

Michigan Large Quantity Water User Survey

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Executive Summary

Michigan water users are instrumental to the state's economy, environment, and culture, and state water policy seeks to optimize the value of water resources now and into the future. Balancing the current and future societal benefits Michigan enjoys from water use requires wise management from the local to state levels. As an interdisciplinary team of scientists from Michigan State University with expertise in local governance, the interaction of human and environmental systems, and the development of sophisticated support tools, our research focuses on one component of Michigan water policy and law that encourages local large quantity water users to form Water User Committees (WUCs) and make joint management decisions about this shared, local resource.

Funded by Michigan's Department of Environment, Great Lakes, and Energy (EGLE) and Michigan Sea Grant, this research aims to develop a Water User's Guide that provides information, procedures, tools, and resources necessary to create and facilitate successful WUCs in Michigan. Our goal is to create a guide that is accessible to water users and effectively aids their efforts in collectively managing water resources within their watersheds.

This report highlights key findings from phase one of the three-phase research project: a water user survey sent to all large quantity water users in Michigan. The survey gauged water users' perceptions of current and future water availability, familiarity with water policies, degree of communication within local communities about water management, awareness and perceptions of Water User Committees, trust in water management at the state, community, and personal levels, and the most pressing issues faced by Michigan water users. Based on our findings from the survey, this report offers suggestions to EGLE and Michigan's Water Use Advisory Council (WUAC) for how the state can incentivize water users to take an active role in governing shared water resources.

The second phase of our research involves conducting focus groups with members of our advisory board to explore methods for engaging water users while facilitating the formation of WUCs. The final phase entails conducting case studies with actual water users to test the efficacy of the new Water User's Guide and to improve the guide through their feedback.

Key Findings:

1) Most large quantity water users view water management as a collective issue.

- Approximately 60% of water users believed that their water use affects, and is affected by, others a “moderate amount” to a “great deal.”
- Although water users perceived current levels of cooperative management to be low, there is overwhelming agreement (94% of respondents) that **cooperation should be higher**.

2) Water users have low levels of trust in the state to manage water resources, but they do trust their neighbors.

- One fifth of water users did not trust the state “at all” to manage water resources.
- Water users overwhelmingly believed that they were personally managing water responsibly (94%), and that **their neighbors were responsible as well** (68%).

3) Michigan large quantity water users perceive water as abundant and unlikely to become scarce in the future.

- Nearly 70% of water users believed that water was currently either “very abundant” or “abundant,” while only 4% believed resources were “scarce” or “very scarce.”
- **Very few respondents (4%) believed that water resources will become scarcer in the future** in their watershed or in Michigan generally (2%).

4) Water users recognize benefits of Water User Committees, but they also note obstacles.

- Water users viewed the primary benefits of participating in Water User Committees as learning more about why the state would prevent a new or expanded withdrawal and helping their neighbors since one person’s water use affects others.
- The majority of water users cited **time constraints** as the principal barrier to their participation in Water User Committees.

5) Water users report low levels of knowledge about Michigan water policy.

- Water users had **low levels of water policy knowledge**, particularly regarding the Great Lakes-St. Lawrence River Basin Water Resources Compact and Water User Committees.

Recommendations Based on Key Findings

Based on the responses received from Michigan large quantity water users and an understanding of collaborative governance approaches to natural resource management, we offer the following suggestions to EGLE and the WUAC to increase the successful formation of water user committees.

1) Implement WUCs to keep decision-making among people water users trust.

Water users believe that they and others—especially others in their watershed—use water responsibly. This fact, combined with perceptions of too much government involvement in their affairs and a distrust of the state’s water management, could make participation in WUCs desirable. The legislative intent of WUCs is to help ensure that management decisions are made at the local level among water users who share similar experiences and interests, while at the same time minimizing government oversight. Highlighting the autonomy and self-determination that participation in Water User Committees generates may create buy-in within the water user community.

2) Provide funds for facilitators to assist WUCs.

Given the complexity of the Compact and Michigan water law, as well as the potential difficulty water users may face when forming collaborative governance groups, the state should provide resources for a facilitator to aid water users in convening and running a WUC. It is likely that water users who choose to form WUCs will find the process contentious because it involves a mindset shift from individual to collective decision-making and because decisions about water use directly affect their livelihoods. Hiring a skilled facilitator with a history and networks among the water user community will increase the probability that a WUC will form and be successful.

3) Follow best practices to make meetings accessible.

For large quantity water users, the biggest problem associated with participating in WUCs is a lack of time. To make meetings as accessible as possible, best management practices should be followed. These include holding meetings outside of regular working hours, making virtual attendance an option for participants, and possibly incorporating WUCs into already existing meetings attended by water users.

4) Improve water policy communications.

For water users to effectively manage shared water resources, they need to understand the powers granted to them under Michigan law, as well as the constraints imposed by water law and related policies. Based on the survey, there are three particularly important and interconnected areas where the state can improve policy communication efforts with water users.

a) **Keep Our Water at Home.** Water users reported a decisive lack of familiarity with the Great Lakes-St. Lawrence River Basin Water Resources Compact. This is one of the largest and most complex multi-state, bipartisan agreements enacted in United States history. In order to cut through the complexity, the state can emphasize that the purpose of the legislation is to **protect** water users in Michigan from other states that may want to divert water out of the Great Lakes basin. The Compact keeps Great Lakes water in the Great Lakes for the benefit of local water users.

b) **Protecting Fish = Protecting Our Water.** The state needs to clarify why the Compact requires Michigan to protect characteristic **fish** populations. Congress stipulated that the Compact be written as a document aimed at ecological conservation to fit within the parameters of the Interstate Commerce

Clause. If Michigan and other Great Lake states want to keep their water from being used outside of the Great Lakes, they must demonstrate that the prevention of diversions to outside states is not for economic protectionism, but rather, for ecological conservation. In recognition of the legal validity of the Interstate Commerce Clause, Michigan adopted policies to protect fish populations as a mechanism for evaluating the maintenance of ecosystem integrity.

c) **WUCs Instead of Courts.** Just as they are unfamiliar with the Compact, the survey shows that water users were equally unfamiliar with WUCs. WUCs are a beneficial **strategy** for local water users to make decisions about how to share water resources while operating within the withdrawal allowances based on protecting fish populations. Foreseeing that capping withdrawals may lead to water use conflicts, Michigan's legislature created WUCs as a conflict resolution mechanism whereby water users can work amongst themselves to resolve issues rather than relying on courts to adjudicate disputes. WUCs provide participants with a degree of autonomy for making decisions based on their own expertise while avoiding potentially arbitrary decisions made by courts.

Introduction

In the fall of 2022, a survey was sent to all registered large quantity water users in Michigan as the first of a three-part, interdisciplinary research project to develop a Water User Committee (WUC) Guide that provides the information, tools, and resources necessary to create and facilitate successful WUCs in Michigan.

Michigan state law grants “all registrants, permit holders, and local government officials” within watersheds the right to make decisions about how they can work together to share resources by forming WUCs (Michigan Comp. Laws § 324. 32725). Water users and water resources vary widely across the state, and the main purpose of WUCs is to help water users avoid state intervention or court adjudication and resolve water use conflicts among themselves.

Our research team utilized the Integrative Framework for Collaborative Governance (IFCG) (Emerson et al., 2012) to create a survey with the aim of identifying the information, tools, resources, and strategies water users need to successfully create WUCs. The IFCG states that there are four motivating factors that drive people to collaboratively govern common pool resources: uncertainty, interdependence, consequential incentives, and leadership. We operationalized these factors into survey questions aimed at understanding the absence of WUCs as a function of how active or inactive these factors are in Michigan's water user community. Specifically, we asked water users about their perceptions of current and future water availability, the degree to which they perceive resource management as a collective or individual responsibility, their knowledge of state water policies, and the degree to which they trust each other and regulatory agencies to manage water responsibly.

As a result of this survey, we outline the necessary information, motivational factors, decision-making processes, and resources necessary to inspire large quantity water users to form successful groups at the local level. Each of these focal points are important for understanding the extent to which water users are currently prepared to participate in WUCs, recognizing barriers to their formation, and informing the development of a Water User's Guide to help water users form WUCs.

The completed guide will be evaluated by water users, as well as EGLE and WUAC. Through these sources of feedback, the guide will be improved before a final version is published.

