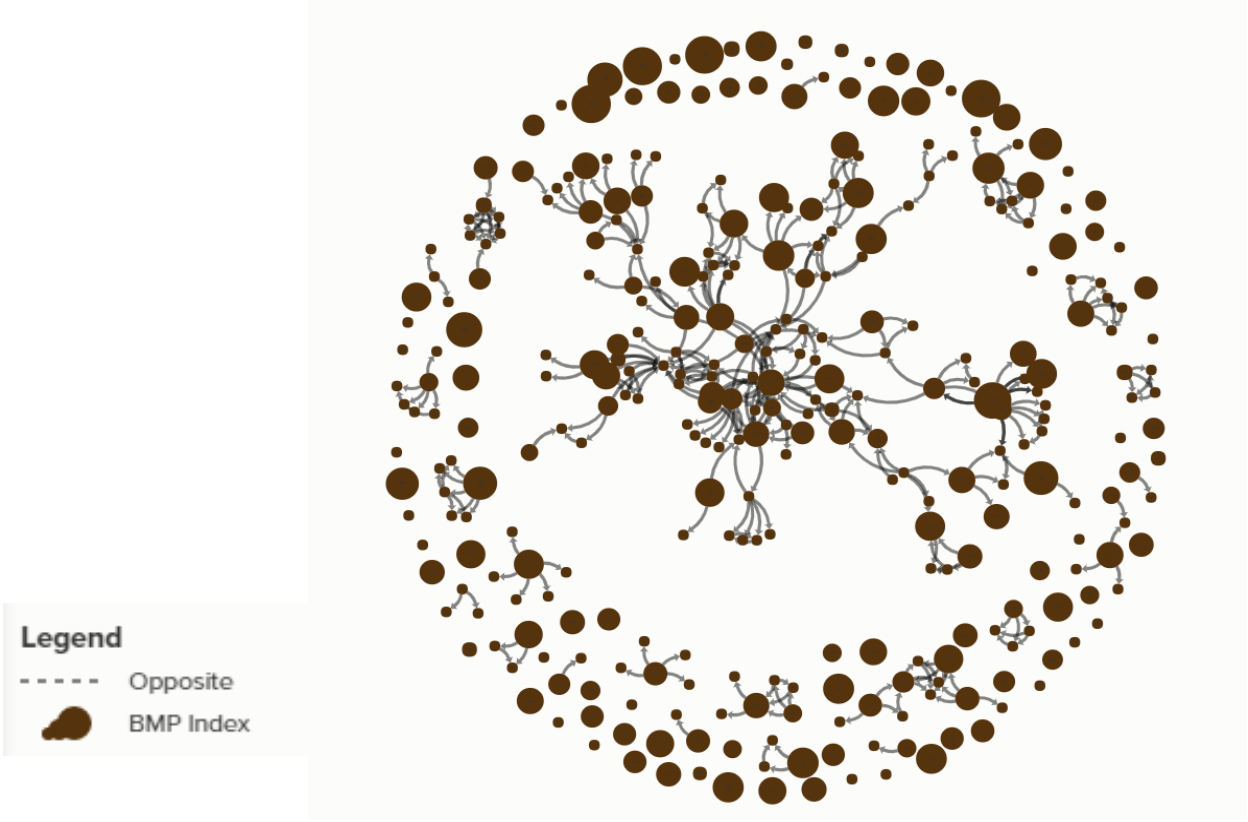
included grass waterways, fencing off livestock from streams, no-till or strip-till, midfield buffers, manure management, barnyard runoff management systems, cover crops, riparian buffers, and nutrient management plans. We asked farmers how many BMPs occur on their farmland and included a range from "no use," "a few areas," "most areas," and "extensive use" for each BMP item. The BMP Index is the measure of BMPs used on a farmer's land, given the type of farming that occurs there (i.e. livestock and/or row crops). Those who reported no use of BMPs were those who could use BMPs consistent with their type of farming but instead use none.[8] All other BMP Index numbers reflect the percentage they do use compared to what they could use (e.g. a BMP score of 55 indicates that they use 55% of the BMPs they could use on their farmland). 88% of the farmers surveyed reported use of at least some BMPs, and on average farmers use about 25% of possible BMPs on their land.[9]

Our independent variables included age, gross farm sales (1 = Less than $50K, 2 = $50K-$100K, 3 = $100K-$250K, 4 = $250K-$500K, 5 = $500K+), how important conserving natural resources is for human use (1 = Not important, 2 = Slightly important, 3 = Moderately important, 4 = Extremely important), whether or not they are active farmer or a non-operating landowner or NOL (self-reported, 0 = farmer, 1 = NOL), if they have interest in or have attended a conservation agriculture conference (0 = No interest, 1 = Some interest or experience), if they are connected to someone in the Red Cedar Basin (0 = No, 1 = Yes, determined by GIS mapping of their physical mailing address, if provided), and number of connections in the network (i.e. number of people who a farmer trusts and/or trusts them for farming advice, measured as self-disclosed). In order to arrive at connections, we asked farmers to list up to five people they trust for farming advice, along with some identifying information like address (so we could verify which "John Smith" they trust, in case there is more than one in the overall network). While there were certainly some reciprocal relationships (e.g. John Smith and Jane Smith both identify each other as people they trust), we did not analyze any reciprocity in the results presented here. The overall network of connections for the Red Cedar Basin farmers is displayed in Figure 1. Where the size of the circle is larger if they have a larger BMP Index score. All results are reported in aggregate, and all identities are kept confidential according to OHRP guidelines. Finally, we asked whether the respondent had ever attended a conservation agriculture conference and/or has interest in attending one it the future.

[8]Without specific data about the parcels of land survey respondents were discussing, it is impossible to conclusively state whether "no use" means that the farmer does not use practices that could be used or that a BMP that is possible for their type of farming is not used because it would be inappropriate for their land. For example, a farmer with a corn and soybean rotation might not use mid-field contours because of lack of knowledge or interest in doing so, or they might not use it because their parcel is flat, and a contour is not necessary. Thus, the BMP index might not capture some nuance, but it is a helpful measure, nonetheless.

[9]It may be that the farmer is enrolled in one or more programs that incentivizes BMP use. We asked if the farmer claimed DATCP Farmland Preservation Tax Credit, which was not a significant predictor and left out of the regression models to limit the degrees of freedom in those models.

Figure 7: Social Network Map of Farmers in Red Cedar Basin



Results

Means, standard deviations, minimums, and maximums for the dependent variable and all non-binary independent variables are provided in Table E1. On average, 31% of farmers believe it is moderately important and 27% of farmers believe it is extremely important to value natural resource conservation for human use. 42% reported having interest or experience in attending a conservation agriculture conference. 83% of farmers were active farmers who did not merely rent their farmland out to others. Average farm sales were between $50K and $250K. 46% of farmers had an identified connection to someone in the Red Cedar Watershed. The average number of identified connections in the network was two other people and average age was 59.

Table E1: Means, Standard Deviation, Minimum, and Maximum

Variable	Obs	Mean	Standard Deviation	Min	Max
BMP Index	234	25.02	24.51	0	85.19
Value natural resource conservation for human use	159	3.77	0.95	1	5
Gross farm sales	123	2.85	1.36	1	5
Age	132	59.24	12.89	0	85
Interest/experience in conservation ag conference	151	0.66	0.76	0	2
Number of connections in network (degree)	321	2.2	2.52	0	24

We see statistically significant, positive correlations between BMP Index and gross farm sales, owner's conservation values, and interest in conservation agriculture conference. as shown in Table E2. There is a significant negative correlation between BMP Index and if the farmer is connected to someone in the Red Cedar Basin. These correlations are explored further in our regression models.

Table E2: Correlations for BMP Index and Independent Variables from Regression Models

Correlations for BMP Index and Independent Variables from Regression Models								
		Gross Farm Sales	Age	NOL	Conservation Value for Human Use	Interest in Conservation Agriculture Conference	Degree	Connected to Someone in RCB
BMP Index	Pearson Correlation	0.25***	-0.02	0.01	0.15*	0.31***	0.02	-0.24***
	Sig. (2-tailed)	0.01	0.82	0.95	0.08	0.001	0.82	0.001
	n	115	121	226	145	137	234	226

*Correlation is significant at the 0.10 level (2-tailed).

**Correlation is significant at the 0.05 level (2-tailed).

***Correlation is significant at the 0.01 level (2-tailed).

We created a regression model to single out the interactive effects of connections with interest in conservation agriculture conferences on BMP use. To maintain the predictive capabilities of fitting within the 0% to 100% spectrum of BMP use, we conducted a Tobit regression to examine the relationship between a non-negative dependent variable and independent variables. These are presented in Table E4. Since an R^2 for Tobit is less meaningful, we also ran an OLS regression model to provide corresponding coefficients and an R^2 (see Table E3). R^2 for the model in Table E3 is .40, explaining 40% of the variation in BMP Index levels (the associated F-test suggests this is significant at all alpha levels).

Table E3 Regression statistics for effects of conservation value gross farm sales, NOL vs. farmer status, age, if farmer is connected to someone in Red Cedar Basin in network, level of interest or experience in Conservation agriculture conference, number of connections in network ("degree"), and interaction between degree and conservation ag conference interest on BMP Index

	1	2
Value conservation for human use	5.87***	6.86***
Gross Farm Sales	3.55**	3.55**
[1]NOL	-15.41**	-14.89**
Age	-0.13	-0.10
[2]Connected to someone in RCB	-12.33**	-15.29***
Interest in Conservation Ag Conference	6.80**	11.05***
Number of connections in network	2.99**	5.31**
Interaction of Degree/Ag Conference		-2.07**
R^2	0.36	0.40
df	7	8
N	89	89

[1]Reference group: Active Farmer

[2]Reference group: Not connected to someone in Red Cedar Basin

*p<.10; **p<.05; ***p<.01, two tailed tests

Source: LAKES REU Farmer Survey 2014-2017

For a one-unit increase in conservation importance to a farmer, we see a 7.81 increase in BMP Index score in Table E4, significant at the .01 level. For a one-unit increase in gross farm sales we see a 3.90 increase in BMP Index score in Table E4, significant at the .01 level. There is no statistically significant relationship between age and BMP Index. We predict NOLs would have an 18.64 lower BMP Index score compared to active farmers in Table 4, significant at the .01 level. Those connected to someone in the Red Cedar Basin we predict have a 17.12 lower BMP Index score than those who trust nobody in the Red Cedar Basin for farming advice, significant at the .01 level, in Table E4. We predict those with interest or experience in attending a conservation agriculture conference would have a 12.21 higher BMP Index score compared to those with no interest or experience in Table E4, significant at the .01 level. For each additional person a farmer is connected to in this network, we predict a 5.97 increase in BMP Index score in Table E4, significant at the .01 level.

