COMMUNICATING RISK AND INCREASING CIVIC ENGAGEMENT IN WATER PROTECTION IN MINNESOTA

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ABSTRACT

Forty percent of Minnesota lakes and rivers are classified as “impaired bodies.” The extent of water problems is far-reaching; each of Minnesota’s 87 counties has an impaired river, lake, or stream. Despite the magnitude of Minnesota’s water problems, water protection and restoration initiatives primarily have been agency-driven and technology-centered. Though new programs are touting a more collaborative watershed management approach, true civic engagement is needed to identify and solve water issues that span multiple jurisdictions and land uses. Engaging residents in water protection increases the success of a project, builds trust between residents and local agencies, and sets future projects up for greater public support. Despite all these benefits, the question of how to get residents involved in water management persists. Minnesotans value clean water and water provides multiple cultural services on which residents depend. Given these water values and benefits, how do residents perceive water in the state? Do perceptions of water quality and beliefs about water problems influence civic engagement in water? Using an integrated model of the Risk Information Seeking and Processing framework and Norm Activation Theory, I analyze data collected through a statewide survey of Minnesota residents to determine the influence of perceptions of water risk, experience with water, perceived information sufficiency, self-efficacy, socio-demographics, and social and personal norms on civic engagement in water. The integrated model explained 24% of variance in civic engagement in Minnesota residents, with information sufficiency and relevant water experience being the strongest predictors. This suggests that residents may need a stronger personal connection to water issues to get involved in protection efforts. Study findings will help to inform future outreach and risk communication strategies to develop pro-environmental behaviors in Minnesota residents.

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CHAPTER 1

INTRODUCTION

Water quality has long been a challenge for policy makers, resource managers, and agricultural producers across the United States. Traditional top-down agency approaches have come under increasing scrutiny as the complexity of water problems has become clearer. Collaborative watershed management was developed in response to the widespread, far-reaching problem of water issues in the United States. In the past, remediation efforts have been directed towards point-source discharges into water bodies, resulting in legislation such as the Clean Water Act (1972). However, water quality issues in the United States have since revealed themselves to be much more complex. An agricultural pollutant in the northern United States can be picked up in surface runoff and carried hundreds of miles across the landscape to ultimately arrive in the Gulf of Mexico.

Minnesota, despite being the headwaters of three major watersheds (the Mississippi, Great Lakes, and Red River watersheds), is not immune to these water problems. Forty percent of assessed Minnesota lakes and rivers are classified by the Minnesota Pollution Control Agency as “impaired bodies,” and an estimated 86% of the state’s water pollution stems from widely dispersed sources (MPCA, 2018a, 2018b). The extent of Minnesota’s water problems is far-reaching; each of Minnesota’s 87 counties has an impaired river, lake, or stream (MPCA, 2018a).

Assuming it were possible to identify all sources of a lake’s impairments, remediation is still complicated. Seventy-five percent of Minnesota’s land area is privately owned and jurisdiction over land uses is complex. An impaired lake in

Minneapolis, for example, could be under the jurisdiction of the City of Minneapolis, Hennepin County, the Department of Natural Resources, a local Soil and Water Conservation District, a local watershed district or the Minnesota Pollution Control Agency. While all state and local agencies have the common goal of clean water, their priorities for clean water vary, they often lack coordination and attempts to inspire meaningful community engagement have fell short. . In addition, current management efforts are likely to be focused on a solution for a particular water body, rather than broadly looking at the watershed-level stressors.

Collaborative watershed management examines all sources and solutions within a watershed. Collaborative watershed management and its key tenet, civic engagement, allows for a bottom-up approach that includes residents throughout the process, rather than solely asking for their opinions after all policies and rules have been drafted. In this process, residents are treated not only as consumers of water resources, but also as environmental managers whose decisions have significant direct or indirect impacts on the environment (Morton & Brown, 2011; Sabatier et al., 2005). Engaging residents in water protection has proven to increase the success of a project and build trust between residents and agencies to set up future projects for greater support (Prokopy & Floress, 2011).

This study examines how perceptions of water problems in Minnesota and experiences with water influence residents' engagement in water protection. Many past studies have examined who gets involved in environmental and water protection, but fewer have examined why they get involved. By integrating Griffin, Dunwoody, and Neuwirth's Risk Information Seeking and Processing model (RISP) and Schwartz's Norm Activation Theory (NAT), this study examines how information about water issues,

experience with water, perceptions of threats to water, social and personal norms, self-efficacy, and sociodemographics impact civic engagement in water.

Study data were gathered using a statewide resident survey. The survey was administered via an 8-page, 25-item mail survey, and was sent to a geographically stratified random sample of 6000 Minnesota residents. The questionnaire included a variety of fixed-choice and scale questions that asked about residents' community, concerns about water, water protection, and sociodemographic information.

The overarching goal of this study was to answer the following questions:

1. What drives perceptions of water and water problems?
    a. Where do people get water information?
    b. Who or what influences them?
    c. Do sociodemographics matter?
2. How do perceptions of water quality and beliefs about problems affect civic engagement in water?

The survey instrument was developed with the goals of two broader research projects in mind. The first, funded by the Minnesota Clean Water Council, seeks to understand the true value of clean water to better account for the benefits of Clean Water Fund investments. The second, funded through the Environment and Natural Resources Trust Fund, asks the question "what are the public benefits of protecting sourcewater?" and similarly seeks to understand the value of clean water and community capacity to protect sourcewater in Minnesota.

This study contributes broadly to the body of knowledge around environmental decision making and pro-environmental behavior, and specifically to emerging theory

related to the drivers of civic engagement in conservation and water protection. Findings point to opportunities for agencies and resource managers to enhance communication and outreach programming in Minnesota communities. Understanding where Minnesotans get water information and how they are influenced by it, will inform and improve community engagement. This thesis is organized into three chapters. This, the first chapter, provides an overview of the study. The second chapter details study methodology and results. Chapter two is presented as a standalone manuscript intended for submission to peer-reviewed journal. The final chapter concludes with a discussion of study findings, practical implications, theoretical implications, and areas for further research.

CHAPTER 2

COMMUNICATING RISK AND INCREASING CIVIC ENGAGEMENT IN WATER PROTECTION IN MINNESOTA

Introduction

Forty percent of U.S. water bodies are impaired for human uses such as swimming or fishing (Environmental Protection Agency, 1996)**.** Similarly, in the "Land of 10,00 Lakes", forty percent of assessed Minnesota lakes and rivers are classified by the Minnesota Pollution Control Agency as "impaired bodies," and an estimated 86% of the state's water pollution stems from widely dispersed, or non-point sources (MPCA, 2018a, 2018b). The extent of Minnesota's water problems is far-reaching; each of Minnesota's 87 counties has an impaired river, lake, or stream (MPCA, 2018a).

The problem of water pollution in the United States is widespread. The United States has invested in reducing point source pollution from industrial and agricultural sources with much success. However, states report that nonpoint source pollution, from widely dispersed sources (Environmental Protection Agency, 2018)) is the leading cause of water body impairments (Environmental Protection Agency, 2017, 2018). These impairments have impacts on human health, wildlife, recreation, and aquatic life.

Water protection and restoration initiatives in Minnesota, like many states, primarily have been top-down or agency-driven and characterized by technical solutions that focus on water pollution in a particular stream segment or lake (Sabatier et al., 2005). Sabatier and colleagues' text on collaborative watershed management provides insights and critiques on traditional water protection solutions, and argues that technical solutions for water protection and restoration often do not capture the full extent of water

problems. Water problems or consequences typically do not align with jurisdictional boundaries, and the full scope of the state's water pollution is not captured in agency strategies that target one county or water body (MPCA, 2018b). Water problems affect Minnesota residents and visitors in multiple ways and identifying or isolating threats to human well-being and community health is complicated. While new programs exist that integrate a more collaborative approach, engagement with local communities is still needed to identify and solve all parts of the issue. Engaging residents in water protection has proven to increase the success of a project and build trust between residents and agencies to set up future projects for greater support.

The most comprehensive way to ensure that all sources and impacts are being addressed is collaborative watershed management, which examines all sources and solutions to an impairment within a watershed (Sabatier et al., 2005). Engaging with the community to identify and solve local water issues is key in this process. Residents are treated not only as a consumer of the resource, but also as a land manager whose decisions make an impact on the environment (Morton & Brown, 2011; Sabatier et al., 2005). The traditional approach involves agencies proposing and stakeholders voting on a rule or policy. The collaborative approach allows stakeholders to be involved in the proposal design and policy development process (Leach, 2006; Michaels, 2001; Sabatier et al., 2005). This approach also integrates civic engagement, or decision-making and collective action through citizen participation rather than authority or political weight (Fagotto & Fung, 2009).

Minnesota residents have proven that water quality and natural resources are important to their lifestyles. The Clean Water, Land, and Legacy Amendment passed by Minnesotans is used for water restoration and protection activities throughout the state

(Clean Water, Land, and Legacy Amendment, 2008). However, the role of civic engagement in this plan is limited. The Amendment includes the Social Measures Monitoring System (SMSS), with the goal of improving public participation and engagement, but there have been no sustained efforts to evaluate community outcomes and little social information has been gathered since the implementation of the SMSS (Clean Water Land & Legacy Amendment, 2018). Other strategies to get Minnesota residents engaged in water protection have been marginally more successful. For example, Governor Mark Dayton's "25 by 25" Water Quality Goal engaged residents throughout the state in a series of town halls to evaluate top concerns and improvement strategies related to water quality. Minnesotans proved again that clean water is important to them and impacts all parts of their lives, from business to recreation to human health. However, while residents' needs and priorities have been identified, there has been little initiative to engage them further (Dayton, 2017).