Methods

The Department of Agriculture and Rural Development (MDARD) and EGLE provided contact information for large quantity water users for the sole purpose of this study. MDARD provided contact for agricultural producers, while EGLE provided contact information for all other large quantity water users in the state.

Invitations were sent to 1,788 agricultural producers from September 23, 2022, to October 6, 2022, and to 1,531 non-agricultural water users (e.g., public water suppliers, industries) from November 11, 2022, to November 22, 2022. An initial email explained the intent of our work and provided a link to the survey. This email was followed by three follow-up emails to encourage maximum participation. Survey respondents were offered the chance to win \$100 to either Amazon or Family Farm and Home.

Invitations to agricultural producers resulted in 555 responses out of 1,788 contacts, with a 31% response rate. Non-agricultural producer participation resulted in 450 responses out of 1,531 contacts, with a 29% response rate. In total, we achieved a 30% response rate.

To maintain confidentiality, the names and contact information of all respondents were separated from the information they provided, ensuring that no individual or business could be connected to their responses.

Results

We present the survey results by separating agricultural producers from all other large-quantity water users. Agricultural producers represent a disproportionately large percentage of Michigan water users and as a group share more in common in terms of culture, incentives, constraints, and history of water use than non-agriculture water users. As WUCs are likely to be primarily comprised of agriculture water users, it is important to understand where perspectives of water users may differ.

Characteristics of Survey Participants

Numerous water user types were represented in our sample, reflecting the diversity of large quantity water users in Michigan (Table 1). Agricultural producers represented just over half of the sample (50.7%) with most non-agricultural use being water for irrigation, public water supply, and industry.

Table 1: Water User Type

Water User Type	N	% of Respondents
Irrigation for Agriculture	520	50.7
Irrigation for Non-Agriculture (e.g., golf courses)	189	18.4
Public Water Supply	84	8.2
Industry	71	6.9
Livestock Production	40	3.9
Fire Protection	32	3.1
Mining	19	1.9
Snowmaking	12	1.2
Dewatering	11	1.1
Heating, Air Conditioning, and Ventilation	10	1.0
* Other	36	3.6
Total	1024	100

** Eight other water user types each represented less than 1% of respondents*

Perceptions of Current and Future Water Availability

This section of the survey gauged water users' perceptions of water availability in Michigan and their watershed, both now and in the future. Research on common pool resource management shows that resource users' perceptions of resource availability is an important driver for predicting their willingness to participate in collaborative governance (Bardhan, 1993). If resources are viewed as abundant, there may be a lack of incentive for assuming the costs and responsibilities associated with collaboration because individuals can access and use those resources without working together. On the other hand, if resources are viewed as overly scarce, users

may lack incentive to collaborate because they do not believe that working together will be sufficient to improve availability (Blanco et al., 2015; Araral, 2009; Uphoff et al., 1990).

To choose collaboration, resource users must perceive resources as neither too scarce nor too abundant. In this "goldilocks zone," users perceive resources as being scarce enough to warrant working together and abundant enough that they believe collaborative efforts will be worthwhile. The first set of questions revealed their perceptions of current water *availability in their watershed*.

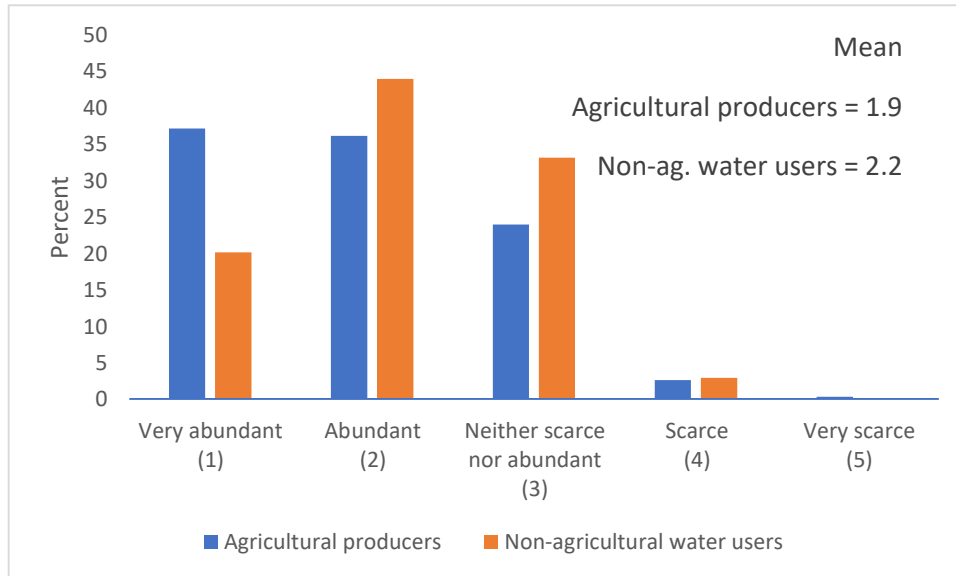


Figure 1: Perceptions of Current Water Availability in Watershed

Water users believed that water resources *in their watershed* are abundant (Figure 1). Nearly 70% claimed that resources are either very abundant or abundant and only 4% of respondents claimed that water in their watershed is currently scarce or very scarce. Non-agricultural water users ($M = 2.2, SD = 0.61$) were more likely than agricultural producers ($M = 1.9, SD = 0.73$) to perceive watershed resources as being scarce ($t = 4.05, p < 0.01$). Based on these results, Michigan water users may believe their current water resources are too abundant to be motivated by scarcity, and not scarce enough to be motivated to preserve it.

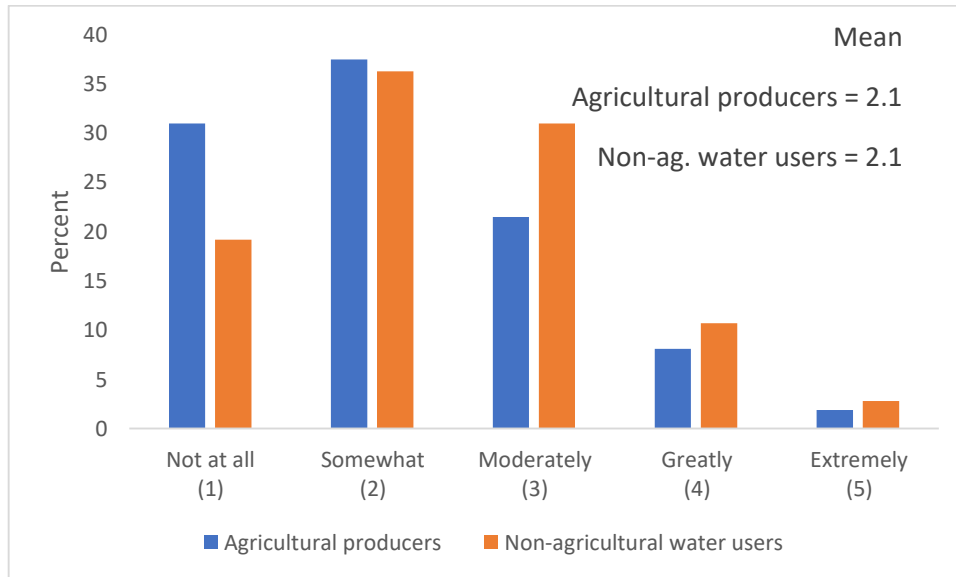


Figure 2: Expected Increase in Future Watershed Scarcity

Additionally, respondents thought water scarcity *in their watershed* would not be a major problem in the future (Figure 2). Over a quarter (26%) of respondents said that water will not become scarce at all, and 63% claimed that water will only become somewhat or moderately scarce in the future compared to current levels. There was no difference between agricultural producers ($M = 2.1, SD = 0.78$) and non-agricultural water users ($M = 2.1, SD = 0.72$) in their expected increase in watershed scarcity in the future ($t = 0.66, p > 0.05$).