Table E4: Tobit regression coefficients for independent variables on BMP Index

	BMP Index
Value conservation for human use	7.81***
Gross Farm Sales	3.90**
[1]NOL	-18.64***
Age	-0.15
[2]Connected to someone in RCB	-17.12***
Interest in Conservation Ag Conference	12.21***
Number of connections in network	5.97***
Interaction of Degree/Ed Conference	-2.31**
Uncensored observations	78

[1]Reference group: Active Farmer

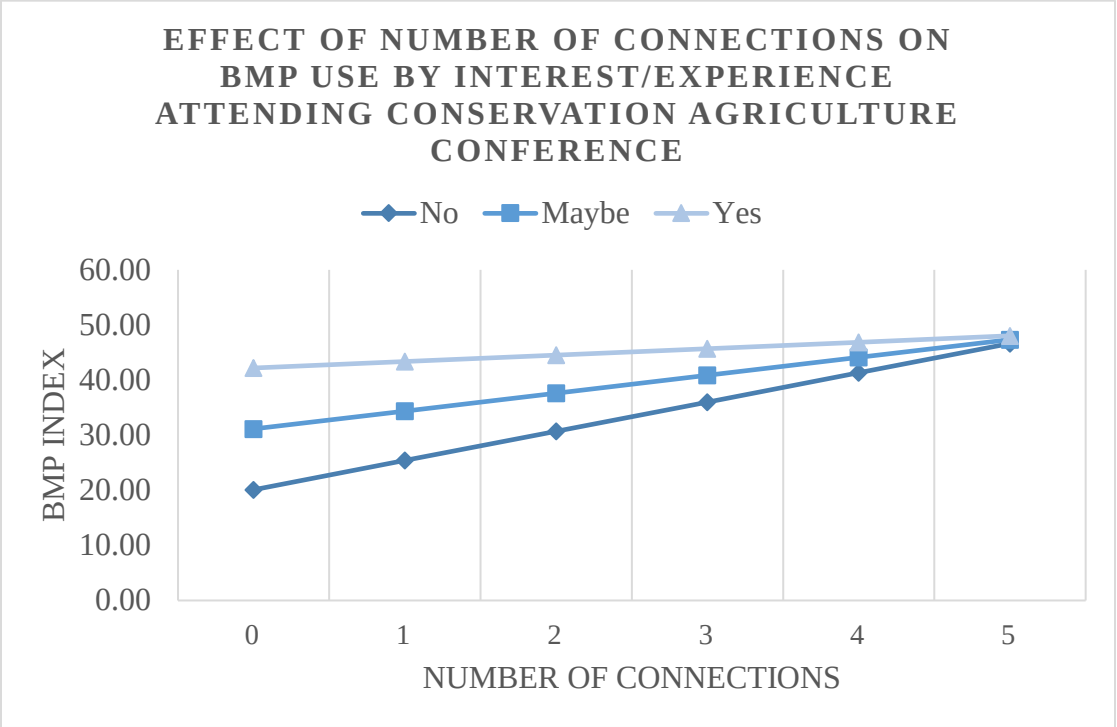
[2]Reference group: Not connected to someone in RCB

*p<.10; **p<.05; ***p<.01, two tailed tests

Source: LAKES REU Farmer Survey 2014-2017

The interaction effect between number of connections and interest/experience in attending conservation agriculture conference is a particularly meaningful relationship identified here. In Table E4, we see that the effect on BMP Index from the interaction between number of connections and interest/experience in attending conservation agriculture conference is statistically significant at the .05 level. This is best represented visually in Figure E2, which shows the calculated predictions, holding all other variables in the model at their means. We find an increase in BMP Index score for farmers as they have more connections in the network, to the point that we predict they reach the same BMP Index score as those farmers with actual interest and experience in conservation agriculture education. This suggests the gains from attending a conservation agriculture conference could come from a larger number of connections in the overall network in the Red Cedar Basin (or vice versa).

Figure 8: The interaction effect of number of connections and interest/experience in attending conservation agriculture conference on BMP Index score



Discussion

Several rather straightforward conclusions and recommendations can be taken from these findings. Farmers' connections are consequential for their adoption of Best Management Practices. Attending conservation agriculture conferences also increases their BMP use. Getting farmers connected to more people in a given watershed's network increases BMP use. Number of connections can even offset the gains from conference interest/experience. However, connections *in* the Red Cedar watershed likely constrain BMP use. This suggests that knowledge gained from more people in a network matters; however, we must be careful about in-group orientation and groupthink.

To increase BMP adoption, it is crucial for farmers to be socially connected to build trust and share knowledge surrounding conservation agriculture. Encouraging farmers to transition from conventional to conservation agriculture is not just a matter of making it financially feasible or increasing equipment access. Instead, it is perhaps most important for farmers to receive BMP information from people that they trust. Integrating farmers with one another and with government agencies and farmer-led organizations is likely the best method for expanding conservation agriculture in the Red Cedar Basin, which may offer implications for other watersheds.

APPENDIX F: AN HEDONIC PRICING ANALYSIS OF WATER QUALITY VALUATION

I. Introduction and literature review

Water quality impacts local economies in numerous ways, but perhaps the most directly measurable is seen in real estate values of lakeshore property and housing, particularly those with access to water-based recreation. An increasing body of literature has developed in the last 15-20 years utilizing hedonic modeling attempts to put a precise dollar figure on housing value of water quality.

Valuation of natural resources is notoriously difficult, as these are typically not goods or services traded in traditional markets. Approaches to quantify values of water, in particular, have typically fallen into two methodological categories: behavioral (revealed preference) and attitudinal (stated preference). See Mendelsohn and Olmstead (2009) for an overview of these approaches, which include natural experiments, contingent valuation, travel cost estimation, averting behavior models, and hedonic pricing.

The basic premise of hedonic price models was laid out by Grillches (1971) and Rosen (1974) and is a very simple revealed preference approach: if one were able to theoretically drop two identical pre-fabricated houses onto two different lots of identical size, one on a lake, and one several miles away in a field but otherwise the same in every way (same school district, same proximity to job centers, retail outlets, etc) then it stands to reason that any variation in the market price of the two houses should represent the implicit value of the amenities associated with living on a lake. Thus, if the house on the lake sells for $25,000 more than landlocked house, then the implicit market valuation of living on a lake must be $25,000. Similarly, if we conducted the same thought experiment with two identical houses on a pristine and a degraded lake, then the difference in value should represent the implicit value of the water quality itself. It is a combination of these approaches which we undertake in our study.

Hedonic analysis of water quality effects on lakefront properties has been conducted previously in several key studies, dating back to, among others, Epp and Al-Ani (1979), who studied the effects of stream pH levels on adjacent property values, Wilman (1984) who looked at vacation rental price impacts of beach pollution, Young and Teti (1984) who compared lakefront housing values inside and outside a polluted bay location in Vermont, and a study of fecal coliform bacteria issues in the Chesapeake Bay by Leggett & Bockstael (1999). Significant works have similarly applied hedonic methods to other household characteristics, including Freeman's (1978) seminal work on air quality effects.

More recently two studies in Maine (Boyle, Poor, & Taylor (1999) and Michael, Boyle, & Bouchard (2000)) and Gibbs et al (2002) New Hampshire, explored the effects of eutrophication on property values, using alternative measures of water quality. While our approach is similar in

methodology to those of previous authors, variations in market structures and amenities in the upper Midwest compared to other regions make for unique differences that require additional study.

One of the advantages of our particular study area is that the bulk of the environmental pollutants affecting water quality for an individual household flow into the lakes from many miles upstream, sometimes several counties away, meaning that other potential omitted variables related to "bad neighbor" effects from industrial polluters are unlikely to be present here, and we can measure the impact of the water quality itself. In addition, one key difference of our study is that our research has closely followed a watershed which has been seen as a potential demonstration area for successful implementation of EPA Total Daily Maximum Load (TMDL) plans for phosphorus pollution mitigation. The unique mix of active partnerships with local lake associations and lake districts, supportive municipalities and county land and water divisions, Wisconsin Department of Natural Resources, Army Corps of Engineers, and University of Wisconsin researchers through local campuses and Extension offices have resulted in a watershed with a progressive focus on improving water quality, and an emphasis on data driven planning and citizen engagement.

II. Background and Model:

Increasingly, water quality degradation in the Midwest, and elsewhere nationally and internationally, is impacting human health and quality of life. In Wisconsin in particular, this degradation is typically caused by eutrophication induced by excessive levels of phosphorus pollution.

When phosphorus enters lakes and streams, photosynthetic organisms such as algae and bacteria flourish. Even a relatively small amounts of phosphorus pollution can trigger dramatic algae growth: a single pound of phosphorus can feed the growth of over 500 pounds of algae. Throughout Wisconsin, and the Red Cedar Watershed, blooms of blue-green algae, or cyanobacteria, limit recreation and lead to overpowering stench during peak summer months. Of the waterbodies listed as impaired by the Department of Natural Resources, 99 percent of reservoirs and 91 percent of freshwater lakes had blue-green algae as the cause of the recreation-related impairment. Exposure to blue-green algae can lead to a variety of health consequences, including stomach cramps, vomiting, diarrhea, difficulty breathing, fever and muscle weakness. Blue-green algae also presents a threat to dogs, causing illness or death if they are exposed to water with high levels of microcystin toxin.

This problem is particularly severe at the bottom of the Red Cedar Watershed, a large river basin that drains a 1,893 square-mile portion of the Northwoods region of western Wisconsin, encompassing portions of 8 counties. (See figure 1.1 below for a map of the watershed). While the northern portions of the watershed are primarily forest land, the remaining land is largely

agricultural land which has been in heavy row-crop rotation for decades (see figure 1.2). The increased phosphorus has multiple sources, however there is substantial evidence that agricultural runoff is the largest contributor. The polluters are therefore diffused throughout the watershed while those suffering from the effects of the algae blooms are geographically concentrated. The wide variety of jurisdictions and stakeholders has made progress toward improving water quality challenging over the years.