Many Minnesota residents are unaware of impairments or threats to water in their local communities, despite their overarching support for water resource protection (Davenport, Perry, Pradhananga, & Shepard, 2016). Moreover, research suggests that while residents may adopt certain water conservation behaviors individually, they are unlikely to talk to their neighbors or other members of the community about water issues (A. K. Pradhananga, Davenport, & Olson, 2015). In this study, I examine what drives and constrains civic engagement in Minnesota in collaborative watershed management. Studies have found that multiple cultural, institutional and physical barriers exist (A. K. Pradhananga, Davenport, & Green, 2019), as well as psychological barriers like motivations to engage (A. K. Pradhananga et al., 2019, 2015). Here I explore motivations to engage civically and in particular risk perceptions as a driver of civic

engagement. Do perceptions of water or experiences with water affect water-related behaviors, including civic engagement in water? In this study, I examine Minnesota residents' perceptions of water and the influence of perceptions on their engagement in clean water actions. Specifically I ask, how do perceptions of water quality and beliefs about water problems affect a resident's engagement in civic water actions and initiatives? Data for this study were gathered through a statewide Minnesota resident survey.

Related Literature

What is civic engagement and how does it affect water management?

Fagotto and Fung (2009) define civic engagement as "making public decisions and taking collective actions through processes that involve discussion, reasoning, and citizen participation rather than through the exercise of authority, expertise, status, political weight, or other such forms of power." In collaborative watershed management, civic engagement takes the form of a face-to-face exchange of information and problem solving that includes community stakeholders and decision-makers to come up with creative, win-win solutions to this complex problem (Koontz & Newig, 2014; Sabatier et al., 2005). Engaging a community can be more time-consuming than the traditional approach of drafting and voting on a policy, there are countless benefits that may ultimately increase a project's likelihood of success (Michaels, 2001; Prokopy & Floress, 2011; Sabatier et al., 2005).

While it may challenging for local decision-makers to give up their power to citizen groups, studies have proven that engaging the community in this process can set up a project for success. Citizen engagement can be the difference in whether the goals

of a project meet the needs of a community, whether a project will attract participants, and whether a project will succeed in the long-term (Prokopy & Floress, 2011). Civic engagement in social issues builds trust in the community, and builds the behavioral patterns needed to address future problems more successfully (Leach, 2006; Sabatier et al., 2005). Increased trust in the community also can increase support for regulations surrounding water protection initiatives, as well as increase social capital to help stakeholder groups accomplish a wide variety of tasks (Lubell et al., 2005).

Civic engagement can increase the effectiveness of water protection and restoration plans. A study of community-based environmental stewardship in Portland found that involving citizens throughout the stormwater remediation planning and implementation process enhanced the riparian canopy, and allowed community members to establish a connection between their own actions and the environment around them (Shandas & Messer, 2008)**.** Similarly**,** a study conducted in Ohio and West Virginia found that when collaborative watershed groups are involved, there is an increased likelihood of implementation of total maximum daily loads (TMDLs). However, the study also found that the challenge is not only in implementing the TMDLs, but in developing collaborative watershed management efforts (Hoornbeek, Hansen, Ringquist, & Carlson, 2013). Of the watersheds with EPA-approved TMDLs, 43% had not pursued collaborative management approaches, despite them being the only effective mechanism at the federal level (Hoornbeek et al., 2013). While the benefits have been examined, the question of how to engage people in pro-environmental behavior and civic action still persists.

Who engages in water and why?

Studies find that income, education, gender, geographic location, and age often predict *who* is engaged in community issues (Larson & Lach, 2008; Manzo & Weinstein, 1987; Martinez & McMullin, 2004; Smith, 1994). However, *why* citizens participate is a growing area of study. Hines, Hungerford, and Tomera (1987) found that the variables most associated with responsible environmental behavior were knowledge of issues, knowledge of action strategies, locus of control, attitudes, verbal commitment, an individual's sense of responsibility, and situational factors. Norm activation theory (NAT) (Schwartz, 1973) integrates these similar variables, and proposes that since environmental and ecosystem services are a public good, personal moral norms must be activated to avert any harmful environmental consequences of one's behavior (Schwartz, 1973; Stern, 2000) (Appendix E). In civic engagement and environmental action, norms become activated when an individual becomes aware of the consequences of not acting, and believes that they have control over the action that will eventually make a difference (A. K. Pradhananga et al., 2015; Schwartz, 1973).

Personal experience with an environmental risk or hazard can also serve as a guide for an individual who is deciding how to think, behave, or communicate in a situation (Griffin, Dunwoody, & Neuwirth, 1999). The Risk Information Seeking and Processing model (RISP) proposed by Griffin, Dunwoody, & Neuwirth (1999), proposes that individual characteristics, perceptions, and external pressures all influence the extent to which an individual will seek out and critically analyze risk information (Appendix D). The information-seeking strategies that people apply make a difference in what messages they take away, and how those messages impact their future behaviors (Kahlor, 2011).

Griffin examines the variables that determine whether an individual undergoes deeper, systematic processing. Those who undergo systematic processing are more likely to develop stable attitudes towards the topic and are more resistant to change than those who only go through heuristic processing (Kahlor, Dunwoody, Griffin, & Neuwirth, 2006). Demographic and sociocultural characteristics, perceived hazard characteristics, relevant hazard experience, informational subjective norms, information sufficiency, and perceived information gathering capacity all determine whether an individual will pursue deeper processing effort about a risk.

The RISP model was originally developed to evaluate the development and maintenance of preventative health behaviors. However, several studies have successfully applied the model to environmental risk information (Kahlor, 2011; Yang, Rickard, Harrison, & Seo, 2014). Studies have successfully integrated other models such as Ajzen's Theory of Planned Behavior (Ajzen, 1991; Kahlor, 2011) in an effort to extend the TPB to information seeking as the variable or behavior of interest. Most RISP applications evaluate personal risk (e.g., public health issues such as contaminated food), rather than environmental risk, which for some may be a less immediate personal issue. In applications of impersonal risk, studies found that informational subjective norms (the knowledge a person believes they would be expected to hold about the risk) play a more powerful role, and are not only related to information insufficiency but also to information seeking and processing directly (Kahlor et al., 2006). Overall, the study found that the RISP model holds up when applied to impersonal risk. The results suggest that communicators of impersonal risk can use the RISP model as a guide in developing strategic communication (Kahlor, 2011; Kahlor et al., 2006).

Conceptual Model

Based on the literature outlined above, a conceptual model is proposed to determine the influence that multiple independent variables have on engagement with an issue. The conceptual model (Figure 1) draws on NAT, RISP and the model of responsible behavior (Griffin et al., 1999; Hines, Hungerford, & Tomera, 1987; Schwartz, 1973) to examine determinants of civic engagement: Information sufficiency, social and personal norms, perceived hazard characteristics, relevant water experience, self-efficacy and demographic information. In our conceptual framework, relevant water experience is used in place of RISP's relevant hazard experience. This was our best available measure from our survey instrument, and could be interpreted as a measure of likelihood of having encountered a water hazard or threat. In the proposed framework, I hypothesize that each of the psychological and social determinants will have a positive relationship with an individual's civic engagement in water. I hypothesize that residents are more likely to be engaged in water protection if they are frequent visitors to water bodies (and therefore potentially see water issues firsthand), they are highly knowledgeable about water issues, they feel socially and personally obligated to engage in water resource issues, and they believe that water resources are at risk.

In developing the final study model, we first used a baseline model with all hypothesized independent variables relating to RISP and NAT regressed on the dependent aggregated civic engagement variable. Then we used stepwise deletion of independent variables to develop the final study model. Variables in the baseline model that were not significant predictors of civic engagement were removed, with the exception of survey items needed to maintain the integrity of the model and to answer our research questions.

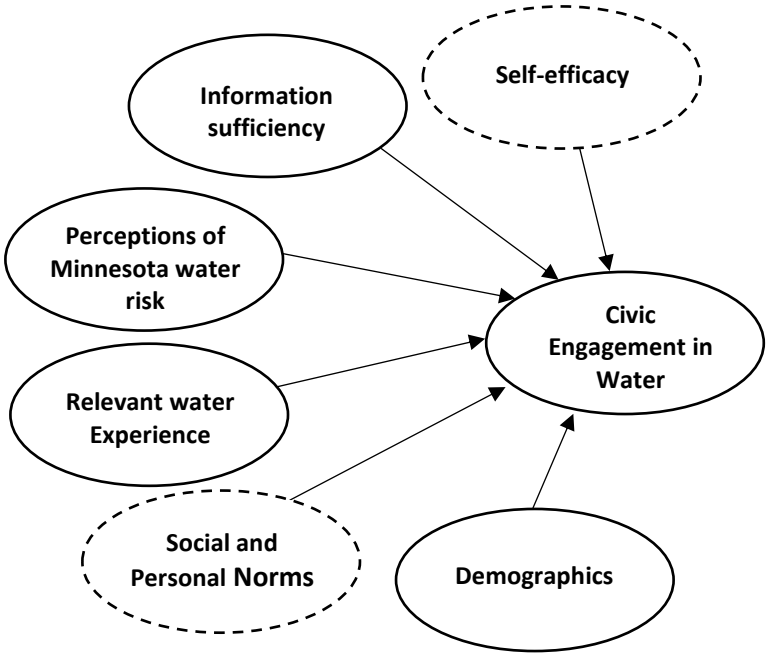


Figure 1. Study conceptual framework (RISP constructs outlined with solid lines, NAT constructs outlined with dashed lines).