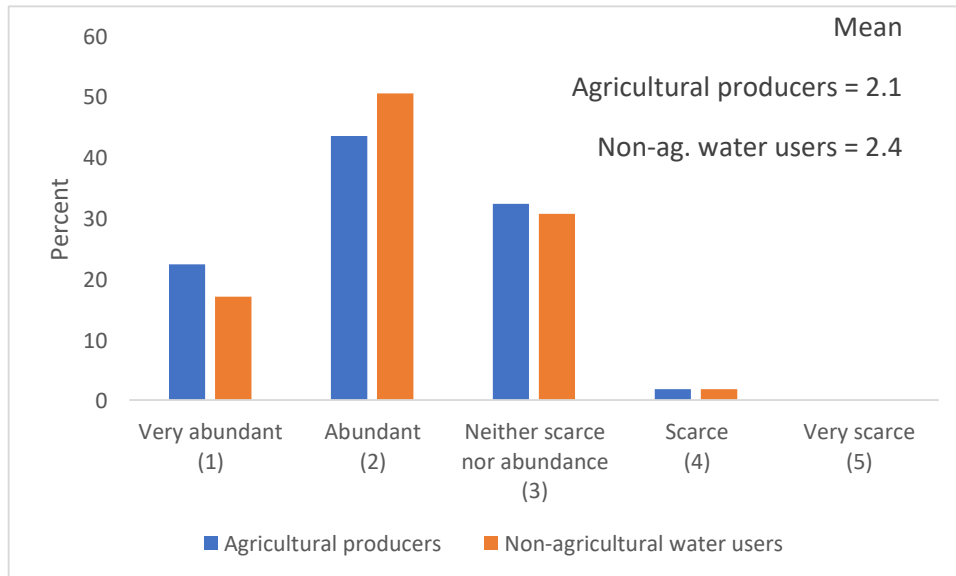


Figure 3: Perceptions of Current Water Availability in Michigan

Similar to perceptions about resource availability at the watershed level, water users believed that resources are currently abundant *in Michigan as a whole* (Figure 3). Nearly 70% of respondents claimed that water is either very abundant or abundant. Only 2% of respondents believed that water is currently scarce, and no one believed that water is currently very scarce in the state. Non-agricultural water users ($M = 2.4, SD = 1.01$) were more likely

to perceive Michigan water resources as scarcer than agricultural producers ($M = 2.1$, $SD = 1.00$; $t = 3.71$, $p < 0.01$).

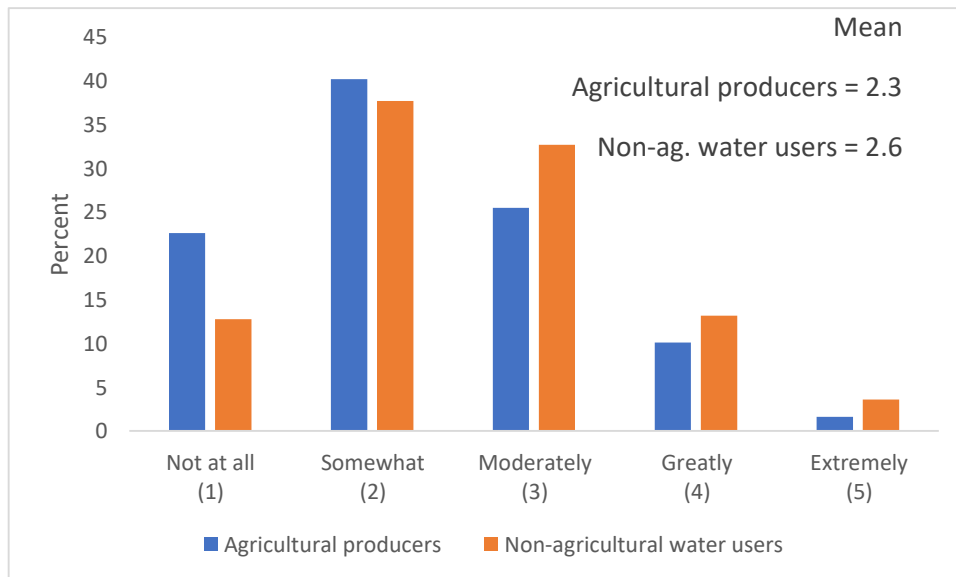


Figure 4: Expected Increase in Future Michigan Water Scarcity

Overall, water users believed water scarcity in *Michigan as a whole* is slightly more likely to occur in the future compared to increases in scarcity at their local watershed level (Figure 4). Nearly 70% of respondents believed that scarcity is likely to increase somewhat or a moderate amount, and 14% claimed that scarcity will increase greatly or extremely in the future. Non-agricultural water users were more likely ($M = 2.6$, $SD = 0.99$) to report expected increases in Michigan water scarcity in the future compared to agricultural producers ($M = 2.3$, $SD = 0.98$; $t = 0.73$, $p < 0.01$).

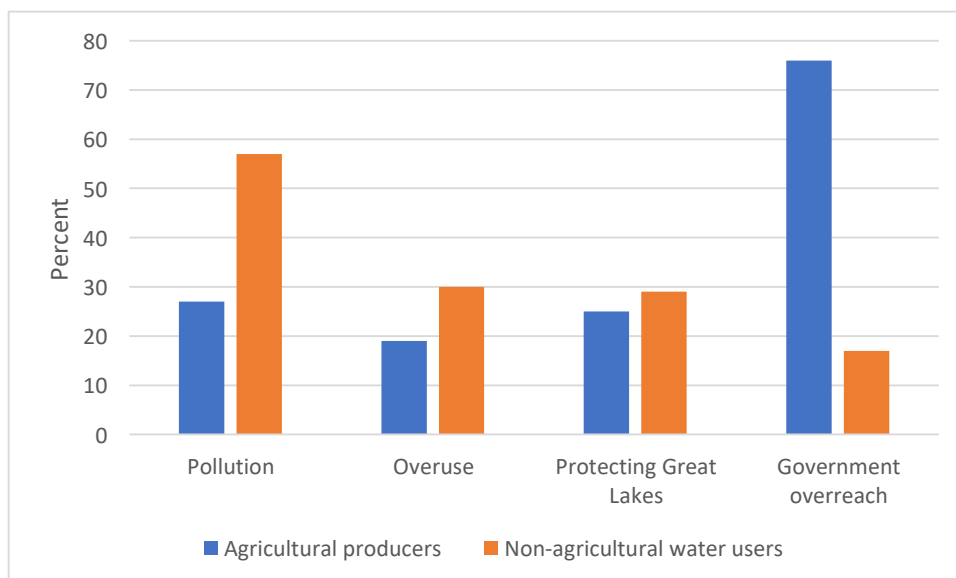


Figure 5: Perceived Water Concerns

Finally, we asked water users about the most pressing water issues in Michigan (Figure 5). The top four concerns among both agricultural and non-agricultural users were pollution (listed by 27% of ag respondents and 57% of non-ag respondents and), overuse (19% and 30% respectively), protecting the Great Lakes from external pressure (25% and 29% respectively), and government overreach (76% and 17% respectively).

Water Management: An Individual or Collective Problem?

Collaborative management requires a shared understanding that water use is a collective issue rather than a private one. When water is viewed as a shared resource, people are more likely to discuss water management with friends, family, and neighbors, feel comfortable doing so, and believe that such conversations can strengthen their relationships (Biddle, 2017). Collaborative management also requires a belief that one’s water management can affect others and will have an impact on the watershed (Magnuszewski et al., 2018). Finally, the legitimacy of collaborative efforts depends on participants believing that they should work together to manage shared resources (Orr et al., 2016).

This section of the survey took the pulse of water users’ frequency and type of communication about water with other water users, their beliefs about the effect of their management decisions on other water users, their current collaboration with other water users, and, finally, their beliefs about working with the state and other water users to manage their water resources.

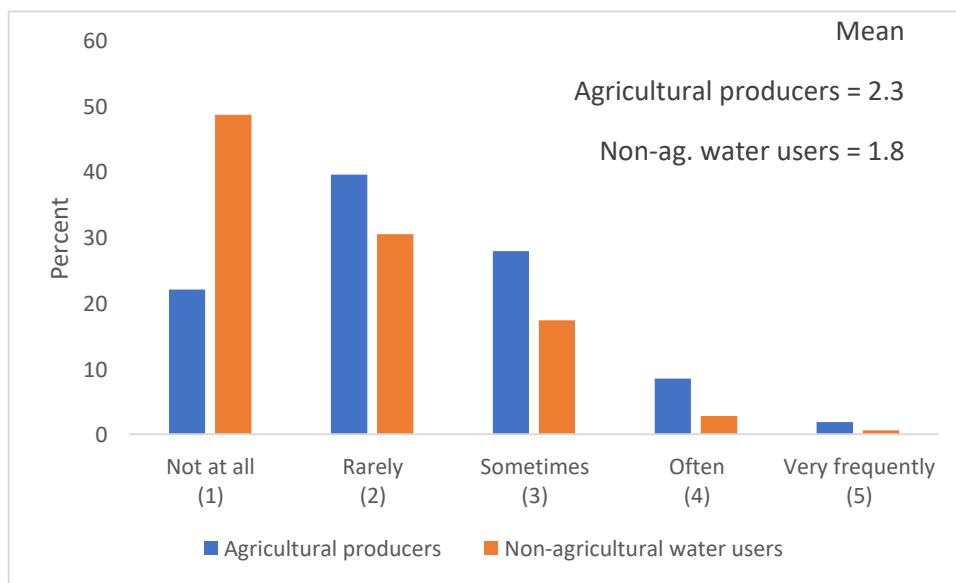


Figure 5: Frequency of Communication with Others in Watershed

Overall, one third of respondents said that they do not talk with others at all, and for those who did report communicating, 60% said they only rarely or sometimes talk with others (Figure 6). Only 7% of respondents said that they talk with others often or very frequently about water use. Agricultural producers reported a greater frequency of communication with other water users in their watershed ($M = 2.3, 0.97$) compared to non-agricultural water users ($M = 1.8, SD = 0.88; t = 8.15, p < 0.01$).