This study looks specifically at housing in three distinct areas of the watershed, chosen for their economic significance, population levels, and variation in water quality. In addition, each has several different bodies of water which allows for further variation and solves one of our identification issues in the hedonic model. Lakes were thus grouped into markets based on proximity and economic activity, unified by employment, shopping, dining, and recreation.

2.1 Menomonie area:

At the distal end of the watershed in Dunn County lies the county seat, Menomonie, WI. It is home to a population of a bit under 20,000 as well as roughly 10,000 students at the University of Wisconsin-Stout. The city began its history as home of the Knapp, Stout, and Company, Co., which was at one point in the 1800's the largest lumber operation in the world. It was for this purpose that the Red Cedar River was first dammed to become a lumber holding pond, and yielded Lake Menomin, a man-made impoundment and reservoir of just over 1000 acres. The city center is located overlooking the south shore of the lake. Just north of Menomonie is a second reservoir, Tainter Lake, which is 1600 acres and has numerous residential properties.

While both lakes are perfectly situated for tourism and recreation potential, both are highly eutrophic and have some of the worst water quality and severest cyanobacteria blooms in Wisconsin.

2.2 Chetek Area

40 miles north of Menomonie is Chetek, WI in Barron County. Chetek is significantly smaller, with just 2,200 residents however it has a thriving summer tourism market attracting visitors largely from Minneapolis, Madison, and Chicago. The area is well known for its excellent fishing and relaxed small-town Wisconsin resort community feel.

The Chetek Chain of Lakes—Prairie Lake, Mud Lake, Pokegama Lake, Lake Chetek and Ten Mile Lake, in Barron County have traditionally had better water quality than Lakes Tainter and Menomin, rarely experiencing severe algal blooms. In recent years, however, the Chetek Chain has experienced water quality deterioration. The lakes in the Chain contain increasingly high levels of phosphorus, which supports growth of both algae and invasive species such as curlyleaf pondweed. This growth can deprive fish of oxygen and places the recreational lifeblood of a largely tourist-

based economy at risk. Previous studies of water transparency show that all the lakes became much cloudier from 1996 to 2008 and this trend continues today. This is representative of an area at a tipping point on the eutrophication scale.

II.3 Cumberland

30 minutes northwest of Chetek is Cumberland, WI – sometimes referred to as the "island city" as the main city center is on land surrounded by Beaver Dam Lake. Cumberland is in many ways similar to Chetek with a population of roughly 2200 and a number of different lakes making up an extended area of housing and rental vacation properties. Situated toward the north end of the watershed, most of the lakes in the Cumberland area have good water quality, are generally not eutrophic, and are far less prone to problematic algal blooms.

III. Methodology, Model Specification & Data:

As in Freeman (1993) and subsequent studies, we use cross-sectional data on lakefront property sales. Because changes in water quality and levels of eutrophication from year to year are very gradual and repeated sales were very rare in our sample, a panel approach was not possible. Following the established literature of hedonic pricing approaches to environmental valuation, the general form of our hedonic pricing equation is given by:

$$HP = f(E, S, L) \quad (1)$$

where HP = home price, E = environmental characteristics related to the water quality, S = structural characteristics of the property, and L = locational characteristics. Detailed descriptions of the variables included in each category, and summary statistics are outlined below.

3.1 Measuring Lake Water Quality:

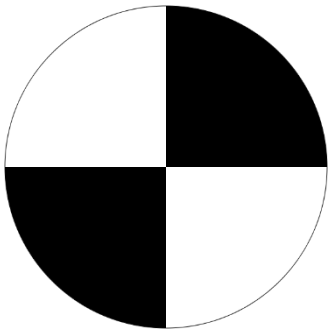
There are several methods to measure the water quality in a lake. They include:

1. Water clarity
2. Concentration of chlorophyll-A as a determination of algal biomass
3. The frequency, or number of times an algal bloom occurs
4. The algal toxins present during a bloom
5. The number, variety and type of rooted aquatic plants present
6. Dissolved oxygen levels
7. The pH of the water

While there are more scientifically sophisticated measures which we also explored, our primary approach was the first, water clarity, as measured by secchi depth. Secchi depth measurements are quite straightforward to do, and can be easily done by trained volunteers, making them a popular choice for understaffed natural resource and conservation offices and allowing data on these

measurements to be more readily and frequently available. Secchi depth is, in essence, a measurement of water transparency - the number of feet a Secchi disc can be lowered into the lake while remaining visible at the surface. The Secchi disc, named after its 1865 creator Angelo Secchi, is (in its freshwater-modified modern form) an 8-inch black and white disc that is lowered into a body of water on a chain or rope. The disc is quartered with alternating black and white pie wedges, and a depth measurement is recorded when the observer can no longer differentiate between the black and white quarters from the surface.[10]

Figure 9: Secchi Disc



Because water clarity is the most readily observable measure of quality by owners and potential buyers of waterfront property, this is likely the best proxy for housing value effects. In addition, there is a very high correlation between calculations of a lake's Trophic State Index and its Secchi depth, Total Phosphorus concentration, or Chlorophyll-A levels, two other measures that more directly correspond to algal bloom levels. The figure below shows an example of the three alternative measures in Menomonie's Lake Menomin over time. Because summer months are the time when sunlight and warm temperatures lead to algal growth and the highest eutrophication levels, this was the portion of the available date used to measure peak eutrophic states for each lake.

[10] The Secchi disk readings have some degree of potential for inconsistencies, as there can be based on individual technique, eyesight, glare, etc., however, it is an inexpensive and straightforward method of measuring water clarity. Best practices to minimize variations are to always take a measurement off the shady side of a boat or dock between 9 am and 3 pm. The same observer should take Secchi depth measurements in the same manner every time. One can approach the measurement by lowering the disk beyond a point of disappearance, then raising it and lowering it slightly to set the Secchi depth.

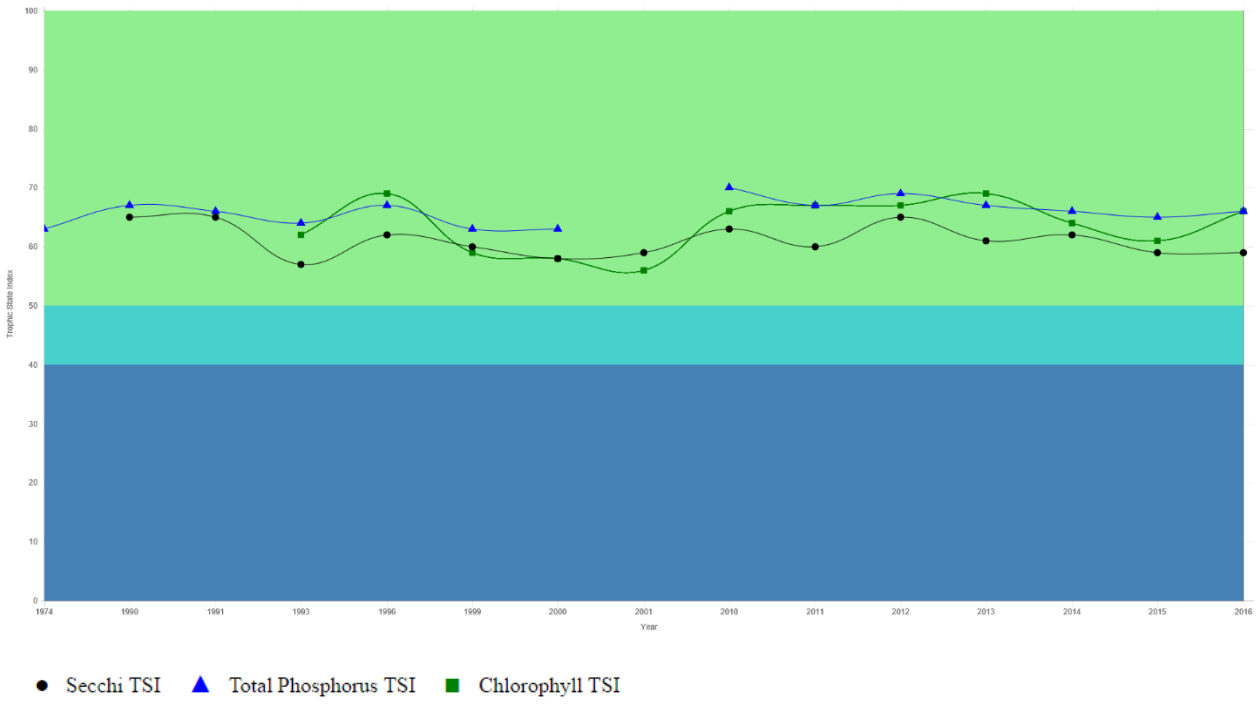


Figure 10: Trophic State Index (TSI) measurements for Lake Menomin over time

Oligotrophic, Mesotrophic, and Eutrophic Classifications

A lake's trophic state index (TSI) score determines categorization as oligotrophic, mesotrophic, eutrophic, or hypereutrophic. While lakes can naturally fall into the former three categories, lakes become hypereutrophic only as a result of nutrient enrichment due to human involvement.

Oligotrophic lakes are generally very clear, deep, and cold. Nutrient levels are low, so the lake generally does not support large populations of aquatic plants, animals, or algae. The fish that occur in oligotrophic lakes are often low in abundance, but large in size. *Mesotrophic* lakes contain moderate amounts of nutrients, and contain healthy, diverse populations of aquatic plants, algae, and fish. Occasional algae blooms may occur. *Eutrophic* lakes are high in nutrients and contain large populations of aquatic plants, algae, and fish. The aquatic plants and algae often grow to nuisance levels, and the fish species are generally tolerant of warm temperatures and low oxygen conditions. Common fish species include carp, bullheads, and bluegills. *Hyper-eutrophic* lakes are very high in nutrients, and often exhibit large algae blooms, which may include dangerous levels of blue-green algae. Fish communities in hyper-eutrophic lakes are dominated by carp and other species that can tolerate warm temperatures and low oxygen conditions. Most hypereutrophic lakes are small impoundments of streams and fed by large watersheds composed of urban or agricultural land uses.

Water quality data in this study came from the Wisconsin Department of Natural Resources public database reports on lake quality (WDNR 2016). For most water bodies in our sample, multiple observations - both across time and at different points within the lake- were available. While one might not expect water quality to differ dramatically within a given lake, because of wind directions, water flow channels, bays and inlets, and varying depths there can actually be quite a bit of variation even within a relatively small lake. Because of this, every attempt was made to use GIS mapping to assign a given parcel of real estate its most accurate water quality value.