Methods

The study was conducted to determine how Minnesota residents use and value water, perceive water risk, and engage in water-related behaviors. Data were collected using a self-administered mail survey, sent to a geographically stratified random sample of 6000 Minnesota residents. The sample was purchased from Survey Sampling International (SSI). The sampling strata are consistent with the Minnesota Soil and Water Conservation Districts. In each of the 8 districts, 750 residents were selected for participation to ensure that denser metropolitan areas are not overrepresented in our sample.

The questionnaire included a variety of fixed-choice and scale questions that asked about residents' community, concerns about water, water protection, and

sociodemographic information. Several strategies were used in questionnaire design to ensure question validity and boost questionnaire completion. Care was taken to ensure that items were technically accurate, not double-barreled, succinct, and clear and understandable. Each item required an actionable response from the participant so that participants could answer quickly and accurately. The study included three waves of mailing, and used an adapted version of Dillman et al.'s (2014) tailored design method. Each mailing included a cover letter, questionnaire, and a self-addressed postage-paid return envelope. The survey introduction page and cover letter described sponsors and goals for the survey. After the first wave of mailing, subsequent waves were sent to non-respondents only. An option to take the survey online was included in the cover letter of the survey. Survey questions were piloted with relevant stakeholders to assess the effectiveness of the questionnaire. The study was reviewed by the University of Minnesota's Institutional Review Board. Returned and completed questionnaire responses were coded and entered into a database. Data were analyzed using R (R Core Team, 2017) and Statistical Package for Social Sciences (IBM Corp., 2016).

Measures

Perceptions of risk and threats to water.

Perceptions of risk to water were measured using two items adapted from previous research (Amberson, Biedenweg, James, & Christie, 2016; A. Pradhananga, Fellows, & Davenport, 2018). Respondents rated the statements "water resources in Minnesota are at risk," "I am concerned about the consequences of water problems or pollution for people in my community," and "I am concerned about the consequences of water problems or pollution for local economies" on a 5-point Likert scale from *strongly disagree* to *strongly agree.*

The baseline model also asked about concern for the consequences for recreation opportunities, human health, and future generations. The baseline model included a question about pollutants in Minnesota; pollutants and water issues were measured using four items, “agricultural runoff,” “sediment in water bodies,” “urban runoff,” and “road salt runoff.” The response format was in a 4-point scale from “not a problem” to “severe problem,” and included a “don’t know” option.

Relevant water experience.

Respondents were also asked, “In the last twelve months, about how many times did you visit a lake, river, or stream in Minnesota in which visiting the water body was one of the primary purposes of your trip?” Options were “0 (I did not visit a water body),” “1-3,” “4-12,” “13-24,” and “25 or more.” Responses were analyzed using the lower bounds of each range (0, 1, 4, 13, and 25). In our conceptual framework, relevant water experience is used in place of RISP’s relevant hazard experience. The survey did not include any items that asked specifically about experiences with hazards to water.

Information sufficiency.

Information sufficiency was measured using items adapted from Pradhananga et al (2018). Respondents answered “how familiar are you with water issues in your local area?” on a 5-point scale from “not at all familiar” to “very familiar." In addition respondents answered “where do you get information on water-related issues?” by selecting from a list of 15 sources of information. Responses were dummy-coded into science-related sources of information (federal agencies/government, tribal agencies/government, state agencies/government, county agencies/government, city or township government, and university researchers/academic community), community-

related sources of information (family and friends, my neighbors), and a variable for residents that used both sources.

Social and personal norms.

Items used to measure social and personal norms were adapted from previous research (Davenport et al., 2016; A. Pradhananga et al., 2018) and measured personal and subjective norms in reference to water resource protection. Respondents rated the statements, “people in my community expect me to help protect water,” and “it is my responsibility to help protect water,” on a 5-point scale from “strongly disagree” to “strongly agree.” The baseline model also included the statement “residents in my area should be responsible for protecting water,” measured on the same 5-point scale.

Self-efficacy.

Self-efficacy was measured using the statement “residents in my community have the ability to work together to protect water resources,” adapted from Pradhananga et al (2015). Participants rated the statement on a 5-point scale from “strongly disagree” to “strongly agree.” The baseline model also included the question “how important are the following qualities of a community to you?” in regards to “opportunities to be involved in community projects.”

Sociodemographics.

The baseline model included education (“What is the highest level of formal education you have completed?”), age (“In what year were you born?”), gender (“How do you describe yourself?”), and income (“Which of the following best describes your total household income from all sources in 2017 before taxes?”). In the final study model,

education was the only demographic included. Past studies have found that education is consistently the strongest demographic predictor of volunteer participation (Smith, 1994).

Engagement in civic water action.

Engagement in water action, the dependent variable, was measured using four items adapted from (Kahlor et al., 2006; A. K. Pradhananga et al., 2015). Respondents were asked “have you engaged in the following actions or initiatives in the past 12 months? If yes, how often did you engage in the action or initiative?” Respondents answered “yes” or “no” to the first question, and if they marked yes, picked one of four options: “every few months,” “once a month,” “every two weeks,” “weekly or more.” Items used for this construct were “heard about a water resource protection initiative,” “talked to others about conservation practices,” “attended a meeting or public hearing about water,” and “worked with other community members to protect water.” Responses were recoded so that “no” was recoded into “never,” and responses were analyzed on a 5-point scale from “never” to “weekly or more.” Participants’ response to each item were aggregated into a single dependent variable for analysis, or the grand mean of all engagement activities.

Analysis

The hypothesized relationships were analyzed using multiple regression. Multiple regression was chosen because of its flexibility in analyzing a quantitative dependent variable as a function of multiple independent variables of interest. The analysis yields a measure of the magnitude of the entire relationship of all independent variables to the dependent variable, as well as the partial relationships of each of the independent variables (Cohen & Cohen, 1975). In our study, we assessed the influence that each of

the independent variables (Information sufficiency, social and personal norms, perceived hazard characteristics, relevant hazard experience, self-efficacy, and sociodemographic information) had on our dependent variable, civic engagement.

Listwise deletion of model variables, as well as deletion of case where the “don’t know” or “NA” option were selected, yielded an effective sample size of 1195. Listwise deletion is appropriate because multiple regression requires the same number of cases to be analyzed for each variable. While the data loss was fairly large, a sample size of 1195 is adequate for a multiple regression with six independent variables (Cohen & Cohen, 1975; Maxwell, 2000).

There are four key assumptions for multiple regression. First, the linearity assumption states that the mean of all y-values from the conditional distribution all fall on the same line. The independence assumption assumes that each y-value is independent from every other y-value in the distribution. The normality assumption indicates that the conditional y-values are normally distributed. Lastly, the homogeneity of variance, or homoscedasticity assumption, states that the variance of the conditional distributions is the same (Cohen & Cohen, 1975; Lewis-Beck & Lewis-Beck, 2016). The Central Limit Theorem states that if you have a sufficiently large sample size, the sampling distribution starts to approximate a normal distribution (Maxwell, 2000; Rouaud, 2017).

Our study variables were checked for multicollinearity between variables. Intercorrelations between variables were examined to see if any had coefficients of .8 or larger (Lewis-Beck & Lewis-Beck, 2016). Coefficient values ranged from <.001 to .664, indicating that our study variables were below the threshold for high multicollinearity.

Results

Of the 6,000 surveys mailed, 681 were returned undeliverable and 1480 completed surveys were received, resulting in a final response rate of 28%. A majority of respondents were male (64%) and white (93%). The median age of respondents was 62 years old, and median income was between $50,000 and $74,999 per year. About 18% of respondents completed high school, 21% had a bachelor's degree, and 14% had a graduate degree. While the sample size was large enough to conduct analysis, a limitation of the study was the sample demographic, which differs from Minnesota's population (see Table 1).

Table 1. Survey sample vs. Minnesota Census numbers

	Survey respondents	**Minnesota population[1]**
Male	64.1%	49.8%
White	93%	84.4%
Median income	$50,000 - $74,999	$65,699
Bachelor's degree or higher	42.9%	34.8%
Persons 65 years and over	43%	15.4%

[1]Minnesota Census 2018 estimates (United States Census Bureau, 2018)

Wave analyses were conducted to determine whether participants who responded early (wave 1) were different from those who responded late (wave 3), or not at all. Significant differences in means were found between wave 1 respondents and wave 3 respondents in the information sufficiency construct. Those who responded early were significantly more familiar with local water issues ($p<.001$) and used more scientific sources of information for their water-related issues ($p<.001$). Significant differences

Table 2. Descriptive statistics of survey items used in the study conceptual model

Theoretical construct	**Survey items**	**Mean***	**SD**
Information sufficiency	How familiar are you with water issues in your local area?[1]	2.48	.88
	Where do you get information on water-related issues? (science sources)[2]	.29	.45
	Where do you get information on water-related issues? (social sources)[2]	.15	.35
	Where do you get information on water-related issues? (both science and social sources)[2]	.38	.49
Social and personal norms	People in my community expect me to help protect water[3]	3.64	1.06
	It is my personal responsibility to help protect water[3]	4.39	.83
Perceptions of risk and threats to water	Water resources in Minnesota are at risk[3]	3.70	1.05
	I am concerned about the consequences of water problems or pollution for local economies[3]	3.95	.87
	I am concerned about the consequences of water problems or pollution for people in my community[3]	4.11	.86
Relevant water experience	In the last twelve months, about how many times did you visit a lake, river, or stream in Minnesota in which visiting the water body was one of the primary purposes of your trip?[4]	3.02	1.36
Self-efficacy	Residents in my community have the ability to work together to protect water resources[3]	3.54	.93
Civic engagement in water	*Have you engaged in the following actions or initiatives in the past 12 months? If yes, how often did you engage in the action or initiative?*		
	Heard about a water resource protection initiative[5]	1.44	.80
	Talked to others about conservation practices[5]	1.65	1.01
	Attended a meeting or public hearing about water[5]	1.16	.45
	Worked with other community member to protect water[5]	1.15	.54
	Aggregated civic engagement variable (dependent variable)[6]	1.35	.52