Respondents were also asked to describe who they talked to about water management in their watershed. Most respondents reported speaking to others who use water for similar purposes, while some respondents reported speaking with water users unlike themselves. There were no discernable communication patterns connecting certain water user types with others.

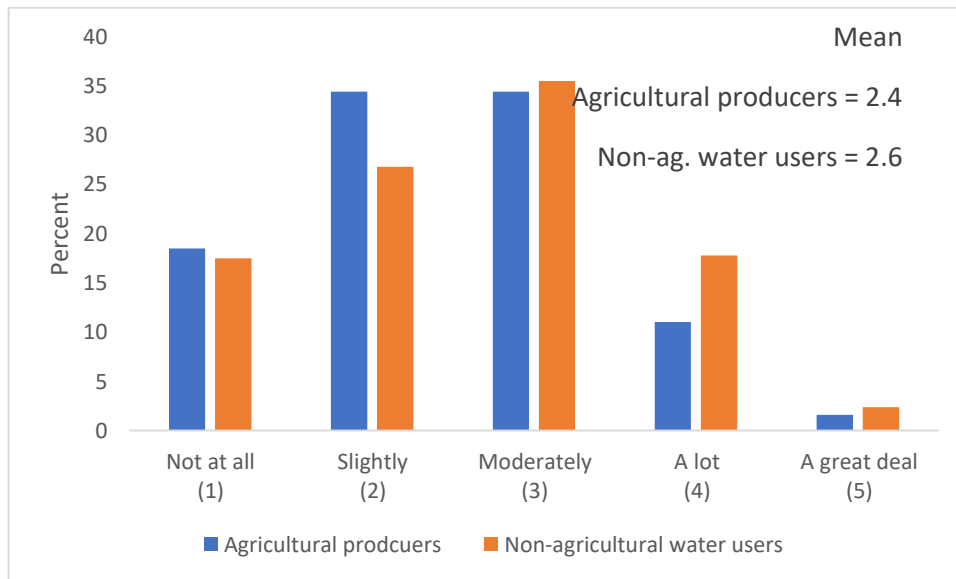


Figure 6: Extent to which water users believed having conversations about water management with others could improve their relationship

Most respondents believed having conversations with others about water management would improve relationships to some degree, though 18% said that conversations would not improve relationships at all (Figure 7). At the other end of the spectrum, 16% said that conversations would improve relationships a lot or a great deal. The remaining 66% believed that conversations about water management would improve relationships slightly or moderately. Non-agricultural water users were more likely to believe that having conversations about management may improve relationships ($M = 2.6, SD = 1.04$) compared to agricultural producers ($M = 2.4, SD = 0.97; t = 2.47, p < 0.05$).

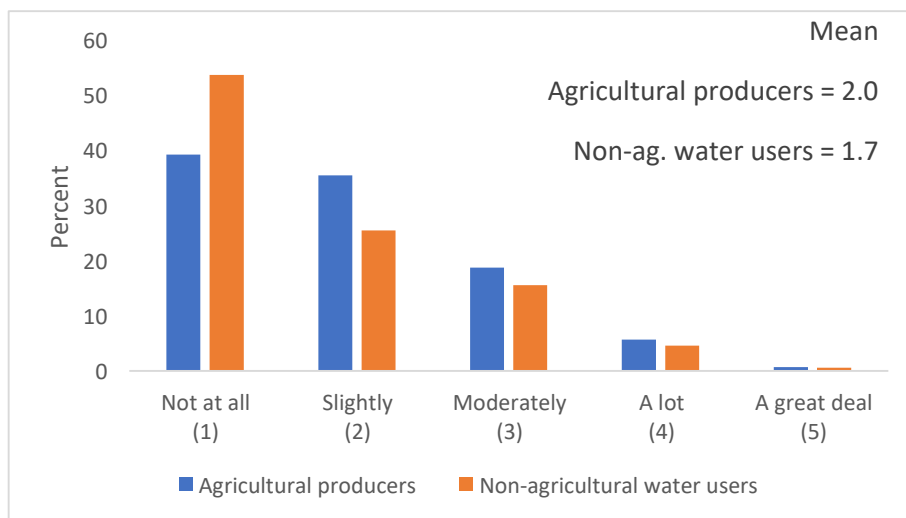


Figure 7: Extent to which water users believed having conversations about water management with others could harm their relationship

Respondents believed that having conversations about water management would not harm their relationships with other water users (Figure 8). Nearly half (46%) said that conversations would not harm relationships at all, and only 6% believed that conversations would harm relationships a lot or a great deal. Agricultural producers

were more likely to believe that conversations about water management could harm relationships ($M = 2.0, SD = 0.93$) compared to non-agricultural water users ($M = 1.7, SD = 0.93; t = 2.91, p < 0.01$).

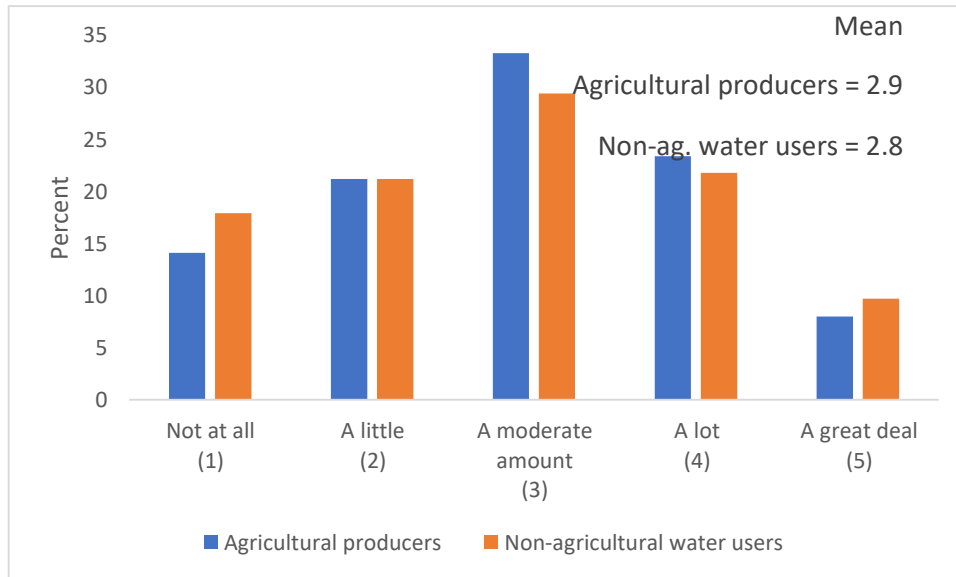


Figure 8: Perceived Interdependence of Water Use

Perceived interdependence of water use—the belief that one’s own water use affects and is affected by the use of others—influences resource users’ willingness to collaborate. Respondents were fairly evenly distributed on this subject (Figure 9). Sixteen percent of water users believed there is no interdependence of water use, while 9% of respondents believed that there is a great deal of interdependence amongst water users. Most respondents (75%) believed that there is at least some amount of interdependence. There was no difference between agricultural ($M = 2.9, SD = 0.82$) and non-agricultural water users ($M = 2.8, SD = 0.84$) in their perceived interdependence of water use ($t = 1.05, p > 0.05$).