However, data is spotty in many cases and not all measurements are made in all locations in all years. At its most complete, the WDNR data includes the following information:

Table F1: Lake Water Quality data

Location	**Lake name**
Sub-Location	Sub-location within lake
StationID	Station ID for sub-location
Date	Date of observed reading
Coordinates	Spatial coordinates used for GIS mapping
SD(ft)	Secchi Depth in feet; This is a measurement of water transparency - the number of feet a Secchi Disc can be lowered into the lake while remaining visible at the surface; "hit bottom" is noted if the disc is still visible on the bottom
CHL	Chlorophyll-A concentration; This is measurement of the concentration of algae in the upper layer of the lake
TP	Total Phosphorus concentration; the total amount of phosphorus that can be measured in a water sample by the State Lab of Hygiene
TSI (SD)	Trophic State Index score based on Secchi Depth; A higher water transparency value results in a lower TSI score
TSI (CHL)	Trophic State Index score based on Chlorophyll concentration; A higher chlorophyll concentration results in a higher TSI score
TSI (TP)	Trophic State Index score based on total phosphorus; A higher TP value results in a higher TSI
Lake Level	Lake level is noted as "high", "normal", or "low"
Clarity	Indicator variable that can be either "Clear" if the water appears to be mostly free of algae and other suspended particles or "Murky" otherwise
Color	One of five color choices is noted as "blue", "green", "brown", "red", or "yellow"; The color of a lake's water can be influenced by algae, suspended particles, or dissolved compounds. Green water indicates a large presence of green algae. Yellow or brown colors are caused by dissolved organic compounds that are released from decaying organic matter. Red color can be caused by certain kinds of algae or other microorganisms, or by dissolved iron in the water. Relatively pure water typically contains low concentrations of algae, suspended particles, or dissolved compounds. It appears blue because of two primary reasons. First, the other wavelengths (colors) of light are absorbed first in a lake, allowing a higher relative percentage of blue light to be reflected back to a person's eye. The deeper the water is, the more pronounced this effect becomes. Secondly, lakes appear bluer on sunny days, because the color of the blue sky is reflected off of the lake's surface.
Perception	This describes the volunteer's opinion of the lake's aesthetic quality on the day of monitoring. It ranges from 1 ("beautiful, could not be nicer") to 5 ("swimming and aesthetic enjoyment of lake substantially reduced because of algae levels").

Table F2: Lakes and observation sub-locations included in the sample

	Lake	Sub-location	Station ID#
Menomonie	Lake Menomin	Deep Hole	173121
	Lake Menomin	Near Wolske Bay	10031500
	Lake Menomin	Site 1 S Basin Deep Hole	173228
	Tainter Lake	East Lobe of Hay River Bay	10033688
	Tainter Lake	Middle Basin - Site 2	173215
	Tainter Lake	Tainter Lake - North Basin - Site 1 /Middle Of Red Cedar Lobe	173214
	Tainter Lake	South Basin - Site 3 /South Bay	173216
Chetek Chain	Bass Lake	(T33R10wS34) - Deep Hole	33182
	Tenmile Lake	N of Cty Park	33152
	Chetek Lake	Deep Hole	33120
	Prairie Lake	Deep Hole	33149
	Prairie Lake	Near South End	33144
	Prairie Lake	Long Bridge Bay	10031994
	Prairie Lake	North Basin	10031995
	Mud	Deep Hole-Nr. Center of S Basin	33150
	Pokegama	Deep Hole- SE of Island	33151
Cumberland	Beaver Dam Lake	Cemetary Bay	33137
	Beaver Dam Lake	Library Bay	33134
	Beaver Dam Lake	NE of Eagle Pt At Deepest Section	33131
	Beaver Dam Lake	Norwegian Bay	33135
	Beaver Dam Lake	Nw End Deepest Pt	33131
	Beaver Dam Lake	P O Access Bay	33133
	Beaver Dam Lake	W of Eagle Pt	33132
	Little Sand	Deepest Hole	33241
	Silver Lake	Deep Hole	33100
	Lower Spirit	Deep Hole	10021469
	Little Dummy	Deep Hole	33184
	Sand Lake	Central Basin	10030738
	Sand Lake	Near Deepest Pt	33143
	Sand Lake	North Basin	10030739
	Sand Lake	Outlet	10034773
	Sand Lake	W Trib at Silo Bay	10034770
	Granite Lake	South Basin	10022808
	Kirby	Deep Hole	33160
	Lower Vermillion Lake	Deep Hole	33185
	Big Dummy Lake	Deep Hole	33171
	Largon	Deep Hole	493142
	Spring Lake	Deep Hole	33172

3.2 Housing data:

We collected data on 464 recently sold houses in Menomonie, Chetek, and Cumberland over a 2-year period from mid-2014 to mid-2016 from a variety of sources including GIS layers, real estate websites, Department of National Resources lake quality assessments, and local Dunn and Barron county tax records. Both lakefront and non-lakefront properties were represented in each of the three regions.

Individual real estate data provided several characteristics about each property including the age of the house, number of bedrooms, number of bathrooms, square footage, number of stories, presence of a fireplace, garage size, acreage, lake frontage, and location. Descriptive statistics for each of these is provided in Table 3 below. In general, data was complete, however at times missing information was filled in using observations from pictures in home listings, satellite imagery, google street-view pictures, or even direct observations in person. Housing quality is inherently plagued with unobservable characteristics and idiosyncratic differences however every effort was made to code the included variables consistently.

In principle, all variables representing characteristics relevant to utility of buyers or cost to sellers should be included in our model. However, data limitations and individual preference idiosyncrasies make this impractical. At one point in our data collection we attempted to include additional information such as "recent kitchen remodel" but we were unable to accomplish this with the data available to us in a consistent way, so these additional variables were omitted. To the extent that additional attractive home amenities are systematically omitted, our results may somewhat overestimate the water quality values. It is not clear, however, that omitting positive amenities is any more likely than omitting negative amenities and so we have operated under the assumption that such unobservables are normally distributed in our sample. Furthermore, many desirable and undesirable household characteristics are highly correlated (a house with new granite countertops is also likely to have a remodeled bathroom; a house with flooring in poor condition is also likely to have an aging roof or furnace, etc.), so we believe the potential bias from misspecification of the housing characteristics is likely to be small relative to the far less correlated water quality inputs.

Table F3: Names and Descriptions of Variables used in Lake Water Quality Model

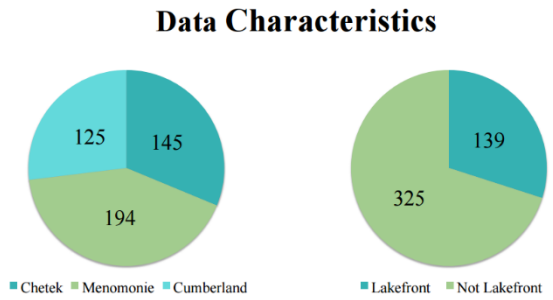
Variable Name	Description	Anticipated Effect
Dependent Variable		
$ Sale Price	Selling price of the house, nominal dollars	
Housing Structural Variables		
Bedrooms	Number of bedrooms	Positive
Bathrooms	Number of bathrooms	Positive
Square Feet	Square footage of finished living area, excluding bathrooms and closets	Positive
Age of House	Age of house, in years	Negative
Age SQ	Age of house, in years, squared	Positive
Fireplace	Presence of fireplace in home	Positive
Stories	Number of stories	Indeterminate
Garage Size	Number of car stalls available in garage	Positive
Acreage	Number of Acres included in lot	Positive
Waterfront	1 if waterfront property, 0 otherwise	Positive
Locational Variables		

Distance	Distance in miles to nearest major lake (>500 acres)	Negative
Distance SQ	Square of distance to nearest major lake	Positive
Lake size	Surface area of Lake (acres)	Indeterminate
Menomonie	1 if home is in Menomonie region, 0 otherwise	Indeterminate
Chetek	1 if home is in Chetek region, 0 otherwise	Indeterminate
Environmental Quality Variables		
Average SD	Average Secci Depth at closest point of nearest lake	Positive
Min SD	Secci Depth minimum observation (worst quality)	Positive
Average TSI	Average Trophic State Index at closest point of nearest lake	Negative
Max TSI	Maximum observed TSI value (worst quality)	Negative
Perception	Average observed subjective rating of water quality in summer at closest point of nearest lake	Positive

Table F4: Summary Statistics

Variable Name	Description	Mean	Std. Dev	Min	Max
Dependent Variable					
$ Sale Price	Selling price of the house, nominal dollars	$154,182	$85,593	$21,956	$649,000
Housing Structural Variables					
Bedrooms	Number of bedrooms	3.075	0.795	1.00	6.00
Bathrooms	Number of bathrooms	2.004	0.800	0.75	5.00
Square Feet	Square footage of finished living area, excluding bathrooms and closets	1924.736	842.181	540.000	5206.000
Age of House	Age of house, in years	47.335	31.196	5.000	149.000
Age SQ	Age of house, in years, squared	3211.548	3871.709	25.000	22201.000
Fireplace	Presence of fireplace in home	0.416	0.493	0.000	1.000
Stories	Number of stories	1.402	0.517	1.000	4.000
Garage Size	Number of car stalls available in garage	1.819	0.917	0.000	5.000
Acreage	Number of Acres included in lot	3.014	7.255	0.010	40.791
Waterfront	1 if waterfront property, 0 otherwise	0.300	0.459	0.000	1.000
Locational Variables					
Distance	Distance in miles to nearest major lake (>500 acres)	0.942	1.503	0.005	7.687
Distance SQ	Square of distance to nearest major lake	33.837	182.583	1.005	2179.762
Lake size	Surface area of nearest Lake (acres)	991.879	456.512	24.000	1605.000
Menomonie	1 if home is in Menomonie region, 0 otherwise	0.418	0.494	0.000	1.000
Chetek	1 if home is in Chetek region, 0 otherwise	0.313	0.464	0.000	1.000
Environmental Quality Variables					
SD	Avg SD at closest point of nearest lake	5.393	4.923	1.280	14.885
Min SD	Secci Depth minimum observation (worst quality)	4.261	4.523	0.750	13.250
TSI	Avg Trophic State Index at closest point of nearest lake	59.486	10.792	39.588	73.500
Max TSI	Maximum observed TSI value (worst quality)	63.265	12.847	40.250	82.000
Perception	Avg observed subjective rating of water quality in summer at closest point of nearest lake	2.925	1.426	0.059	4.250

Figure 11*:* Percentage of observations in each region



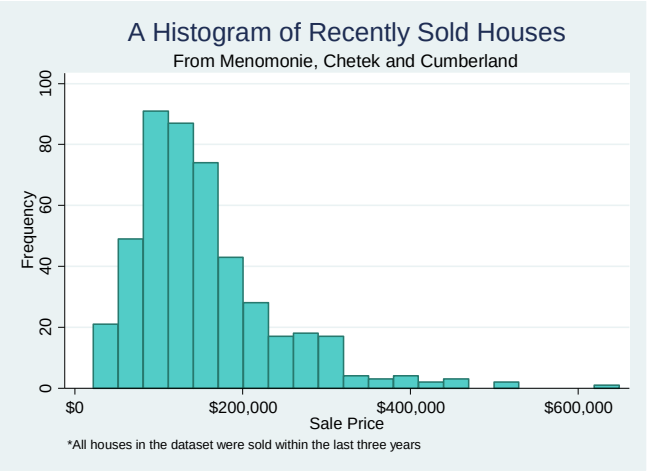


Figure 12*: Distribution of housing prices*

IV. Results:

Results of alternative specifications of OLS regressions are summarized in ***Tables F5***, ***F6, and F7*** below. The Breusch-Pagan (1979) procedure as well as Cameron-Trivedi's (1990) information matrix tests indicate heteroskedasticity issues, and therefore robust standard errors were calculated in each case, using White's method. All statistically significant variables had the expected signs and results were generally consistent with previous findings in the literature.