Notes: SD, standard deviation

*n = 1480

[1]Items measured on a 4-point scale from “not at all familiar” (1) to “very familiar” (4)

[2]Items dummy-coded between did not use this type of source (0) and did use this type of source (1)

[3]Items measured on a 5-point scale from “strongly disagree” (1) to “strongly agree” (5)

[4]Items measured on a 5-point scale: “0 (I did not visit a water body)” (1), “1-3” (2), “4-12” (3), “13-24” (4), “25 or more” (5)

[5]Items measured on a 5-point scale from “Never” (0) to “Weekly or more” (5)

[6]Dependent variable created by taking a mean of all civic engagement activities

were also found in number of visits to water. Early respondents had visited a lake, river, or stream in Minnesota significantly more times in the last twelve months than late respondents ($p<.001$). Early respondents were also significantly more educated than late respondents ($p<.001$) and were also significantly more civically engaged (based on the four engagement activities used in the model), than those who responded late ($p<.001$).

Table 3. Conceptual model regression results

Theoretical construct	Survey Items (independent variables)	Baseline model	Final reduced model			
		B	*B*	SE	*P*	δ (std. beta weight)
Information sufficiency	How familiar are you with water issues in your local area?	.2166**	.205**	.0162	.000	.346
	Where do you get information on water-related issues? (science sources)	.1996**	.104*	.0426	.0146	.0920
	Where do you get information on water-related issues? (social sources)	.1124	.0276	.0475	.562	.0191
	Where do you get information on water-related issues? (both science and social)	.2468**	.129**	.0408	.0016	.1218
Social and personal norms	People in my community expect me to help protect water	.0315	.0095	.0144	.511	.0193
	It is my personal responsibility to help protect water	.0254	.0068	.0185	.714	.0107
	Residents in my area should be responsible for protecting water	-.0483				
Perceptions of risk and threats to water	In your opinion, how much of a problem are the following water pollutants or issues to water in your local area? (Agricultural runoff, sediment in water bodies, urban runoff, road salt runoff)	.0590				
	Water resources in Minnesota are at risk	.0232	.0244	.0131	.0632	.0494
	I am concerned about the consequences of water problems or pollution for recreation opportunities	-.0198				
	I am concerned about the consequences of water problems or pollution for human health	-.0237				
	I am concerned about the consequences of water problems or pollution for future generations	.0072				
	I am concerned about the consequences of water problems or pollution for local economies	-.0721*	-.0532**	.0202	.0085	-.0887
	I am concerned about the consequences of water problems or pollution for people in my community	.0923**	.0483*	.0205	.0186	.0806
Relevant water experience	In the last twelve months, about how many times did you visit a lake, river, or stream in Minnesota in which visiting the water body was one of the primary purposes of your trip?	.0121**	.0096**	.0014	.000	.1796
Self-efficacy	Residents in my community have the ability to work together to protect water resources	-.0052	-.0106	.0148	.472	-.0190
	How important are the following qualities of a community to you? Opportunities to be involved in community projects	-.0089				
Demographics	Education	.0209	.0361**	.0079	.000	.1164
	Income	.0110				
	Gender	-.0351				
	Age	-.000006				
	Constant	.345	.420**			
	n	650	1205			
	F statistic	11.1	33.3			
**$p \leq 0.01$, *$p \leq 0.05$	**Adjusted R^2**	**.246**	**.243**			

Model results

The final regression model in this study explained 24.3% of variance in civic engagement. Although the full baseline model explained 24.6% of variance in civic engagement, removal of nine non-significant variables resulted in a loss of only 0.3% of variance. Variables used in the final study model were significant, or were included for theoretical consistency with RISP. Full results are outlined in Table 3.

Familiarity with water issues was the strongest predictor overall, followed by the science information source variable, both from the information sufficiency construct. A one-unit increase in familiarity with water issues (e.g. from “moderately familiar” to “very familiar”) increases a resident’s civic engagement score by .205. A resident who uses only scientific information for their water-related issues has a civic engagement score that is 0.1 unit higher than that of a resident who uses only social information.

Relevant water experience and education, respectively, were the next highest predictors of civic engagement. A one-unit increase in water experience (e.g. from 4-12 visits in the last 12 months to 13-24 visits in the last 12 months) led to a .01-point increase in civic engagement score.

The only negative predictor of significance was concern about the consequences of water problems for local economies. The more concerned a resident is about impacts of water to local economies, the less likely they are to get involved civically.

Discussion

This article began by examining the shortcomings of traditional top-down agency approaches to water protection in the United States, and collaborative watershed management and civic engagement as a solution to those shortcomings. This study examined Minnesota residents' perceptions of water quality and beliefs about water problems, and how those perceptions impact their engagement in civic water actions. By using an integrated RISP/NAT model, this study not only examined residents' information seeking about water issues, but also explored other information processing behaviors: talking to others about conservation practices, working with other community members to protect water, and hearing about a water resource protection initiative.

Results show that familiarity with water issues and sources of water information were the strongest predictors of civic engagement in water. Those who were familiar with water issues and used scientific sources of information for water-related issues were more likely to engage in civic water action. This supports past findings that science communication and environmental education are key in promoting pro-environmental behaviors in residents (Hines et al., 1987; Samuelson et al., 2005).

Civic engagement in water resource protection was also driven by experience with water, measured in this study through visits to water. Similar to previous applications of RISP (Griffin et al., 1999; Kahlor et al., 2006), relevant experience was a significant predictor of engagement in water resource protection. The more residents visit water bodies, the more likely they are to engage in civic actions and seek out more information about the issues. Though not a direct measure of "hazard" experience, those with fewer visits, and presumably less firsthand experience with water problems or threats, are far less likely to participate in protection initiatives.

Study findings suggest new strategies and approaches for getting residents and stakeholders involved in the collaborative watershed management process in Minnesota and beyond. This study found that environmental risk perception goes beyond scientific and technical knowledge and relies more on experiential processes. Results suggest that residents need a stronger connection to water issues to get engaged. This is consistent with past studies of environmental risk, where researchers found that global warming risk perception was greatly influenced by emotional factors and negative imagery, rather than political ideology (Leiserowitz, 2006).

Future research should examine what residents hope to gain from risk communication, and how to best characterize risk surrounding water resource issues. While many studies have explored science communication in relation to climate change, very few studies have examined communication specific to water problems. Characterizing water resource issues effectively and allowing for more experiential knowledge can lead to more effective participation and decision-making (Besley & McComas, 2014; Kahlor et al., 2006; Leiserowitz, 2006).

A future integrated RISP/NAT model could be expanded to include other variables such as ascription of responsibility, awareness of consequences, or barriers to engagement. In building a more comprehensive model, researchers could examine what factors specifically take residents beyond information seeking and processing into other engagement behaviors.

Moving forward, science communication efforts should focus on getting residents "out in the field," and integrate real-time reporting of issues at water bodies that are frequently visited. Agencies have found that getting residents out to the water and

showing them what water problems look like can help the reality of the issues sink in and provide the experiential knowledge needed to motivate residents to take the next step (Comito & Helmers, 2011; Leiserowitz, 2006). For example, a visitor may see a sign that shows elevated nitrogen levels in the lake, and when they get to the lake, they will see algal blooms that makes their swimming or boating experience less pleasant. Since the connection between the two may not be obvious to the layperson, agencies and resource managers can build communication connecting those two experiences and send home a relatable message that a particular pollutant will create a particular experience for the visitor.

Beyond making residents aware of the problems in their area, resource managers can also build communication to show pollutant sources and how pollutants make their way to water bodies. An educational sign at a water body laden with litter could also include information about stormwater runoff or storm drain contamination in their neighborhood. Showing how a problem came to be can help residents to build connections between their actions and the physical world.

CHAPTER 3

DISCUSSION

Water pollution in the United States comes from widespread, dispersed sources across the landscape, and solutions must be equally as widespread to capture the full extent of the problem. Traditional top-down agency strategies to water remediation often fail to engage the residents and other key stakeholders in their approaches. By engaging the community, and examining all sources and solutions to a water problem, collaborative watershed management allows for residents to be involved throughout a remediation process. Many past studies have explored who gets involved in civic water action, but few have examined why they get involved.

This study sought to investigate decision making in pro-environmental behavior, specifically civic engagement in water. This study aimed to answer the following questions:

1. What drives perceptions of water and water problems?
    a. Where do people get water information?
    b. Who or what influences them?
    c. Do sociodemographics matter?
2. How do perceptions of water quality and beliefs about problems affect civic engagement in water?

In exploring why residents get involved in civic water action, we can increase participation in water protection initiatives, create more effective water policies, and eventually improve water conditions across the United States.

Key Lessons

This study revealed key lessons in understanding civic engagement in water. First, information sufficiency and the use of scientific sources of information were found to be significantly correlated with civic engagement behaviors. Second, relevant experience with water was associated with higher rates of civic engagement. Lastly, perceptions of risks to water and concern about the consequences of these risks for people in the community were positively associated with civic engagement in water, but concern for local economies were negatively associated.