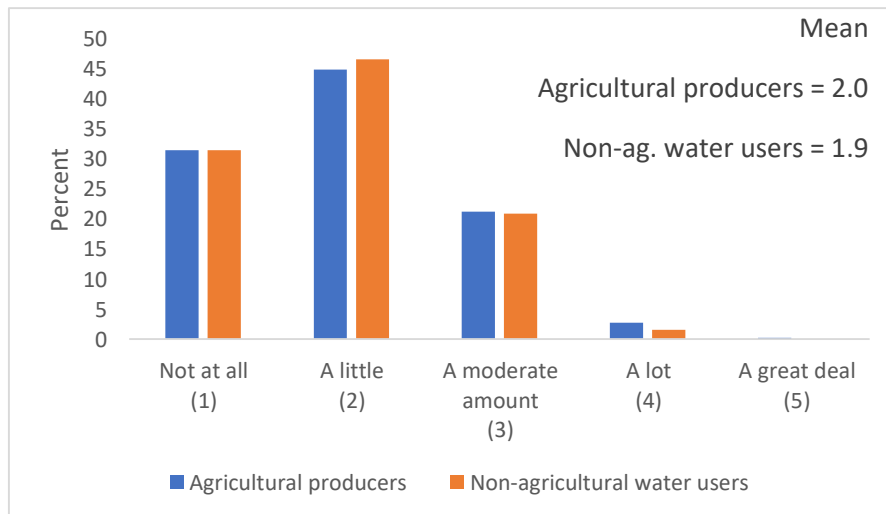


Figure 9: Extent of current cooperation among water users

Establishing new working groups such as a WUC can be a significant challenge without a history of cooperation. Currently, respondents reported very little cooperation among other water users (Figure 10). Overall, 32%

claimed that water users do not work together at all, and only 2% said they work together a lot. The remaining 66% of respondents said that water users work together a little or a moderate amount. There is no difference between agricultural ($M = 2.0, SD = 0.81$) and non-agricultural water users ($M = 1.9, SD = 0.76$) in their beliefs about the extent of cooperation among water users regarding water management ($t = 0.59, p > 0.05$).

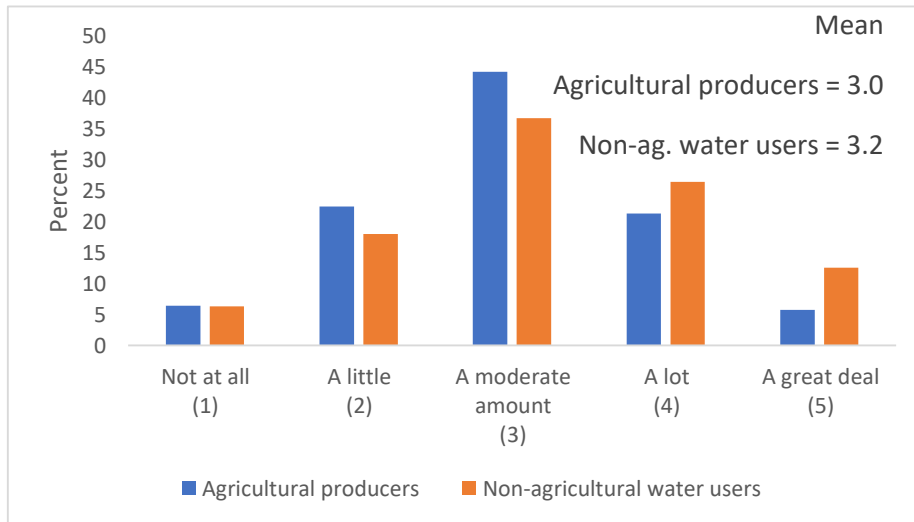


Figure 10: Beliefs about how much they should work together

However, when respondents were asked how much they think water users *should* work with other water users (Figure 11), most believed that water users should work together, at least a little bit, with only 6% saying that they should not work together at all. Overall, nearly a third (32%) said that water users should work together a lot or a great deal, and the remaining 62% said they should work together a little or a moderate amount. Non-agricultural water users are more likely to believe that water users should work together ($M = 3.2, SD = 1.08$) compared to agricultural producers ($M = 3.0, SD = 0.96; t = 3.51, p < 0.01$).

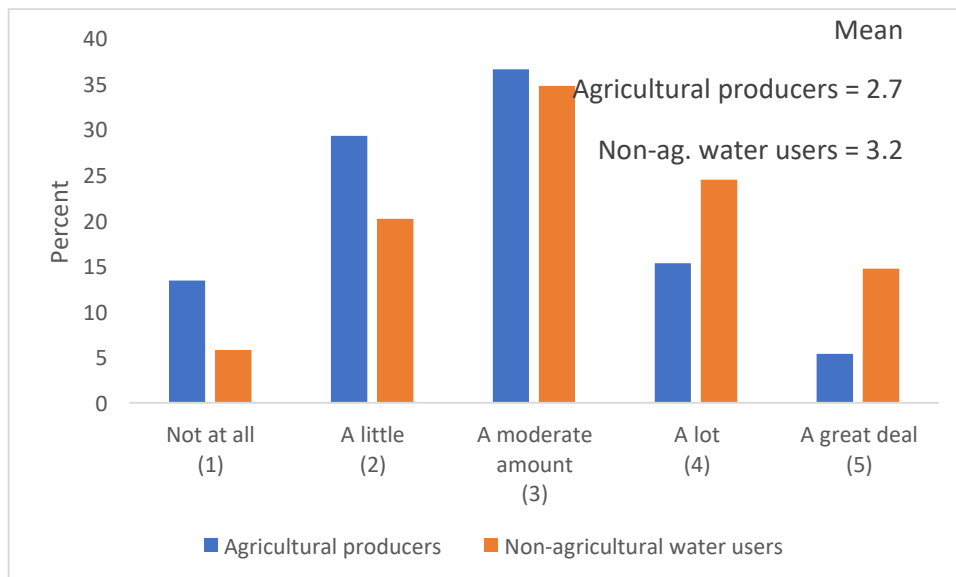


Figure 11: Water users' beliefs about the extent to which they should work with the state

Respondents were slightly less supportive when it came to working together with the state, with 10% saying they should not work with the state at all (Figure 12). A little less than one third (29%) said water users should work with the state a lot or a great deal, and the remaining 61% believed they should work with the state a little to a moderate amount. Non-agricultural water users were more likely to believe that water users should work with the state to manage resources ($M = 3.2, SD = 1.11$) compared to agricultural producers ($M = 2.7, SD = 1.05; t = 6.48, p < 0.01$).

Knowledge of Water Policy

This section of the survey explored the extent to which water users are familiar with policies that affect their ability to access and use water resources and establishes a baseline measurement of water users’ knowledge of water law and policy in Michigan. For water users to participate in WUCs, it is important they understand the policy landscape that sets limitations on what they can and cannot do as a diverse, multistakeholder group.

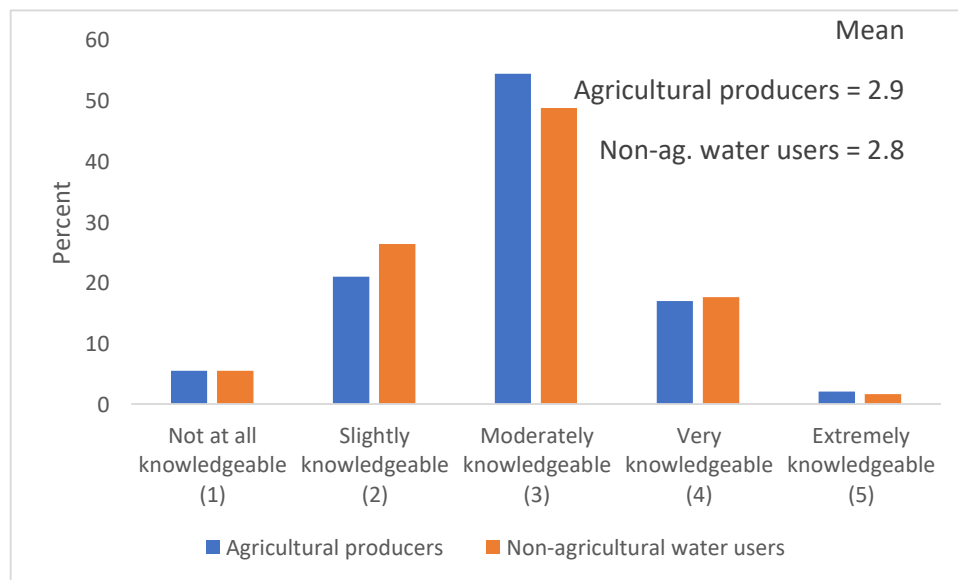


Figure 12: Self-reported Knowledge of Water Policy in General

Few respondents claimed no (6%) or extreme (2%) knowledge of Michigan water policies (Figure 13). The majority said they were slightly (23%), moderately (52%), or very knowledgeable (17%). There was no difference between agricultural producers ($M = 2.9, SD = 1.15$) and non-agricultural water users ($M = 2.8, SD = 1.51$) in their reported degree of Michigan water policy knowledge ($t = 0.70, p > 0.05$).