Our initial specifications assume a linear relationship between water quality and housing values and differ only in the water quality measurement used. We tested average Secchi depth, minimum Secchi depth, objective perception, average TSI, and max TSI. The overall model proved to be consistent and robust to alternative choices for water quality metrics. Results are given below in Table 5. Coefficient estimates can be interpreted as the marginal effect of a one-unit increase in the independent variable on the sales price of a given property. The interaction terms represent the implicit price of water quality for lakefront property owners under the various metrics. In Model 1, average Secchi depth measurements during the summer recreation months of June, July, and August is used and our results indicate that an additional foot of water clarity results in a $3,685 increase in housing value. Model 2 uses the minimum Secchi depth recorded during the sample period as a measurement of the worst possible water quality and finds a nearly identical $3,976 impact on housing values for each additional foot of clarity. Model 3 utilizes the average Trophic State Index value for a given lake, with a similar finding that an additional point on the TSI scale corresponds to a $1,587 decrease in housing value. Model 4 again uses the worst water quality observed via the highest TSI value and gives an estimate of $1,057 per point increase on the TSI scale. Given that the range in our sample on the TSI scale is slightly more than double the range in

Secchi depth, these coefficient estimates all represent virtually identical findings. Model 5 differs more substantially from the previous four models, as it utilizes the subjective observations made at the time by sampling staff taking Secchi depth measurements in the field. This "perception" variable is measured on an inverted 5 point scale, where 1 represents the best possible water quality and 5 represents the worst possible water quality. Our model estimates that a one-unit increase in quality on this scale corresponds to a $17,915 increase in housing values. While this would seem to be the least "scientific" water quality measure, it also proved to be the most statistically significant, and probably also most closely mirrors the type of assessment a potential home buyer would make about lake quality. Again, however, adjusting for the altered scale, this estimate is exactly in line with the other metrics, confirming that the model is very robust to alternative specifications of quality.

Table F5: Coefficient estimates for alternative water quality metric specifications – Linear models; Dependent variable = Sales price($)

	Model 1 - Avg Clarity		*Model 2 - Minimum Clarity*		*Model 3 - Trophic State Index*		*Model 4 - Maximum TSI*		*Model 5 - Objective Perception*	
	Coef.	**P-value**	**Coef.**	**P-value**	**Coef.**	**P-value**	**Coef.**	**P-value**	**Coef.**	**P-value**
Bedrooms	$ 1,291	0.763	$ 1,237	0.772	$ 1,203	0.780	$ 977	0.823	$ 1,441	0.725
Bathrooms	$ 9,451	0.137	$ 9,296	0.142	$ 8,927	0.158	$ 9,554	0.137	$ 8,963	0.151
Sq Feet	$ 40	0.000	$ 40	0.000	$ 40	0.000	$ 40	0.000	$ 40	0.000
Age of House	$ (1,100)	0.002	$ (1,096)	0.002	$ (1,139)	0.002	$ (1,127)	0.002	$ (1,137)	0.002
AgeSq	$ 4	0.135	$ 4	0.138	$ 4	0.113	$ 4	0.116	$ 4	0.116
Fireplace	$ 13,171	0.019	$ 13,416	0.017	$ 12,822	0.021	$ 12,394	0.027	$ 14,399	0.009
Stories	$ 16,484	0.015	$ 16,400	0.016	$ 16,545	0.014	$ 17,078	0.013	$ 15,558	0.021
GarageSize	$ 7,751	0.021	$ 7,805	0.019	$ 8,078	0.016	$ 8,007	0.018	$ 7,559	0.018
Lot Acres	$ 915	0.135	$ 935	0.129	$ 984	0.105	$ 882	0.152	$ 1,039	0.069
Waterfront access	$ 28,754	0.010	$ 32,348	0.001	$ 143,080	0.005	$ 114,986	0.010	$ 101,030	0.000
Menomonie	$ 28,030	0.034	$ 31,366	0.036	$ 34,615	0.019	$ 22,338	0.135	$ 34,326	0.007
Chetek	$ 27,149	0.059	$ 29,414	0.058	$ 36,980	0.042	$ 21,119	0.236	$ 26,817	0.012
SDAvg	$ 560	0.627								
SDAvg * Waterfront	$ 3,685	0.069								
SD Worst			$ 885	0.522						
SD Worst * Waterfront Access			$ 3,976	0.072						
TSIAvg					$ (594)	0.365				
TSIAvg * Waterfront Access					$ (1,587)	0.050				
TSIWorst							$ (27)	0.962		
TSIWorst * Waterfront Access							$ (1,057)	0.111		
Perception									$ (2,044)	0.546
Perception * WaterfrontAccess									$ (17,915)	0.005
Constant	$ 11,675	0.623	$ 8,957	0.715	$ 45,938	0.212	$ 20,882	0.542	$ 20,061	0.334
R-squared	***0.6550***		***0.6552***		***0.6549***		***0.6507***		***0.6663***	

Specification 6, 7, and 8 assume a logarithmic relationship, in which an improvement from 1ft to 2ft of clarity has a stronger impact than an improvement from 11ft to 12ft. This follows

earlier work by Anderson & Bishop (1986) and Smeltzer and Heiskary (1990) who reject the linear model in favor of a semilog functional form for water clarity. Results are found in the table 6 below, and continue to be consistently estimated, although interpretation of the coefficient estimates becomes somewhat less clear. In each of these models, the marginal effect on the lakefront housing price is represented by

$$\frac{\partial PRICE}{\partial WaterQuality * Waterfront} = \frac{\beta}{WaterQuality} \quad (2)$$

and thus must be interpreted at each individual lake value. As an example, the average TSI for Tainter Lake is 63, and so the marginal impact of a one unit improvement in TSI for those homeowners translates to an housing value increase of $\frac{\$91{,}389}{63} = \$1{,}451$. By contrast, the "cleanest" lake in our sample, Beaver Dam Lake has an average TSI of 39, and thus a one unit degradation of that quality would translate to a $2,343 loss in housing value. Similarly, a one foot improvement in clarity via Secchi depth at Tainter Lake would mean a $4,905 increase in housing value, while a one foot loss at Beaver Dam Lake would mean a $1,226 loss in value.

Table F6: Coefficient estimates for alternative water quality metric specifications – Non-linear models; Dependent variable = Sales price($)

	Model 6 - Ln(Secchi Depth)		*Model 7 - Ln(TSI)*		*Model 8 - Ln(Perception)*	
	Coef.	**P-value**	**Coef.**	**P-value**	**Coef.**	**P-value**
Bedrooms	$ 1,039	0.812	$ 1,299	0.761	$ 1,732	0.673
Bathrooms	$ 9,595	0.135	$ 8,839	0.160	$ 8,667	0.168
Sq Feet	$ 40	0.000	$ 40	0.000	$ 40	0.000
Age of House	$ (1,137)	0.002	$ (1,130)	0.002	$ (1,083)	0.003
AgeSq	$ 4	0.112	$ 4	0.118	$ 4	0.153
Fireplace	$ 12,426	0.025	$ 13,020	0.019	$ 13,951	0.012
Stories	$ 17,054	0.012	$ 16,309	0.015	$ 15,397	0.023
GarageSize	$ 7,852	0.021	$ 8,062	0.015	$ 7,761	0.018
Lot Acres	$ 882	0.146	$ 999	0.097	$ 1,041	0.055
Waterfront access	$ 23,369	0.109	$ 420,657	0.023	$ 60,078	0.000
Menomonie	$ 22,329	0.055	$ 36,092	0.014	$ 26,480	0.010
Chetek	$ 23,412	0.124	$ 37,395	0.032	$ 21,526	0.029
Ln(SDAvg)	$ 1,343	0.860				
Ln(SDAvg) * Waterfront	$ 18,150	0.094				
Ln(TSIAvg)			$ (32,749)	0.325		
Ln(TSIAvg) * Waterfront Access			$ (91,389)	0.042		
Ln(Perception)					$ (654)	0.803
Ln(Perception) * Waterfront Access					$ (16,642)	0.018
Constant	$ 17,103	0.502	$ 142,954	0.266	$ 18,162	0.375
R-squared	***0.6515***		***0.6565***		***0.6645***	

Specification 9 follows Gibbs et al. (2002) and Michael, Boyle, and Bouchard (2000) who included an interaction term for lake size and water quality, under the assumption that water clarity may be of more importance to those who purchase properties on larger surface lakes, due to increased opportunities for boating and recreational activities. This assumption is supported by findings from Boyle, Poor, and Taylor (1999).