Civic engagement in water resource protection was most strongly correlated with the information sufficiency construct. Those who were familiar with local water issues and used scientific information for water-related issues were more likely to engage in local water protection efforts. This supports past findings that science communication and education are the first barriers that must be crossed in developing pro-environmental behaviors in citizens (Hines et al., 1987; Samuelson et al., 2005).

Civic water action was also significantly correlated with relevant water experience. Consistent with previous applications of RISP (Griffin et al., 1999; Kahlor et al., 2006), relevant experience was a significant predictor of engagement in water resource protection. Citizens who frequently visit water were more likely to engage in civic actions and seek out more information about the issues. These results suggest that those without direct experience with water issues (and by extension, experience with water threats) are far less likely to participate in protection initiatives. This finding, in conjunction with the information sufficiency finding, suggests that residents need a more personal connection to water issues beyond just the scientific information.

Perceptions of risk and threats to water were also a significant predictor of community engagement. Concern about the consequences of water problems for people in my community had a significant, positive correlation with civic engagement, but concern about the consequences of water problems for local economies had a significant negative correlation. This may suggest a divide between “community-minded” and “business-minded” individuals; those who are concerned about their community will engage civically to protect it, but those more concerned with economic issues may seek other strategies. This also possibly represents a divide between residents with more altruistic, collective values versus those with more egoistic values, and how the two groups engage civically.

Social and personal norms were not a statistically significant predictor of community engagement. Previous NAT and responsible environmental behavior (Hines et al., 1987; Schwartz, 1973) studies that found that citizens are more likely to act if they feel that others expect them to protect water resources, or if they feel personally obligated to act. However, in past studies of impersonal risk (such as global warming), informational subjective norms were the most powerful predictor of deeper processing behaviors, and expectations of others have been found to be significant when making decisions in community engagement (Kahlor et al., 2006; A. K. Pradhananga et al., 2015). However, these past studies engaged rural landowners or urban residents, where a social norm surrounding water action may be much stronger than in the resident sample for this study. The perceived personal impacts of water risk are worth investigating in the future. For example, health concerns related to drinking water may be considered a personal risk, but aquatic invasive species may be an impersonal risk.

Theoretically, this study supports an integrated RISP/NAT model to examine the effect that perceptions of water quality have on civic engagement behaviors in water protection. While the information sufficiency construct by itself may suggest that residents just need more data about water issues, when interpreted in conjunction with other variable constructs such as relevant experience, findings suggest that residents need a stronger emotional connection to water issues to get engaged. This is consistent with past studies of environmental risk, where researchers found that global warming risk perception was greatly influenced by emotional factors and negative imagery, rather than political ideology (Leiserowitz, 2006). The study found that perception of water risk goes beyond scientific and technical knowledge, and relies more on experiential processes.

Practical Implications

Water is a human and societal issue, impacting human health, economic development, recreation, and fish and wildlife. Reframing water risk as a more personal and community-level issue, rather than a technical one, could offer opportunity for the public to engage in the effects (Besley & McComas, 2014; Kahlor et al., 2006). Past studies have shown that health and economy were top priority issues for Minnesotans, yet few acknowledged that Minnesota's clean, abundant waters were central to those issues (Devitt, 2018). Future communication surrounding key community or social issues could benefit from an environmental perspective, and integrate the role of ecosystem services into the health and economic fields. Water is currently less recognized as an issue in its own right, and integrating it into other top-of-mind issues could play a role in getting the community engaged.

Our findings show that familiarity with water issues is the top predictor for engaging in water protection. However, studies have found that water issues often feel abstract compared to visible issues; farmers can see soil erosion on their land, but can't see, feel, or taste differences in their water, and don't feel a direct connection to downstream impacts (Comito & Helmers, 2011). Agency specialists have found that getting residents "out in the field," and showing them test kit results of their individual impact can help the reality of the problem sink in, and provide the experiential knowledge needed to motivate residents to take the next step (Comito & Helmers, 2011; Leiserowitz, 2006). Other statewide studies focusing on perceptions of Minnesota's water quality have found that inconsistencies in how information is presented, and who is presenting it, have perpetuated doubt about the baseline facts of water quality in the state. Establishing the common base fact across agencies, constituencies, and information sources could serve to unify the public about what exactly the issues are and how to fix them (Devitt, 2018). Clearly articulating the uncertainty in water quality data, and integrating different interpretations of risk (technical information about nutrient loads versus visible algal blooms) could help to ground the issue for residents and motivate them to help out in their community.

These findings suggest that agencies and resource managers can work to improve water resource communication in community engagement efforts. This study found that increasing familiarity with water issues is associated with an increase in civic engagement in water, but residents also need a more personal connection. In applying this information, agencies could look to water bodies that are frequently visited, and post test kit information about what pollutants are found in that lake, and how those pollutants manifest themselves. At a lake with a high level of suspended solids for example,

agencies could post real-time information about the amount of sediment in the lake, and help visitors make the connection between that information and the poor water clarity that makes their swimming or fishing experience less pleasant.

Water protection agencies may also be missing large swaths of the population in existing outreach methods. Our findings show that the more a resident visits water bodies, the more likely they are to become civically engaged. Outreach to communities that may not have ready access to recreational waters, and assisting them in visiting more water bodies may establish a familiarity with the water issues, as well as a desire to help protect those water bodies. Past studies have found that while recreational user fees are widely accepted, they significantly reduce participation in lower-income residents (More & Stevens, 2000). There are likely many other demographics that are missing from community efforts, which increases the potential for ineffective policies (Sabatier et al., 2005; Samuelson et al., 2005). Communications about water problems may fail to be dispersed broadly throughout communities, or may not give appropriate attention to threats impacting rural or culturally isolated populations.

The issue of representation is one that has been much discussed in collaborative watershed management (Sabatier et al., 2005). When all demographics are not represented in land-use planning decisions, there is potential for policies to only be representative of those residents with a large amount of time and resources that enable them to participate in the planning process, and can set policies up for failure. Recruitment efforts for past studies found that older, middle-class, white citizens were much more available and willing to participate in community efforts than other demographic groups (Samuelson et al., 2005). Much of this study was limited by the demographic of the respondent population. While some conclusions could be drawn

regarding civic engagement, it should be recognized that the sample population may be those residents with more time and resources to be able to respond to a mailing survey.

Future Research

Future research should focus on building survey instruments and items around this model to more precisely formulate questions to fit within these variables, and expand the model to include other variables used in NAT, RISP, and the Model of Responsible Environmental Behavior (Griffin et al., 1999; Hines et al., 1987; Schwartz, 1973), such as awareness of consequences and ascription of responsibility. A future model could also be expanded to extend beyond just risk information seeking and processing, and examine what factors take residents beyond information seeking and processing into other engagement behaviors.

Barriers to civic engagement were not examined in this study. This study examined why people engage in water protection, but not why they don't engage. Taking barriers into account when examining reasons for civic engagement may account for more variance in engagement behaviors, and allow for more effective communication surrounding water resource issues. Examining barriers may also shed light on what allows residents to shift from more passive engagement (such as information seeking) to a more active role in water protection (such as conservation practices or volunteering for an organization).

A limitation of this study was that although survey research allows for the analysis of proposed relationships, causality cannot be determined without random assignment. In addition, while the sample size was adequate for this study, the low survey response rate that is typically found with mail surveys could potentially result in

non-response error, where those who responded to the survey are different from those who didn't (Dillman et al., 2014). Because our wave analysis found that early respondents were significantly more civically engaged than late respondents, our sample likely showed higher levels of engagement than what actually exists in the Minnesota population.

There is also a need to examine the definition of civic engagement, and to synthesize all engagement behaviors into one overarching definition. Many definitions of civic engagement include the phrase "collective action" (Checkoway & Aldana, 2013; Fagotto & Fung, 2009), but there is potential for a future definition to include individual actions that contribute to the collective good. In defining civic engagement, it is difficult to capture all the different forms of engagement; in this study, behaviors from information seeking to working with community members were all included, but were by no means a comprehensive list. Social media, changing consumption habits, volunteering, and donating money could all be considered a form of civic engagement, yet in the current literature there is no definition that supports all of them.

Despite the limitations of this study, findings show that residents' engagement in water resource protection is driven by relevant hazard experience, social norms, and perceived threats. These findings have implications for community organizers and state agencies who are seeking to get more support in the community, and more participation in water initiatives. Civic engagement in water resource protection builds trust in the decision-making process and leads to behaviors that are needed for future initiatives to be more effective.

Conclusion

Findings from this study support current theory on pro-environmental behavior and civic engagement in natural resources and enhance current understanding of the impact of science communication on civic water action. Combined with results of the past studies, the overarching message is that residents need to be educated on water issues and need to feel that the issues are personal to their lives if they are going to get involved in water protection. Agencies also need to work to improve access to recreational waters for lower-income or culturally isolated communities. The more frequently someone visits a water body, the more likely they are to engage in its protection, yet some recreational water bodies may be inaccessible for lower-income communities.

Overall, residents will be more likely to engage in water protection efforts if they are educated about the issues and the issues feel personal. If water problems feel abstract and irrelevant to residents' lives, they are far less likely to work to fix the issues in their community. If water issues are visibly impacting a resident's lifestyle, the chances that they will engage in water protection increase.