After asking respondents how knowledgeable they felt about water policy in general, we then asked how familiar they were with several specific aspects of water policy, beginning with the 2008 Great Lakes-St. Lawrence River Basin Water Resources Compact. It was Michigan’s implementation of the Compact that created the state policy granting water users the right to form WUCs for collaboratively managing resources at the watershed level.

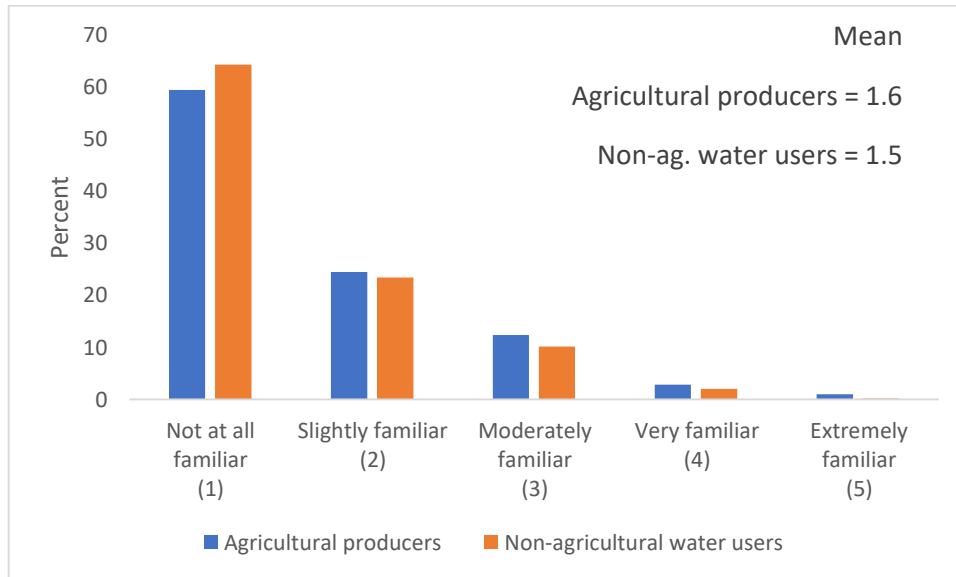


Figure 13: Familiarity with the Great Lakes Compact

Almost two-thirds of all water users were “not at all familiar” with the Compact (Figure 14). For those who reported at least some familiarity, most were only slightly familiar (24%) and almost no one (1%) said that they were extremely familiar. Agricultural producers were more likely to report familiarity with the Compact ($M = 1.6, SD = 0.88$) compared to non-agricultural water users ($M = 1.5, SD = 0.78; t = 2.0, p < 0.05$).

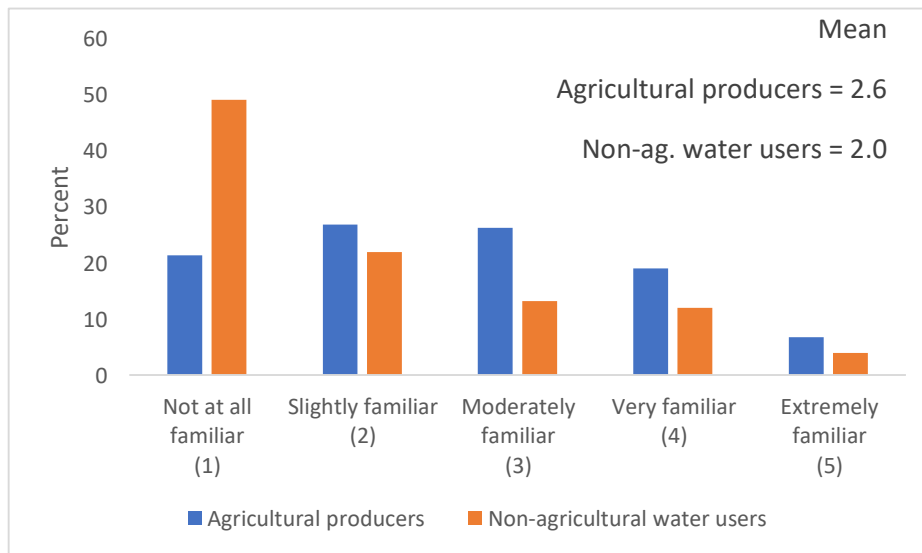


Figure 14: Familiarity with the Water Withdrawal Assessment Tool

The Water Withdrawal Assessment Tool (WWAT) is used by the state of Michigan to make registration decisions. All large quantity water users are required to use the WWAT to screen proposed new or expanded withdrawals before withdrawals are registered by the state. Respondents reported greater familiarity with the WWAT than the Compact, although one third (33%) still said they are not at all familiar with the WWAT (Figure 15). This lack of familiarity with the WWAT may be explained by the fact that water users often have well drillers, or other parties, submit registration applications for them. Still, nearly half (45%) said that they were at least slightly or

moderately familiar with the WWAT. Agricultural producers were more familiar with the WWAT ($M = 2.6, SD = 1.20$) than non-agricultural water users ($M = 2.0, SD = 1.21; t = 7.69, p < 0.01$).

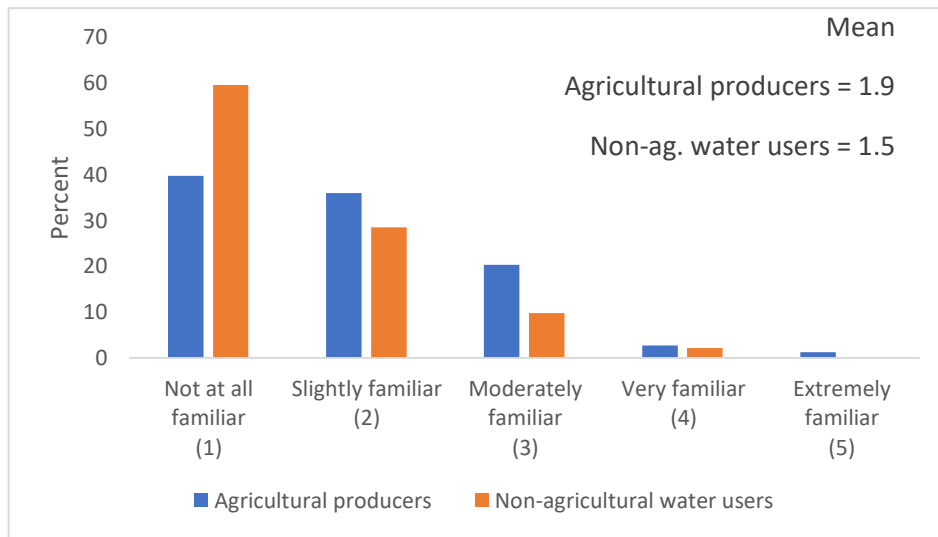


Figure 15: Familiarity with Adverse Resource Impacts

Almost all respondents were unfamiliar with the concept of Adverse Resource Impacts (ARIs), which are triggered when the maximum allowable reduction in stream flow is reached and characteristic fish populations are threatened. Almost half (48%) of the respondents were not at all knowledgeable, and only 3% claimed to be very or extremely knowledgeable of ARI's (Figure 16). Agricultural producers were more familiar with ARI's ($M = 1.9, SD = 0.90$) than non-agricultural water users ($M = 1.5, SD = 0.76; t = 6.18, p < 0.01$).

Finally, respondents were asked whether they knew what zone their wells were in. The WWAT designates a zone based on how close a watershed is to established withdrawal limits. Zone A indicates the watershed is far away from reaching the limit, whereas Zone D indicates the watershed is at the limit. *Ninety-two percent of respondents either did not know or chose not to answer this question.*

Water User Committees: Benefits and Barriers

This section of the survey focused on water users' familiarity with WUCs, specifically, and explored the perceived benefits and barriers to participating in one. We first provided respondents with a brief description of how WUCs were created through Michigan's implementation of the Compact, what power participation in WUCs may convey to water users, and the scenarios under which WUCs could be initiated.