Table F7*:* Coefficient estimates for alternative water quality metric specifications – Lake size model; Dependent variable = Sales price($)

	*Model 9 - Lake size*Ln(SD)*	
	Coef.	**P-value**
Bedrooms	$1,365	0.752
Bathrooms	$9,407	0.145
Sq Feet	$40	0.000
Age of House	-$1,115	0.002
AgeSq	$4	0.129
Fireplace	$11,944	0.029
Stories	$16,938	0.013
GarageSize	$7,858	0.024
Lot Acres	$894	0.113
Waterfront access	$30,634	0.016
Menomonie	$11,911	0.137
Chetek	$11,864	0.175
Lake Size * Ln(SDAvg)	-$2	0.623
Lake Size * Ln(SDAvg) * Waterfront	$14	0.120
Constant	$28,170	0.191
R-squared	***0.6517***	

Interpretation of the coefficient estimates is similar for this model. The marginal effect of water quality on the lakefront housing price is represented by

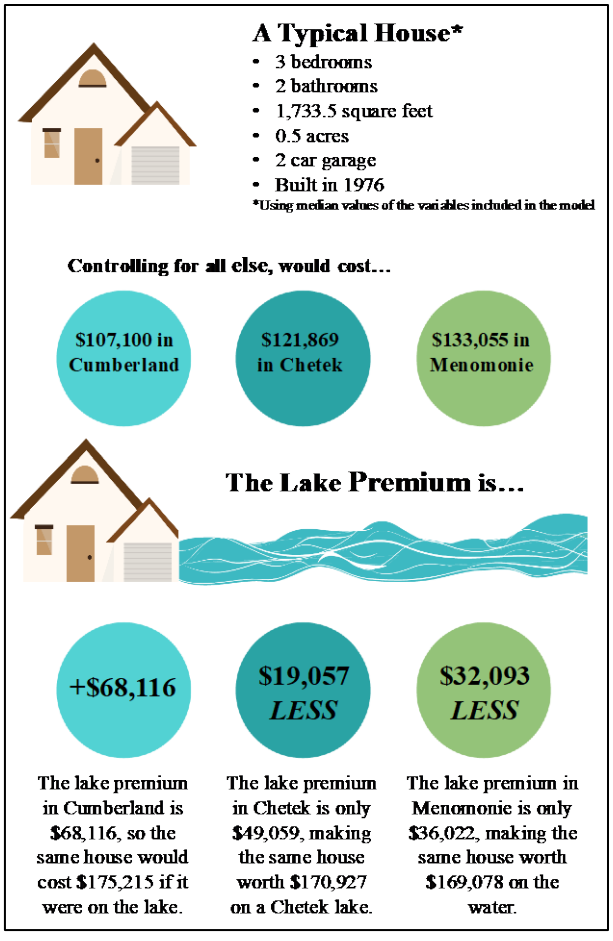
$$\frac{\partial PRICE}{\partial WaterQuality * Waterfront} = \frac{\beta * LakeSize}{WaterQuality} \quad (3)$$

and thus must be interpreted at each individual lake value. As an example, a one foot improvement in Secchi depth clarity at Tainter Lake would mean a $\frac{\$14 * 1605}{3.7} = \$6{,}072$ (or just under 5% of the value of a median home) increase in housing value, while a one foot loss at a small, clean lake such as Silver Lake in Cumberland would mean only a $311 loss in value.

V. Conclusions, directions for further study:

The results of this study emphasize the importance of local water quality in housing market decision making. We find both statistically and economically significant impacts on housing prices that highlight the importance of preventing degradation of water clarity in order to protect individual investments and protect local tax bases. While our results are specific to the individual characteristics of the three markets studied, we believe these areas in the Red Cedar Watershed to have similar patterns to those occurring elsewhere in the upper Midwest, and more broadly, to those occurring in many regions across the globe that are increasingly struggling with the impacts of industrial agriculture and urbanization on local water quality.

The final TMDL for Tainter and Menomin Lakes was released in May of 2012 and approved by the US EPA in September 2012. The initial goal recommended by the TMDL was for a Basin-wide phosphorus load reduction of 45% from levels measured in 1990. Since the statewide phosphorus standard has been established, WDNR, in consultation with US EPA, has modified this goal. Currently, goals include a 65% reduction in non-point-source phosphorus loads upstream of Tainter Lake, and a 45% non-point-source phosphorus load reduction from the watershed contributing to Lake Menomin. Point sources are capped such that they never constitute more than 10% of the total annual load. To put things in perspective however, there will still need to be a reduction of several hundred thousand pounds of phosphorus flowing to Tainter and Menomin Lakes to reach these water quality goals. In May of 2016, the EPA approved what is called a "Nine-Element TMDL Implementation Plan" which outlines a concrete plan for achieving the goals outlined in the TMDL, which was a significant step forward for the watershed, opening up eligibility for federal funding assistance.



If the goals of the Red Cedar TMDL were to be achieved, we would expect to see a 6.5 foot (2 meter) improvement in water clarity, as measured by secchi depth, in the lakes at the distal end of the watershed. Our findings indicate that this ***could lead to a very substantial increase in home values around these water bodies, on the order of $40,000 for a Tainter Lake property, a change of more than 30% for a representative median home***. This would thus contribute greatly to the local tax base, and allow for

many implementation initiatives to become revenue neutral or even revenue positive policies for local municipalities and counties.

Plans for future studies include expanding the range of communities represented within the watershed, and a more complete picture of how non-waterfront properties might be impacted. Here, we have focused specifically on waterfront homes, but in a subsequent study we plan to explore how homes at various distances from recreational water bodies are also impacted by local water quality. While the magnitude of the effect is likely to be less strong, the number of homes is much larger, and thus the overall impact has the potential to be quite significant for a community's local property tax base.

APPENDIX G: IMPLAN ANALYSIS OF LOCAL ECONOMIC IMPACTS OF RED CEDAR WATER QUALITY

Background and Methodology:

Questions concerning the value and impact of natural resources on the larger economy are often difficult to measure, as there is typically no market in which we can observe pricing behavior. Nonetheless, resources such as water and air quality have real value, both tangible and intangible, for citizens and businesses. Community health, recreation, commerce, and aesthetics are all impacted by the quality of these resources which are crucial to economic development, job creation, and quality of life. Each of these dimensions can be measured in using different methods, depending on the characteristics of the resource being considered.

Assessing the value of water quality within the Red Cedar Basin on the regional economy is similarly challenging but can be addressed in several ways. For the purposes of this portion of the study, we will be focusing on the subset of value created through economic activity related to recreation and tourism. A "head-count" approach measures the relative size of the tourism sector via an assessment of the sales revenue generated by visitors, the number of individuals employed in that sector, and the total in that sector. An alternative approach explores scalar linkages between this sector and the broader regional economy, capturing the "multiplier" effect of economic activity related to environmental resources. A third approach uses a fully developed input-output model of the regional economy to capture not only the aggregate multiplier effect obtained in the scalar multiplier approach, but also to estimate specific industry-to-industry linkages, allowing for more precision estimation of effects at an industry level. Input-output models, the most common and widely accepted methodology for measuring local economic impacts, are developed to explicitly account for the web of transactions that occur across various sectors within a regional economy over a given period of time.

1. The Economic Multiplier Effect

The total impact of water quality on the local and regional economy, often referred to as the multiplier effect, is the sum of three elements: the direct effect, the indirect effect, and the induced effect. The *direct effects* accrue from spending associated with recreational water use, tourism, or (externally funded) remediation efforts. Due to the exchanges between firms, industries, and social institutions (household, Federal government, State and local government, enterprises, capital and inventory) that occur within the local economy, the direct effect leads to a series of iterative rounds of income creation, spending, and re-spending that can be observed in the indirect and induced effects. The *indirect effects* are changes in production, employment, and income that are caused by the inter-industry purchases and spending prompted by the direct effect. This can be seen as production changes in backward-linked industries caused by the changing input needs of directly affected industries. For example, an increase in demand for vacation rental properties might spur increased demand from rental firms to employ landscaping firms or custodial firms to upkeep these

properties. In a second iteration, the landscaping firms might need to purchase new equipment from a hardware dealer, etc. The *induced effects* arise due to changes in household income and spending patterns caused by direct and indirect effects. For example, if the employees of the landscaping firm then use their now-higher earnings to purchase a new car from a local dealer. Since the total impact of the recreational expenditures is a compounding of the initial expenditures, the total effect is often expressed as a multiplier effect. For example, an output multiplier of 1.3 indicates that for every million dollars spent (direct expenditure) an additional 0.3 million dollars is generated within the local economy. Similarly, an employment multiplier of 1.6 indicates that for each job created by direct expenditure, an additional 0.6 full time jobs created or supported. Further, a labor income multiplier of 1.8 implies that for every million dollars spent an additional $.8Million of labor income created within the local economy.

2. Leakages and Regional Purchase Coefficient

Industries produce goods and services for final demand and purchase goods and services from other producers. These other producers, in turn, purchase goods and services. This buying of goods and services (indirect purchases) continues until leakages from the region (imports) stop the cycle. In other words, if any of these purchases are made from a firm not in the region, those funds exit the local economy and are no longer contributing to the multiplier. For example, if a local restaurant purchased local produce to use in its dishes, those funds would continue to cycle, but if they purchased produce imported from another region or country, then those dollars would exit the region and accrue to the region the produce was imported from. Leakages are payments made to imports sectors which do not, in turn, re-spend the dollars within the region. The larger the leakages, the smaller the multiplier effect resulting from economic activities. Therefore, spending on goods not produced locally has little impact on regional economies.

To account for this effect, the regional purchase coefficient factor needs to be adjusted to reflect such leakages. A regional purchase coefficient is the ratio of locally purchased to imported goods. For example, a regional purchase coefficient of .95 for dairy products indicates that 95 percent of local demand is met by local producers and 5 percent met by producers outside the study area. These coefficients vary by industry and are accounted for in our study by utilizing a Type SAM (Social Accounting Matrix) multiplier. The SAM approach also accounts for non-linear variations in household spending, saving, taxation, and investment behavior across various income brackets, and is thus a more conservative and accurate methodology than many other approaches to calculating multiplier effects.

3. IMPLAN System

This study was conducted using the IMPLAN (Impact M for Planning) input-output model. Originally developed by the USDA Forest Service, and a product of the Rural Development Act of 1972, IMPLAN is a system of county-level secondary data input-output models designed to meet

the mandated need for accurate, timely economic impact projections of alternative uses of U.S. public forest resources. The Forest Service made IMPLAN as widely available as possible because it was developed using public funds. Contributions by the USDA Cooperative Extension Service additionally cemented the IMPLAN modeling system as the most widely used by rural development researchers and Extension specialists in the Land Grant University System. The Forest Service later privatized IMPLAN; which is now operated by the Minnesota IMPLAN Group (MIG).