Water issues are a unique problem. Water risk can be personal (human health) or impersonal (aquatic health). Water can have individual and collective benefits and impacts. Water problems impact every person, and while there many different initiatives in place to remedy water's myriad issues, collective action must be taken in order to solve upstream and downstream problems.

REFERENCES

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*, 179–211. https://doi.org/10.1016/0749-5978(91)90020-T

Amberson, S., Biedenweg, K., James, J., & Christie, P. (2016). "The Heartbeat of Our People": Identifying and Measuring How Salmon Influences Quinault Tribal Well-Being. *Society and Natural Resources*, *29*(12), 1389–1404. https://doi.org/10.1080/08941920.2016.1180727

Besley, J. C., & McComas, K. A. (2014). Fairness, public engagement, and risk communication. In *Effective Risk Communication* (p. 341).

Checkoway, B., & Aldana, A. (2013). Four forms of youth civic engagement for diverse democracy. *Children and Youth Services Review*, *35*(11), 1894–1899. https://doi.org/10.1016/j.childyouth.2013.09.005

Clean Water, Land, and Legacy Amendment (2008).

Clean Water Land & Legacy Amendment. (2018). *Clean Water Fund Performance Report*. Retrieved from www.legacy.leg.mn

Cohen, J., & Cohen, P. (1975). *Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences*. Hillsdale, New Jersey: Lawrence Erlbaum Associates, Inc.

Comito, J., & Helmers, M. (2011). The Language of Conservation. In L. W. Morton & S. S. Brown (Eds.), *Pathways for Getting to Better Water Quality: The Citizen Effect2* (pp. 67–82). New York, NY: Spring Science+Business Media, LLC.

Davenport, M., Perry, V., Pradhananga, A. K., & Shepard, J. (2016). *A Community Capacity Assessment for Stormwater Management in Three Twin Cities Metro Area Watersheds* (No. 1). University of Minnesota.

Dayton, M. (2017). *25 By 25: Public Input*. Retrieved from

https://www.eqb.state.mn.us/sites/default/files/documents/25by25-report-draft-v12-websm.pdf

Devitt, S. (2018). *The State of Minnesota's Water: An Evaluation of Stakeholder Perspectives on Water Priorities*.

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). *Internet, Phone, Mail, and Mixed-Mode Surveys: the Tailored Design Method* (4th ed.). Hoboken, New Jersey: John Wiley & Sons, Inc.

Environmental Protection Agency. (1996). Nonpoint source pollution: The nation's largest water quality problem. Retrieved from https://nepis.epa.gov/Exe/ZyPDF.cgi/20004PZG.PDF?Dockey=20004PZG.PDF

Environmental Protection Agency. (2017). National Water Quality Inventory : Report to Congress, (August).

Environmental Protection Agency. (2018). Basic Information about Nonpoint Source (NPS) Pollution. Retrieved from https://www.epa.gov/nps/basic-information-about-nonpoint-source-nps-pollution

Fagotto, E., & Fung, A. (2009). Sustaining Public Engagement: Embedded Deliberation in Local Communities. *Everyday Democracy and the Kettering Foundation*. Retrieved from http://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:Sustaining+Public+Engagement:+Embedded+Deliberation+in+Local+Communities#0

Griffin, R., Dunwoody, S., & Neuwirth, K. (1999). Proposed Model of the Relationship of Risk Information Seeking and Processing to the Development of Preventive Behaviors. *Environmental Research*, *80*, 230–245.

Hines, J. M., Hungerford, H. R., & Tomera, A. N. (1987). Analysis and synthesis of research on responsible environmental behavior: A meta-analysis. *Journal of*

Environmental Education, *18*(2), 1–8. https://doi.org/10.1080/00958964.1987.9943482

Hoornbeek, J., Hansen, E., Ringquist, E., & Carlson, R. (2013). Implementing Water Pollution Policy in the United States : Total Maximum Daily Loads and Collaborative Watershed Management. *Society and Natural Resources*, *26*(4), 420–436. https://doi.org/10.1080/08941920.2012.700761

IBM Corp. (2016). IBM SPSS Statistics for Windows. Armonk, NY: IBM Corp.

Kahlor, L. A. (2011). An Augmented Risk Information Seeking Model: The Case of Global Warming. *Media Psychology*, *10*(3), 414–435. https://doi.org/10.1080/15213260701532971

Kahlor, L. A., Dunwoody, S., Griffin, R. J., & Neuwirth, K. (2006). Seeking and processing information about impersonal risk. *Science Communication*, *28*(2), 163–194. https://doi.org/10.1177/1075547006293916

Koontz, T. M., & Newig, J. (2014). From Planning to Implementation: Top-Down and Bottom-Up Approaches for Collaborative Watershed Management. *Policy Studies Journal*, *42*(3), 416–442. https://doi.org/10.1111/psj.12067

Larson, K. L., & Lach, D. (2008). Participants and non-participants of place-based groups: An assessment of attitudes and implications for public participation in water resource management. *Journal of Environmental Management*, *88*(4), 817–830. https://doi.org/10.1016/j.jenvman.2007.04.008

Leach, W. D. (2006). Collaborative Public Management and Democracy: Evidence from Western Watershed Partnerships. *Public Administration Review*, *66*, 100–110.

Leiserowitz, A. (2006). Climate Change Risk Perception and Policy Preferences: The Role of Affect, Imagery, and Values. *Climate Change*, *77*, 45–72. https://doi.org/10.1007/s10584-006-9059-9

Lewis-Beck, C., & Lewis-Beck, M. (2016). *Applied Regression: An Introduction*. (J. Fox, Ed.) (2nd ed.). Thousand Oaks, California: SAGE Publications, Inc.

Lubell, M., Sabatier, P. A., Vedlitz, A., Focht, W., Trachtenberg, Z., & Matlock, M. (2005). Conclusions and Recommendations. In P. A. Sabatier, W. Focht, M. Lubell, Z. Trachtenberg, A. Vedlitz, & M. Matlock (Eds.), *Swimming Upstream: Collaborative Approaches to Watershed Management* (pp. 261–296). Cambridge, MA: Massachusetts Institute of Technology.

Manzo, L. C., & Weinstein, N. D. (1987). Behavioral Commitment to Environmental Protection: A Study of Active and Nonactive Members of the Sierra Club. *Environment and Behavior*, *19*(6), 673–694.

Martinez, T. A., & McMullin, S. L. (2004). Factors affecting decisions to volunteer in nongovernmental organizations. *Environment and Behavior*, *36*(1), 112–126. https://doi.org/10.1177/0013916503256642

Maxwell, S. E. (2000). Sample Size and Multiple Regression Analysis. *Psychological Methods*, *5*(4), 434–458.

Michaels, S. (2001). Making collaborative watershed management work: The confluence of state and regional initiatives. *Environmental Management*, *27*(1), 27–35. https://doi.org/10.1007/s002670010131

More, T., & Stevens, T. (2000). Do User Fees Exclude Low-income People from Resource-based Recreation ? *Journal of Leisure Research*, *32*(3), 341–357.

Morton, L. W., & Brown, S. S. (2011). Pathways to Better Water Quality. In L. W. Morton & S. S. Brown (Eds.), *Pathways for Getting to Better Water Quality: The Citizen Effect* (pp. 3–14). New York, NY: Spring Science+Business Media, LLC.

MPCA. (2018a). Impaired waters viewer. Retrieved March 23, 2019, from https://www.pca.state.mn.us/water/impaired-waters-viewer-iwav

MPCA. (2018b). Nonpoint source issues. Retrieved April 3, 2019, from https://www.pca.state.mn.us/water/nonpoint-source-issues

Pradhananga, A., Fellows, S., & Davenport, M. (2018). *An Assessment of Landowner Conservation Action in the Lower Minnesota Watershed*.

Pradhananga, A. K., Davenport, M., & Green, E. (2019). Cultural Narratives on Constraints to Community Engagement in Urban Water Restoration. *Journal of Contemporary Water Research & Education*, (166), 79–94.

Pradhananga, A. K., Davenport, M., & Olson, B. (2015). Landowner Motivations for Civic Engagement in Water Resource Protection. *Journal of the American Water Resources Association*, *51*(6), 1600–1612. https://doi.org/10.1111/1752-1688.12346

Prokopy, L. S., & Floress, K. (2011). Measuring the Citizen Effect: What Does Good Citizen Involvement Look Like? In L. W. Morton & S. S. Brown (Eds.), *Pathways for Getting to Better Water Quality: The Citizen Effect* (pp. 83–94). New York, NY: Spring Science+Business Media, LLC.

R Core Team. (2017). R: A language and environment for statistical computing. Vienna, Austria: R Foundation for Statistical Computing. Retrieved from https://www.r-project.org/

Rouaud, M. (2017). *Probability, statistics, and estimation: propagation of uncertainties in experimental measurement*.

Sabatier, P. A., Focht, W., Lubell, M., Trachtenberg, Z., Vedlitz, A., & Matlock, M. (2005). Collaborative Approaches to Watershed Management. In P. A. Sabatier, W. Focht, M. Lubell, Z. Trachtenberg, A. Vedlitz, & M. Matlock (Eds.), *Swimming Upstream: Collaborative Approaches to Watershed Management* (pp. 3–22). Cambridge, MA: Massachusetts Institute of Technology.

Samuelson, C. D., Vedlitz, A., Whitten, G. D., Matlock, M., Alston, L. T., Peterson, T. R., & Gilbertz, S. J. (2005). Citizen Participation and Representation in Collaborative Engagement Processes. In P. A. Sabatier, W. Focht, M. Lubell, Z. Trachtenberg, A. Vedlitz, & M. Matlock (Eds.), *Swimming Upstream: Collaborative Approaches to Watershed Management* (pp. 137–169). Cambridge, MA: Massachusetts Institute of Technology.