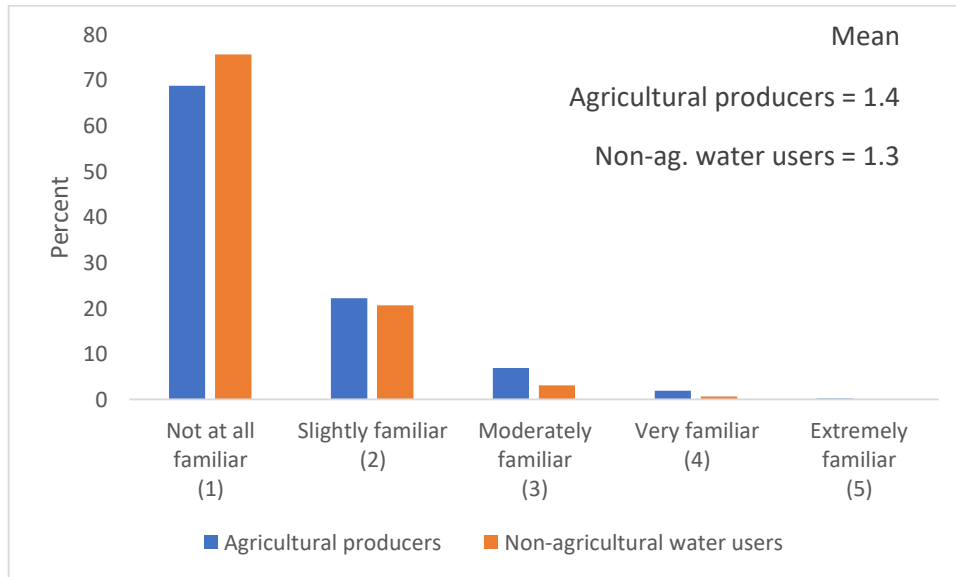


Figure 16: Familiarity with Water User Committees

Not surprisingly, very few respondents were familiar with WUCs (Figure 18). Almost three quarters (72%) said that they were not familiar with WUCs at all. For those who reported some degree of familiarity, the extent of that familiarity was low, with 21% slightly familiar with the policy and only 2% very or extremely familiar with WUCs. Agricultural producers were more likely to be familiar with WUCs ($M = 1.4, SD = 0.72$) compared to non-agricultural water users ($M = 1.3, SD = 0.55; t = 3.0, p < 0.01$).

Next, respondents were given a hypothetical scenario where a water user in their watershed was denied a withdrawal. Under Michigan water policy, the water user has the opportunity to attempt to change this result. They can bring litigation based on their riparian rights or attempt to convene a WUC. This would entail approaching other water users in their watershed to get together and find ways to increase stream baseflow in such a way that the new user's intended withdrawal can be approved. After reading this scenario, respondents were asked how likely they would be to join the WUC if approached by a water user who was denied a withdrawal.

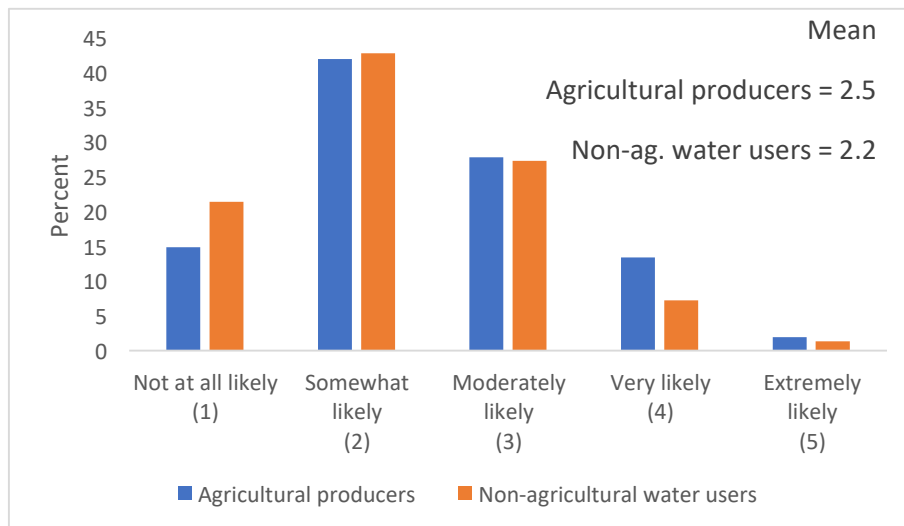


Figure 17: Likelihood of Joining a Water User Committee

Although a large percentage of respondents were originally unfamiliar with WUCs before being introduced to the concept through this survey, after learning about the policy, respondents said they would be at least somewhat likely to join a WUC (Figure 19). While 18% said that they were not at all likely to participate, 13% said they would be very or extremely likely to participate. Most respondents said they were either somewhat (42%) or moderately likely (27%) to participate. Agricultural producers reported a greater likelihood of joining a WUC ($M = 2.5, SD = 0.96$) compared to non-agricultural water users ($M = 2.2, SD = 0.92; t = 2.9, p < 0.01$).

When respondents were asked to explain why they would or would not join a WUC, they offered several reasons. For both agricultural producers and non-agricultural water users, the main purpose for joining a WUC was to understand the reason for a denial in the watershed (26%). Additionally, both groups said they would join a WUC to be a good neighbor (13.6%) and because they face similar vulnerabilities as other water users in their watershed (14.9%).

For both agricultural producers and non-agricultural water users, time constraints were the biggest barrier to joining a WUC (42%). Lack of knowledge and expertise to do what is required to participate in a WUC (16.3%) was also reported as a major barrier. Respondents also said that participating in a WUC may negatively affect their ability to use water because accommodating others may imply a reduction in water use on their part (10.5%).

Trust

The final section of the survey explored the degree to which water users trust online tools approved by the state (such as the WWAT) to make management decisions, the extent to which they trust the state, and the extent to which they trust other water users to use water responsibly. Trust is a critical component of successful collaboration because it builds confidence and positive attitudes between participants, encourages the development of mutual understandings, inspires open dialogue and conflict resolution, and improves the overall performance of collaborative activities (Ran and Qi, 2019).

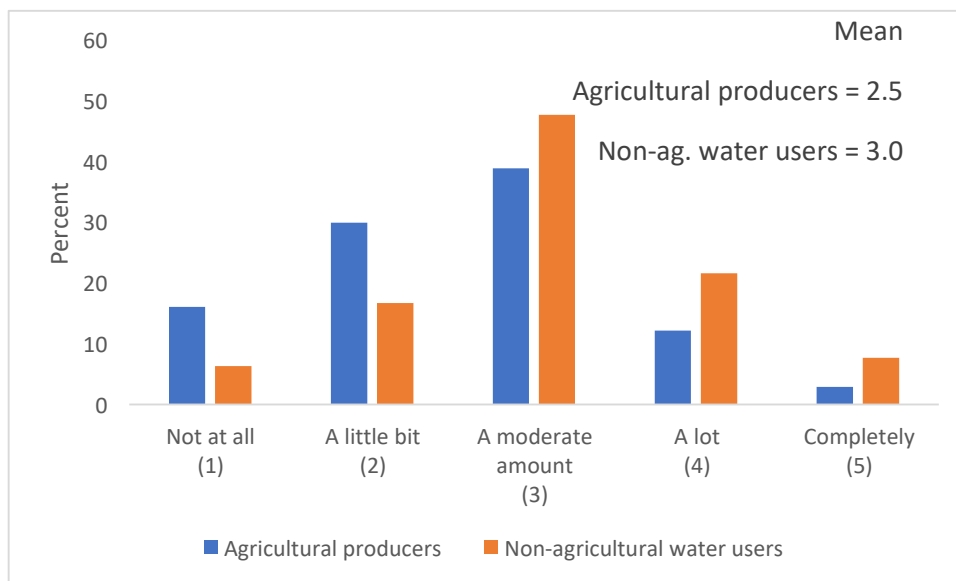


Figure 18: Trust in the Water Withdrawal Assessment Tool

Forty-three percent of water users overall had a moderate amount of trust in the science behind the WWAT, while 13% reported not trusting it at all (Figure 20). Non-agricultural water users were more likely to trust the WWAT ($M = 3.0, SD = 0.97$) compared to agricultural producers ($M = 2.5, SD = 0.99; t = 6.26, p < 0.01$).