IMPLAN is an integrated software and data package coupled with set of tools for creating regional social accounts and for evaluating economic activities. IMPLAN software allows a user to build a study area, or set of social accounts, which is customized for a specific region. Social accounts track the monetary flows (both market and non-market activities) between industries and institutions. The market flows are those occurring between producers of goods and services and consumers, (including other industries). The non-market flows, referred to as inter-institutional transfers, are those between households and government, government and households, capital and households, etc. The IMPLAN system is designed to serve three functions: 1) data retrieval, 2) data reduction and model development, and 3) impact analysis.

The primary data used to build the social accounts are a collection of variables tabulated by the U.S. Department of Commerce, the U.S. Bureau of Labor Statistics, and other agencies. Data are tabulated for 509 sectors of U.S. (national, state and county levels) which correspond to the North American Industry Classification System (NAICS). The IMPLAN database consists of two major parts: 1) a national-level technology matrix and 2) estimates of county-level sectorial activity for final demand, final payments, industry output and employment.

The software allows users to tailor a study region at the county level, or aggregate multiple counties within a state, or multiple states. This region represents the boundaries of the economic multipliers, with trade that occurs beyond these boundaries resulting in leakages. The complete set of social accounts is then converted to the industry by industry formulation of input/output accounts and ultimately the predictive Leontief multipliers. The notion of the multiplier rests upon the difference between the initial effect of a change in final demand and the total effects of that change. The IMPLAN accounts closely follow the accounting conventions used in the "Input-Output Study of the U.S. Economy" by the Bureau of Economic Analysis and the rectangular format recommended by the United Nations.

One advantage of the IMPLAN system is the open access philosophy instilled by the Forest Service. IMPLAN is designed to provide users with maximum access so that they can alter the underlying structure of the data, the model, or means of assessing impact. The combination of the detailed database, flexibility in application, and the open access philosophy has made IMPLAN one of the most widely used and accepted economic impact modeling systems in the U.S. IMPLAN has been accepted in the U.S. court system and in many regulatory settings.

4. Deflators and Margins

To account for inflation, deflators are used to convert impact expenditures from current year to the base year and also can be used to inflate the impact reports of the study area to the current year. This is a necessary step to find expenditures expressed in same year's dollars as the model's data. The latest IMPLAN data used in this study for the State of Wisconsin are for the year 2017. For that reason, the numbers are adjusted to 2019 dollars, which is the year under analysis.

Margins are used to convert purchaser prices to producers' prices. Margins differ depending on the identity of the "final" consumer. Households pay transportation, wholesale, and the full retail margins. Industries, or the Federal government, pay different margins which represent the difference between producer and purchaser prices. For example, government may pay little or no retail margins as it has more buying power. Margining assigns direct expenditures to the correct input/output sector multipliers. It splits a purchaser price into the appropriate values. Thus, the value of the impacts, if purchased by end users or consumers, must be divided into the portion going to the retailer, and wholesaler, transportation, and the manufacturer.

5. Data Requirements

Assessing the contribution of water quality to the local and regional economy requires describing the features of that quality in a way that is compatible with the input-output model. Unfortunately, or perhaps fortunately depending on your perspective, environmental resources such as water quality are not an industrial sector within the market and thus, the input-output model provides no "environmental multiplier". Thus, the key aspect of this study is the creation of a consistent set of metrics to connect water to economic activity. We primarily focused on the income generated by recreation and tourism, through sales, wages, and other avenues. This is, by design, a conservative estimate of the value of water quality and includes just the components that we can most confidently connect to economic activity. Our estimates are thus an under-estimate, or lower-bound, on the true values.

Survey Data

In addition to the county-level input-output data contained within the IMPLAN modelling framework; additional data used in our impact analysis came from a series of surveys conducted over the period of 2014-2019. This data comprised purchasing and decision-making behavior for firms, residents, visitors, and students in the Red Cedar Basin.

This comprehensive survey data was utilized to develop spending patterns, sensitivity to water quality in recreational choices, and sensitivity to water quality in the decision of students at the University of Wisconsin-Stout to remain in Menomonie year-round.

A. Visitors

One way that the lakes and rivers within the Red Cedar Watershed impacts the regional economy is by bringing recreational visitors to the waterfront. As these individuals come to the region, they

spend money on meals, lodging, gear rental, transportation, and other items. This spending translates into greater sales and revenue for area businesses, wages for workers, and an increased labor market.

To determine the economic impact of the water resources of the Red Cedar on the region, multiple surveys were conducted. These surveys were used for two reasons – to estimate the total number of users and to understand their spending patterns. The survey process was reviewed and approved by the University of Wisconsin Stout Institutional Review Board for human subjects research.

Multiple surveys were used over a multi-year period, including:

- a mail survey to local residents of Dunn County and Barron County,
- a visitor survey conducted in Chetek in conjuction with resorts and rental properties, as well as an intercept version gathered at local events during the tourism season,
- an intercept survey of boaters at multiple launches across the region,
- a survey of UW-Stout students about spending habits and summer residential decisions
- a Downtown business survey, in both Menomonie and Chetek

In addition, estimates generated by these surveys were compared with those generated by other regional tourism studies.

- In summer 2014, 274 UW-Stout students were surveyed (27.4% response rate) as well as 236 UW-Stout faculty (44.9% response rate). An additional 82 respondents were canvassed at local events for an intercept survey.
- In summer 2015, 132 lakeshore homeowner surveys were collected from residents on Lakes Menomin and Tainter (58.6% response rate). An additional 325 surveys were conducted with residents of Menomonie and the surrounding area through a combination of mailings and canvassing. A further 218 UW-Stout students were surveyed, representing a 27.2% response rate. Finally, 77 surveys of Menomonie downtown (and near-downtown) businesses were received (24.9% response rate)
- In summer 2016, 128 Chetek resident surveys were returned (25.6% response rate), along with 101 Menomonie resident surveys (20.2% response rate). An additional 67 Chetek business surveys were collected (30.2% response rate).
- In summer 2017, 228 responses were generated from UW-Stout students (22.8% response rate), 121 Chetek tourist intercept surveys were gathered, as well as from 230 recreational boaters at launches at Lake Menomin, Lake Chetek, Tainter Lake, and Rice Lake.
- In summer 2019, 131 responses were collected from Rice Lake residents (8.7% response rate), and 242 from Dunn County residents (12.1% response rate).

B. Estimating visits and spending patterns

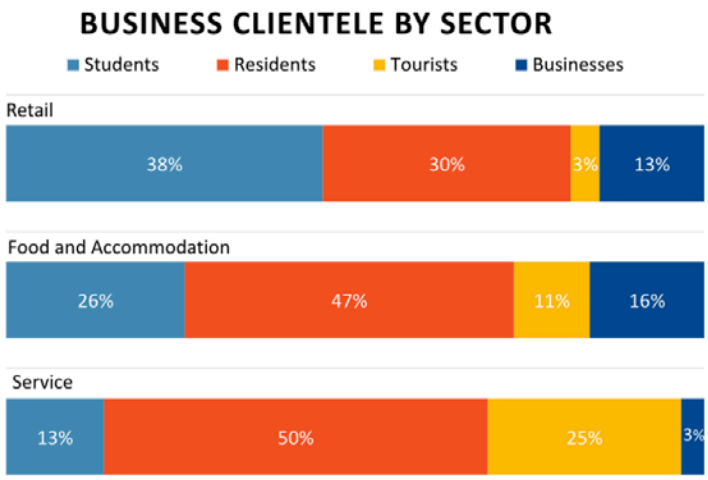
Calculating the current (and potential) number of visitors engaging in recreation around water bodies in the region is necessary to understand the total impact of the watershed. To calculate the number of visits, surveys of tourists, students, and residents were utilized. These surveys asked questions about how often they use the lakes and surrounding resources, and in which ZIP code the individual lived. In addition, spending, demographic, and usage questions were asked.

Using data from student surveys conducted in 2014, and confirmed in a follow up survey in 2015, it was estimated that currently just under 2,000 (25%) of UW-Stout students remain in Menomonie during the summer months. Another 33% indicated that they would "definitely" or "much more likely" stay if water quality improved and more recreational opportunities were available.

Students were further asked about the amount of money they spend in various categories over the summer months. These surveys provided the data necessary to implement an impact study of student spending. Note below that housing was not included. This is due to the fact that the bulk of lease agreements are typically written for 12-months, and students often just pay the full amount despite not being present in the summer. To the extent that sublets or more accommodating leases or campus dorm housing are utilized, our analysis will represent an underestimate the total impact.

Table G1: ***UW-Stout student summer residency average spending pattern***

IMPLAN sector	Student spending category	Average expense total: (June, July, August)
503	*Dining out*	$122.52
400	*Groceries*	$285.5
402	*Gas and transportation*	$236.23
406	*Miscellaneous retail*	$180.04
509	*Personal care services*	$29.34
State/Local Govt Education	*Tuition and fees*	$1000



Surveys of Chetek area tourists in 2017-2019 were used to build a spending profile for visitors to the Chetek Chain of Lakes. These were broken down into average daily per-person expenditures. Using existing data from the Wisconsin Department of Tourism, we were then able to take the total visitor spending for each county, and using the spending profiles, calculate an estimated number of person-visit days. The equated to roughly 768,000 visit-days over the summer for Barron county. (http://industry.travelwisconsin.com/research/economic-impact)

Table G2: ***Chetek area tourism summer average daily spending pattern***

IMPLAN sector	Barron County tourism spending category	Mean per-person daily expense total: (June, July, August)
501	*Restaurants – Full service*	$28.24
406	*Miscellaneous retail*	$12.79
499	*Overnight accommodations (hotels, motels, resorts)*	$17.72
402	*Gas and transportation*	$6.80
496	*Other recreation*	$7.14
443	*Equipment rental*	$17.73
503	*Bars*	$15.49
400	*Food and Beverage retail*	$20.86
404	*Sporting goods retail*	$9.42

This exercise was repeated for Menomonie area tourists, with an estimate of approximately 689,000 visit-days for Dunn County, and a similar spending pattern as seen below:

Table G3: ***Menomonie area tourism summer average daily spending pattern***

IMPLAN sector	Dunn county tourism spending category	Mean per-person daily expense total: (June, July, August)
501	*Restaurants – Full service*	$17.46
406	*Miscellaneous retail*	$5.37
499	*Overnight accommodations (hotels, motels, resorts)*	$19.64
402	*Gas and transportation*	$6.80
496	*Other recreation*	$1.28
443	*Equipment rental*	$2.38
503	*Bars*	$5.83
400	*Food and Beverage retail*	$11.73
404	*Sporting goods retail*	$12.20

6. Economic Impacts:

These estimates of direct spending by students and visitors was utilized to analyze the overall impact that lake-related tourism is contributing to the regional economy. This economic impact initiated by the visitors is measured across labor income (all forms of employment income, including employee wages and benefits, and proprietor income), value added (the difference between an industry's - or an establishment's - total output and the cost of its intermediate inputs), and industry sales (value of industry production).