Schwartz, S. H. (1973). Normative Explanations A Critique , Proposal , of Helping Behavior : and Empirical Test ' Criticisms of Normative Explanations. *Sociology The Journal Of The British Sociological Association*, *9*, 349–364. Retrieved from http://www.sciencedirect.com/science/article/pii/0022103173900711

Shandas, V., & Messer, W. B. (2008). Fostering Green Communities Through Civic Engagement. *Journal of the American Planning Association*, *74*(4), 408–418. https://doi.org/10.1080/01944360802291265

Smith, D. H. (1994). Determinants of Voluntary Association Participation and Volunteering : A Literature Review. *Nonprofit and Voluntary Sector Quarterly*, *23*(3), 243–263.

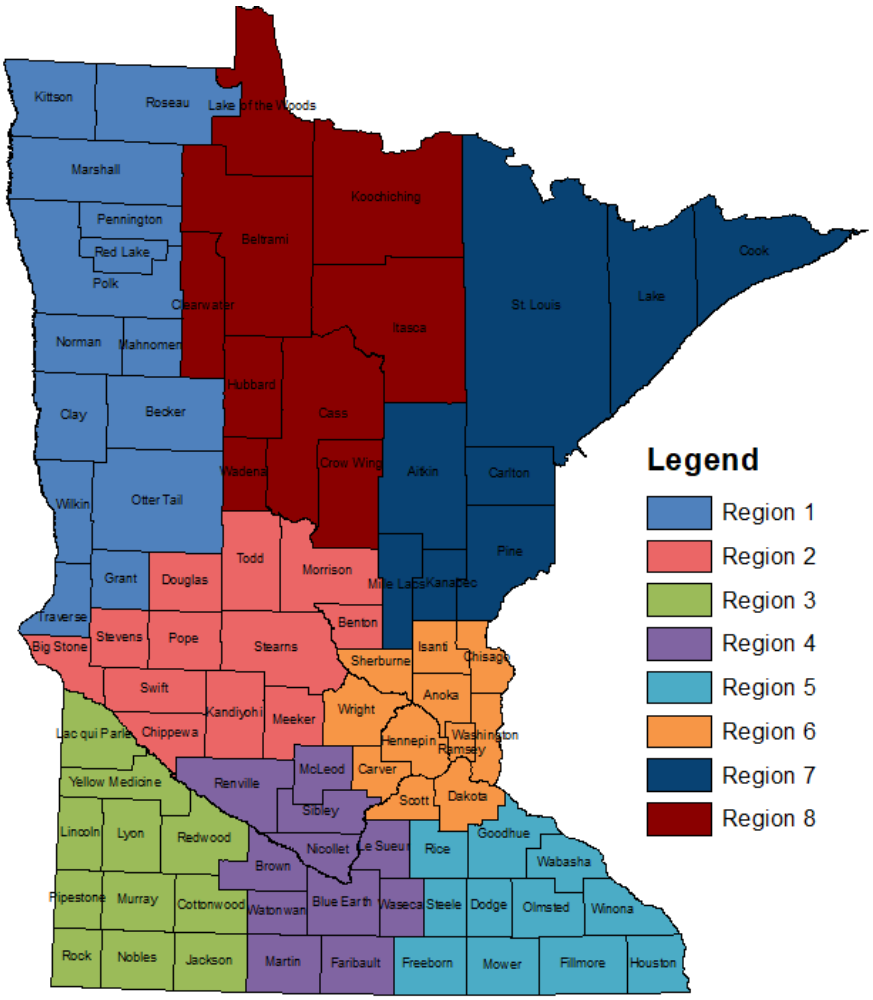
Stern, P. C. (2000). Toward a Coherent Theory of Environmentally Significant Behavior, *56*(3), 407–424.

United States Census Bureau. (2018). QuickFacts Minnesota. Retrieved April 4, 2019, from https://www.census.gov/quickfacts/mn

Yang, Z. J., Rickard, L. N., Harrison, T. M., & Seo, M. (2014). Applying the Risk Information Seeking and Processing Model to Examine Support for Climate Change Mitigation Policy. *Science Communication*, *36*(3), 296–324. https://doi.org/10.1177/1075547014525350

APPENDICES

APPENDIX A: MINNESOTA SOIL AND WATER CONSERVATION DISTRICT MAP



(Minnesota Association of Soil and Water Conservation Districts, 2010)

APPENDIX B: SURVEY COVER LETTER

UNIVERSITY OF MINNESOTA

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College of Food, Agricultural and Natural Resource Sciences

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ID#: _____

[First Name] [Last Name]
[Street Address]
[City] [State] [Zip code]

Minnesota Water Values Survey Information

May 7, 2018

Dear [First Name] [Last Name],

I am writing to ask for your help in a study about water values in Minnesota. The study is being conducted by Mae Davenport, Center for Changing Landscapes, and Bonnie Keeler, Humphrey School of Public Affairs, at the University of Minnesota and is supported by the Clean Water Council; Clean Water, Land and Legacy Amendment funds; Environment and Natural Resources Trust Fund; and the McKnight Foundation. **The goal of the study is to better understand how Minnesotans value and use water, and how they think water should be protected.** Findings from this study will help decision makers prioritize water programs and will support public engagement in water resource management across the state.

We understand that this may be a busy time of the year for you, so we really appreciate you taking the time to help us with this study. If you are willing, please complete the enclosed questionnaire. **It should take you only about 15 minutes.** We are only contacting a random sample of residents in Minnesota, so it is important that we hear from you! The survey is voluntary and completely confidential. The risks of participating in this study are minimal. You are free to withdraw at any time. Completion of this questionnaire indicates your voluntary consent to participate. Your decision to participate will not affect your current or future relationship with the University of Minnesota. The ID # on the front page of your survey is used to help us track mailings, ensuring that your name is never affiliated with your responses. Please answer the questions as completely as possible. Once you have completed the questionnaire, fold it in thirds and mail it back in the enclosed self-addressed, postage-paid envelope.

If you would prefer to complete an online version of the questionnaire, please send us a note with your email address to ccl@umn.edu.

We would be happy to answer any questions or listen to any comments you may have about this study.
Please feel free to contact me by phone at 612-624-9321, or by email at mdaven@umn.edu. If you have any questions or concerns regarding the study and would like to talk to someone other than the researcher(s), you are encouraged to contact the Research Subjects' Advocate Line, D-528 Mayo, 420 Delaware Street S.E., Minneapolis, Minnesota, 55455; telephone 612-625-1650.

I hope you enjoy completing the questionnaire and I look forward to receiving your response.

Sincerely,

Mae Davenport, Ph.D.
Director, Center for Changing Landscapes

APPENDIX C: SURVEY INSTRUMENT

ID#: _____

The Value of Minnesota Water: A Resident Survey

Center for Changing Landscapes
University of Minnesota
Driven to Discover℠

Institute on the Environment
University of Minnesota
Driven to Discover℠

Environment and Natural Resources Trust Fund

Clean Water Land & Legacy Amendment

Before you begin:

We are conducting this survey to better understand Minnesota residents' opinions about the value of water and actions that protect water. This survey is voluntary and confidential. It should take about 15 minutes to complete this questionnaire. Please answer the questions as completely as possible.

Once you've completed the survey:

Please fold it in thirds and mail it back in the enclosed self-addressed stamped envelope.

Thank you for your help!

I. Your Community

First, we have a few questions about your community and the value of water resources.

1. When you think of your community, what comes to mind first? (*Choose one*)

- [ ] My neighborhood
- [ ] My county
- [ ] My ethnic group
- [ ] My city
- [ ] My watershed
- [ ] My close friends and family
- [ ] My workplace
- [ ] Organizations/groups
- [ ] My school system
- [ ] Other (please specify) _____

2. How important are the following qualities of a community to you? *(Please check one box in each row)*

	Not at all important	Slightly important	Moderately important	Extremely important
a. Good relationships among neighbors	☐	☐	☐	☐
b. Clean streams, rivers, and lakes	☐	☐	☐	☐
c. Strong family ties	☐	☐	☐	☐
d. Access to aesthetically pleasing landscapes/views	☐	☐	☐	☐
e. Opportunities to express my culture and traditions	☐	☐	☐	☐
f. Clean and safe drinking water	☐	☐	☐	☐
g. Opportunities to be involved in community projects	☐	☐	☐	☐
h. Opportunities for and access to outdoor recreation	☐	☐	☐	☐
i. A place with a climate that fits my lifestyle	☐	☐	☐	☐

3. To what extent do you agree or disagree with the following statements? *(Please check one box in each row)*

	Strongly disagree	Somewhat disagree	Neither disagree nor agree	Somewhat agree	Strongly agree
a. Water resources in my community are adequately protected	☐	☐	☐	☐	☐
b. Water resources in Minnesota need better protection	☐	☐	☐	☐	☐
c. Protecting water in my neighborhood is a lost cause	☐	☐	☐	☐	☐
d. Water resources in Minnesota are at risk	☐	☐	☐	☐	☐
e. Conservation practices contribute to quality of life in my community	☐	☐	☐	☐	☐
f. My community has the leadership it needs to protect water resources	☐	☐	☐	☐	☐
g. Residents in my community have the ability to work together to protect water resources	☐	☐	☐	☐	☐

4. How familiar are you with water issues in your local area?

[ ] Not at all familiar [ ] Slightly familiar [ ] Moderately familiar [ ] Very familiar