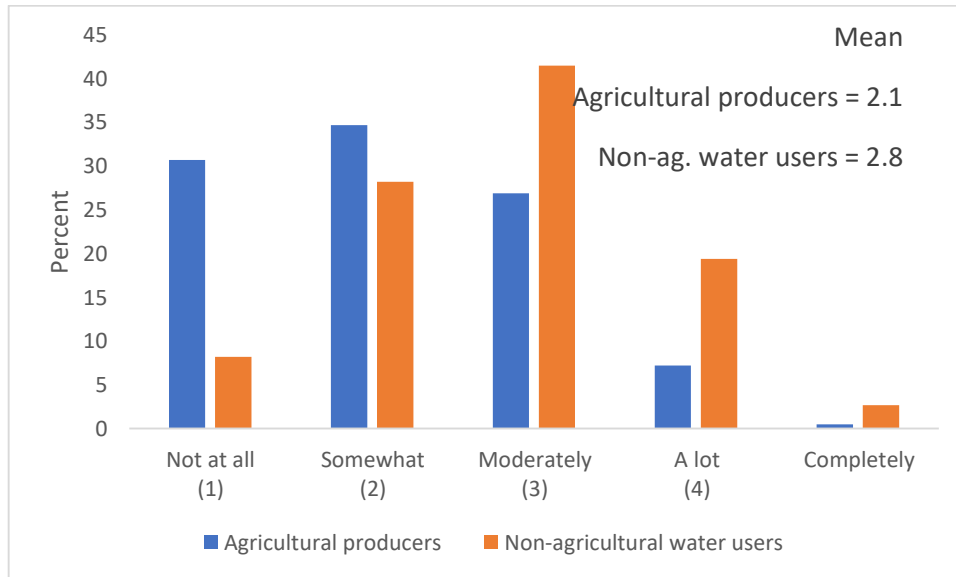


Figure 19: Water Users' Trust in State Water Management

In order for water users to willingly participate in WUCs, trust in state policies that cap withdrawals, while at the same time providing the opportunity for water users to manage shared resources within the cap, is crucial. Overall, the majority (65.7%) of water users said they trust the state somewhat or a moderate amount, while 21% said that they do not trust the state to manage water resources at all. (Figure 21). Non-agricultural water users are more likely to report trusting the state to manage water ($M = 2.8, SD = 0.94$) compared to agricultural producers ($M = 2.1, SD = 0.95; t = 9.31, p < 0.01$).

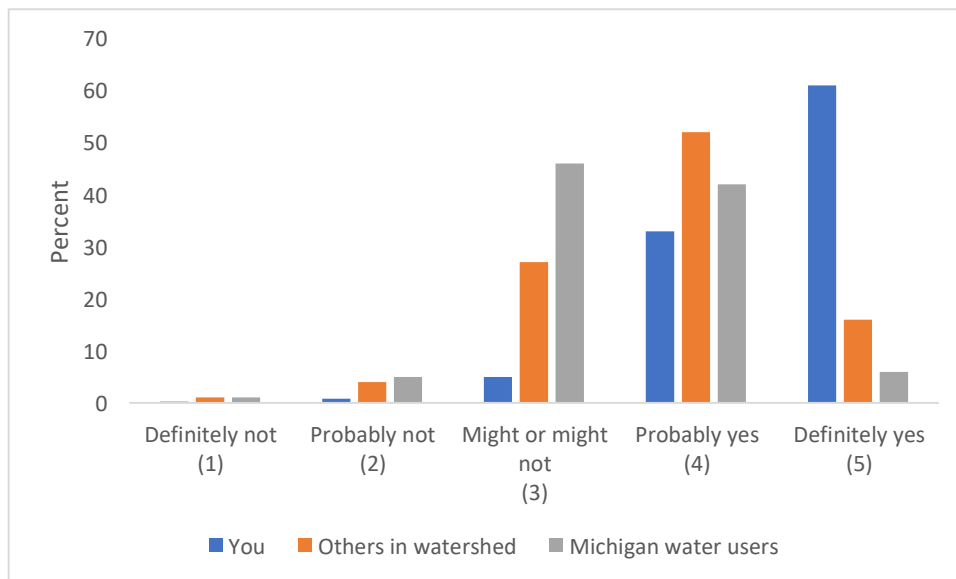


Figure 20: Perceptions of Responsible Water Use by Water Users

In general, respondents felt that they were using water responsibly and that those around them did, too (Figure 22). While they were less sure about water users outside their own watershed, overall, very few respondents believed that others *were not* using water responsibly, showing a general sense of trust in other water users' ability to manage their water resources responsibly.

Conclusion

Michigan's large quantity water users reported some potential benefits and several significant barriers to collaboratively managing water at a local level. Overall, several factors known to facilitate collaboration, such as a perception of water scarcity and trust in the state government, are in short supply. However, Michigan water users did recognize water as a common pool resource that should be managed with some level of cooperation and expressed openness to discussing management options with their neighbors. Respondents to this survey also highlighted logistical challenges to working together, most notably a limited amount of time.

Two prerequisites for collaborative water management are a belief that water is a shared resource and that working together to manage it will not harm one's relationship with others. Respondents largely recognized that surface water and groundwater resources in Michigan are an important common pool resource and generally agreed that they *should* be talking and cooperating with their neighbors more about managing it. A desire to be a "good neighbor" was a common reason given by those in favor of collaboration. Together, this data suggests that social norms for community and collaboration are present and can be drawn on when trying to convene a WUC.

Additionally, respondents believed that having more conversations with others about water management could improve relationships with other water users. Earlier research done in Kansas showed that talking about one's water usage shifted it from a taboo topic to one that was viewed as a positive group learning experience (Zwickle et al., 2021). Farmers in Kansas showed that water users can shift from a history of individualistic water management to a more collaborative approach. Our final WUC guide will draw from past research on collaborative governance to support and encourage positive, productive conversations among water users and will incorporate proven techniques such as participatory modeling exercises to help them pursue agreement on a set of shared goals.

Michigan water policy is exceedingly complex, and while respondents believed that they were at least somewhat knowledgeable about the rules that govern water use in the state, they were unfamiliar with those aspects that are particularly relevant to WUCs including the Great Lakes-St. Lawrence River Basin Water Compact, the Water Withdrawal Assessment Tool, and Adverse Resource Impacts. Increasing knowledge of the purpose behind water policy will also address some commonly held concerns among water users. For example, water users frequently mentioned diversions outside the Great Lakes as a risk to Michigan's water, but the Compact is a multi-state agreement created to specifically address this threat. Including such baseline knowledge of water policy will be important to fostering collaboration and may also help to increase trust in those state agencies tasked with enacting these policies.

Unsurprisingly, respondents were also unfamiliar with Water User Committees. Once they were introduced to the concept through a hypothetical scenario, however, most water users said they would participate in such a group for several reasons: to understand the basis for a denial in the watershed, to be a good neighbor, and because they faced similar vulnerabilities. These collectively oriented motivations may encourage water users to engage in the formation of a WUC if other persistent obstacles such as lack of time and inexperience with collaboration are addressed. Providing funds for a skilled, local facilitator to lead organization efforts will alleviate this burden from water users who lack the time, resources, and motivation to do so in the early stages of a WUC. These facilitators should be trusted members of the community. If this is not possible, they should be chosen from an established third party, such as an extension agent, to maximize users' trust in the process.

Finally, trust in the state is a major barrier given by respondents to forming a WUC, with 20% of respondents reporting they do not trust the state "at all" to manage water responsibly. However, an overwhelming majority of respondents were very likely to believe that they and their neighbors in their watershed did use water

responsibly. WUCs can be promoted and implemented as a way to strike a balance between local decision-making and governmental oversight. These localized WUCs will have the opportunity to craft management plans that are tailored to their specific needs and hydrogeological characteristics.

The next steps in this research project are to apply the findings from this survey to two case study WUCs in the fall of 2023. These groups will be convened and led by a trusted, local facilitator. The facilitator will utilize the first draft of the WUC Guide to help navigate the group through a process that develops systems thinking, engages participatory modeling, and utilizes a suite of water management options and online tools to arrive at a measurable, shared management solution within the framework set by Michigan water policy. At the conclusion of these case studies, the WUC Guide will be revisited and revised based on feedback from the participants and the facilitator.

Questions and Comments?

If you would like to comment on any of the findings presented here, or have questions, please contact:

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