Several alternative scenarios were analyzed using IMPLAN. The study area for which spillover effects could be realized included all of the counties that comprise the Red Cedar Watershed: Dunn, Barron, Washburn, Sawyer, Rusk, Polk, St. Croix, and Chippewa. While the bulk of the watershed likes in Dunn and Barron counties, and the remaining counties are only partially within the boarders of the watershed, for the purposes of economic activity generated by the water resources in the area and captured by the adjacent communities, incorporating the additional counties allows for a more realistic picture of the relavent multiplier effects in the area. Our analysis focused on spending that occurred withing Dunn and Barron only, but recognized that some of the intermediate production induced by that spending would take place in the neighboring counties of the watershed and captured that revenue as part of our "Watershed Multiplier."

Scenario 1 represents an estimate of the annual impact of *current* summer water-related tourism spending in Dunn and Barron county, measured in 2019 dollars, and full-time equivalent (FTE) jobs.

Table G4: ***Scenario 1: Current impacts of summer water-related tourism in Dunn & Barron Counties***

Impact Type	Employment (FTE)	Labor Income	Total Value Added	Output
Direct Effect	746.3 jobs	$13,409,236	$17,570,609	$36,203,334
Indirect Effect	69.5 jobs	$2,361,825	$4,193,675	$8,566,177
Induced Effect	70.2 jobs	$2,343,763	$4,561,682	$8,312,368
Total Effect	**886.0 jobs**	**$18,114,824**	**$26,325,965**	**$53,081,880**

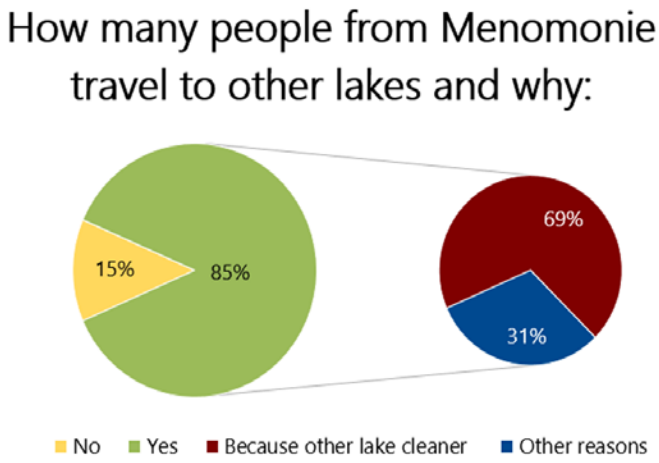
The "Red Cedar Watershed labor income multiplier" is thus **1.35** ($18,114,824/$13,409,236), which suggests that for every dollar of labor income earned by employees from water-related tourism, an *additional* 35 cents of income is earned within the community as a result. Further, the "Red Cedar Watershed value-added multiplier" is **1.50**, which suggests that for every dollar of value added, an *additional* 50 cents is contributed to the local community's gross domestic product. Finally, the industry sales multiplier created by water related tourism in the watershed is **1.46**, implying that for every dollar of sales related to tourists utilizing the watershed; an additional 46 cents of economic activity will be generated in watershed. This economic activity generates approximately **$4.3million** in State and Local tax revenue annually.

Scenario 2 represents the impact that a 10% increase in summer tourism in both Menomonie and Chetek would generate. This percentage was chosen as a conservative estimation of what the impact of achieving the TMDL goals and improving water quality accordingly would generate, taken from data collected in tourism and resident surveys. This amount could be generated either by bringing in new tourism or retaining a portion of the leakage in spending from the 85% of residents currently traveling to lakes outside the watershed during the summer.

Table G5: ***Scenario 2: Potential gains from Increase in summer Menomonie, Chetek tourism***

Impact Type	Employment (FTE)	Labor Income	Total Value Added	Output
Direct Effect	186.1 jobs	$3,366,327	$4,364,610	$8,968,999
Indirect Effect	17.1 jobs	$580,330	$1,039,235	$2,119,869
Induced Effect	17.6 jobs	$586,525	$1,141,584	$2,080,197
Total Effect	**220.7 jobs**	**$4,533,183**	**$6,545,429**	**$13,169,066**

This implies that relatively modest tourism growth resulting from successful implementation of the TMDL goals could spur creation of 220 new jobs annually, as well as over $13million in new spending. This economic activity would generate approximately **$1.1million** in additional State and Local tax revenue annually. The cautionary corollary to this finding is that further degradation of the existing water quality which led to a similar decrease in tourism would lead to corresponding losses in each of these areas. These forecasts showcase the economic importance of the watershed and the significant effect it has on the regional economy. This total does not include other major recreational areas in the watershed such as Rice Lake and Cumberland.



Estimates of current spending leakage from Menomonie alone was calculated as follows:

> 16,429 residents * 85% * 69% * $136/trip day = $1,310,442 *per day* spent by residents at other lakes.

The mean reported number of days was 5.57 which implies $7.3 Million leaking from Menomonie to other locations each summer. The loss to Menomonie's economy is even higher when the 1.46 multiplier is considered, yielding a total loss of $10.6million in potential local spending by residents leaving the area for their water recreation.

Scenario 3 analyzed the impact of spending by UW-Stout students during the summer months in Menomonie. Using the spending patterns outlined above, the below output illustrates the injection of spending generated by UW-Stout students currently.

Table G6: ***Scenario 3: Current impact of summer UW-Stout student residency***

Impact Type	Employment (FTE)	Labor Income	Total Value Added	Output
Direct Effect	42.9 jobs	$1,819,153	$2,079,679	$2,491,367
Indirect Effect	1.6 jobs	$55,306	$98,743	$200,531
Induced Effect	8.3 jobs	$278,459	$541,519	$987,016
Total Effect	**52.8 jobs**	**$2,152,918**	**$2,719,941**	**$3,678,914**

This spending thus has a labor income multiplier of 1.18, a total value multiplier of 1.31, and a **total output multiplier of 1.48**. In other words, every dollar being spent in the community over the summer generates an additional 48 cents for the Dunn County economy. This spending also generates an additional $185,176 in state and local tax revenue.

In **Scenario 4**, we analyzed the potential impact of increased student interest in remaining in Menomonie over the summer. Again, drawing from survey response data, an estimate of an additional 1500 summer student residents was used, corresponding to what was indicated would be plausible if the goals of the TMDL implementation were achieved and a corresponding increase in summer recreation and activity was realized. In addition to the impacts below, approximately $138,880 in new state and local tax revenue would be generated.

Table G7: ***Scenario 4: Potential gains from Increase in summer UW-Stout student residency***

Impact Type	Employment (FTE)	Labor Income	Total Value Added	Output
Direct Effect	32.1 jobs	$1,364,365	$1,559,759	$1,868,525
Indirect Effect	1.2 jobs	$41,479	$74,057	$150,398
Induced Effect	6.3 jobs	$208,844	$406,139	$740,262
Total Effect	**39.6 jobs**	**$1,614,689**	**$2,039,956**	**$2,759,186**

Our final **Scenario 5** combines the theoretical impacts of modest increases in both tourism and student residency that would result from improved water quality as outlined by achievement of the TMDL goals.

Table G8: ***Scenario 5: Combined impacts of increased Menomonie and Chetek tourism and increased student residency***

Impact Type	Employment (FTE)	Labor Income	Total Value Added	Output
Direct Effect	218.2 jobs	$4,730,692	$5,924,369	$10,837,524
Indirect Effect	18.3 jobs	$621,810	$1,113,293	$2,270,268
Induced Effect	23.8 jobs	$795,370	$1,547,723	$2,820,459
Total Effect	**260.3 jobs**	**$6,147,871**	**$8,585,385**	**$15,928,251**

This new spending would generate $1.21million per year in additional tax revenue, and represents an overall "TMDL multiplier" of **1.47**, indicating that every dollar of new recreational spending that occurs as a result of improved water quality generates an additional 47cents of induced and indirect spending in the local economy.

7. Conclusions:

Tourism and residency decisions in the Red Cedar Watershed are directly tied to water resource quality and have wide ranging impacts across the local and regional economy. Dollars spent by visitors engaging with the lakes and rivers in the watershed contribute directly to businesses catering to tourism (lodging, restaurants, sporting goods, etc) but also generate indirect effects that benefit related industries. Those multiplicative spillover effects mean that for every dollar spent on water-related recreation, roughly an additional 50 cents of spending is generated in other indirect ways.

In all, water-related tourism in the Red Cedar Watershed is contributing over $50million annually to the regional economy and generating roughly 900 jobs, and nearly $5million in state and local tax revenue. Modest increases in water quality can be expected to increase these numbers substantially, as more visitors are drawn to the water bodies within the watershed and more residents opt to stay closer to home for their recreational activities rather than travelling outside the region.

Further study is needed to address several additional key pathways to economic growth in the region resulting from implementation of the TMDL plan. First, economic activity generated by the implementation process of the TMDL itself (construction of milkhouse waste facilities, manure storage structures, barnyard runoff structures, replacement of failing septic systems, stormwater retention, etc) has the potential to infuse significant growth to the region, particularly to the extent that funding for these initiatives is received from sources external to the watershed. Preliminary IMPLAN estimates under various funding assumptions put the value of this activity over a 10-year implementation period on the order of $38.8 million dollars with 450 jobs created. However, this work is ongoing and much of the funding remains uncertain. To the extent that these initiatives are

funded internally by diverting other local spending, the additional economic activity that is generated could be much lower.

In addition, the value of the soil itself that is retained as a result of successful implementation can be a boon to farmers and the economy if the current spending on fertilizer costs can be redirected to alternative spending or investment activity. Preliminary estimates by our research team have estimated $2.1million in soil retention value annually if the TMDL goals are met.

Finally, spending patterns for the watershed have thus far been generated for Chetek and Menomonie only. Further study to expand this work to other key areas such as Rice Lake and Cumberland is ongoing and will help to further understand the overall tourism patterns for the region.

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