5. How would you characterize the quality of water in the lake, stream, or river closest to you?

[ ] Very poor [ ] Poor [ ] Fair [ ] Good [ ] Very good [ ] Don't know

6. How would you characterize the quality of water in Minnesota water bodies overall?

[ ] Very poor [ ] Poor [ ] Fair [ ] Good [ ] Very good [ ] Don't know

7. How important is it to protect and restore Minnesota waters (lakes, streams, rivers, and groundwater) for the following values and uses? *(Please check one box in each row)*

	Not at all important	Slightly important	Moderately important	Extremely important
a. Drinking water that is safe and clean	☐	☐	☐	☐
b. Beaches and lakes that are safe for swimming and playing	☐	☐	☐	☐
c. Consistent water supply to water-dependent industries like energy production and agriculture	☐	☐	☐	☐
d. Equitable access to public waters for all Minnesotans	☐	☐	☐	☐
e. Anglers to be able to fish for preferred species	☐	☐	☐	☐
f. Future generations	☐	☐	☐	☐
g. High quality recreation opportunities for my or my family's use	☐	☐	☐	☐
h. Habitat for native fish and wildlife to survive	☐	☐	☐	☐
i. Recreation and tourism businesses across Minnesota to continue to thrive	☐	☐	☐	☐
j. Ricers to be able to harvest in historically abundant wild rice waters	☐	☐	☐	☐
k. The heritage and identity of Minnesota	☐	☐	☐	☐
l. Lakeshore landowners to maintain their property values	☐	☐	☐	☐
m. Healthful and natural foods for people	☐	☐	☐	☐
n. Consistent water supply for watering lawns and landscaping around my neighborhood	☐	☐	☐	☐
o. Towns and cities to avoid costly water treatment expenses	☐	☐	☐	☐
p. Natural systems and processes to be sustained	☐	☐	☐	☐
q. Minnesota <u>not</u> to send water pollution downstream to other states or nations	☐	☐	☐	☐

r. From the previous list (Question 7, a-q), what three water values or uses are <u>most important to you</u>? (*Please list in order of first, second, and third most important*)

1. _____ 2. _____ 3. _____

8. In the last twelve months, about <u>how many times</u> did you visit a lake, river, or stream in Minnesota in which visiting the water body <u>was one of the primary purposes of your trip</u>?

[ ] 0 (I did not visit a water body) [ ] 1-3 [ ] 4-12 [ ] 13-24 [ ] 25 or more

9. What lake, river, or stream do you visit most often in Minnesota? What city is it in or closest to?

Body of water _____ Closest city _____

a. When you visit this water body, what activities do you engage in? *(Please check all that apply)*

- [ ] Swimming
- [ ] Hiking or walking near water
- [ ] Observing water or wildlife
- [ ] Picnicking near water
- [ ] Wading or playing in the water
- [ ] Motorized boating
- [ ] Non-motorized boating (canoeing, kayaking, paddle-boarding, etc.)
- [ ] Spiritual or cultural practices
- [ ] Fishing (open water)
- [ ] Ice fishing
- [ ] Biking near water
- [ ] Gathering plants (e.g., wild rice)
- [ ] Getting together with others (e.g., friends, family)
- [ ] Hunting waterfowl
- [ ] Other (please specify) _____

b. Do you have a home or vacation property near this water body?

[ ] Yes [ ] No

c. To reach this body of water, about how long do you have to travel from your home?

- [ ] 0-5 minutes (I don't have to travel)
- [ ] 6-20 minutes (It's in my community)
- [ ] 21-60 minutes (It's in a nearby community)
- [ ] More than 1 hour to less than 4 hours
- [ ] 4 or more hours

II. Concerns about Water

Next, we would like to know if you have concerns about water.

10. To what extent do you agree or disagree with the following statements? *(Please check one box in each row)*

I am concerned about the consequences of water problems or pollution for….	Strongly disagree	Somewhat disagree	Neither disagree nor agree	Somewhat agree	Strongly agree
a. Cultural heritage in Minnesota	☐	☐	☐	☐	☐
b. Recreation opportunities	☐	☐	☐	☐	☐
c. Human health	☐	☐	☐	☐	☐
d. Future generations	☐	☐	☐	☐	☐
e. Aquatic life	☐	☐	☐	☐	☐
f. Local economies	☐	☐	☐	☐	☐
g. People in my community	☐	☐	☐	☐	☐
h. Downstream communities outside of Minnesota	☐	☐	☐	☐	☐

11. In your opinion, how much of a problem are the following water pollutants or issues to water in your local area? *(Please check one box in each row)*

	Not a problem	Slight problem	Moderate problem	Severe problem	Don't know
a. Industrial discharge to streams, rivers, and lakes	☐	☐	☐	☐	☐
b. Agricultural drainage (e.g., drain tiles)	☐	☐	☐	☐	☐
c. Agricultural runoff (e.g., nutrients, fertilizers, pesticides)	☐	☐	☐	☐	☐
d. Sediment in water bodies	☐	☐	☐	☐	☐
e. Urban runoff (e.g., oil, grease, toxic chemicals)	☐	☐	☐	☐	☐
f. Contaminants of emerging concern (e.g., pharmaceuticals, personal care products)	☐	☐	☐	☐	☐
g. Increased frequency or intensity of floods	☐	☐	☐	☐	☐
h. Declining lake water levels	☐	☐	☐	☐	☐
i. Unsealed private wells	☐	☐	☐	☐	☐
j. Road salt runoff (chloride)	☐	☐	☐	☐	☐
k. Bacterial contamination	☐	☐	☐	☐	☐
l. Water scarcity	☐	☐	☐	☐	☐
m. Faulty septic and sewage systems	☐	☐	☐	☐	☐
n. Aquatic invasive species	☐	☐	☐	☐	☐

III. Protecting Water

Now, we would like to understand your perspectives on actions to protect water.

12. To what extent do you agree or disagree with the following statements? *(Please check one box in each row)*

	Strongly disagree	Somewhat disagree	Neither disagree nor agree	Somewhat agree	Strongly agree
a. It is my personal responsibility to help protect water.	☐	☐	☐	☐	☐
b. Local government should be responsible for protecting water.	☐	☐	☐	☐	☐
c. The state government should be responsible for protecting water.	☐	☐	☐	☐	☐
d. Residents in my area should be responsible for protecting water.	☐	☐	☐	☐	☐
e. The agricultural community in my area should be responsible for protecting water.	☐	☐	☐	☐	☐
f. The urban community in my area should be responsible for protecting water.	☐	☐	☐	☐	☐
g. People in my community expect me to help protect water.	☐	☐	☐	☐	☐

13. To what extent do you support or oppose the following water actions? *(Please check one box in each row)*

	Strongly oppose	Somewhat oppose	Neither oppose nor support	Somewhat support	Strongly support
a. Using conservation practices in my home or on my property	☐	☐	☐	☐	☐
b. Promoting voluntary conservation practices through increased education and outreach programs	☐	☐	☐	☐	☐
c. Expanding programs that offer financial incentives to residents/property owners for conservation practices	☐	☐	☐	☐	☐
d. Engaging more residents in local land use and water resource decision-making	☐	☐	☐	☐	☐
e. Coordinating land use and water planning and management across communities at a regional scale	☐	☐	☐	☐	☐
f. Conducting more water research	☐	☐	☐	☐	☐
g. Monitoring the status and trends of our water bodies	☐	☐	☐	☐	☐
h. Enforcing existing land use laws and regulations	☐	☐	☐	☐	☐
i. Expanding public and private partnerships in conservation	☐	☐	☐	☐	☐
j. Increasing land use laws and regulations	☐	☐	☐	☐	☐

14. Where do you get information on water-related issues? *(Please check all that apply)*

[ ] Family and friends
[ ] Federal agencies/government
[ ] Tribal agencies/government
[ ] State agencies/government
[ ] County agencies/government
[ ] City or township government
[ ] My neighbors
[ ] Community nonprofit organizations
[ ] Environmental organizations
[ ] University researchers/academic community
[ ] Local business owners/industry experts
[ ] Faith/religious leaders
[ ] Agricultural groups/producers
[ ] Elders in my community
[ ] News media
[ ] Other (please specify): _____

15. Below are three potential funding scenarios (A-C) for distributing water program funds in Minnesota across four different water program areas (e.g., safe drinking water).

Water Program Areas	Scenario A	Scenario B	Scenario C
Safe drinking water	40%	40%	10%
High quality swimming and boating	40%	10%	10%
Healthy fish and wildlife populations	10%	40%	40%
Reduce MN's contribution to water problems outside state lines (e.g., Gulf of Mexico, Lake Winnipeg)	10%	10%	40%
Total	**=100%**	**=100%**	**=100%**

Of the three funding scenarios, which would you support the most? *(check one box below)*

[ ] Scenario A [ ] Scenario B [ ] Scenario C

16. Now, we would like you to freely assign the proportion of funding that you think should go to each of the four water program areas. *(Please write a percentage for each funding area. Your total should equal 100%.)*

	Safe drinking water	High quality swimming and boating	Healthy fish and wildlife populations	Reduce MN's contribution to water problems outside state lines (e.g., Gulf of Mexico, Lake Winnipeg)	
My own funding scenario	_____	_____	_____	_____	**=100%**

17. Have you engaged in the following actions or initiatives in the past 12 months? If yes, how often did you engage in the action or initiative?

	First, have you engaged in the following actions or initiatives in the past 12 months?		Second, if you marked "yes", how often did you engage in the action or initiative in the past 12 months?			
	Yes	No	Every few months	Once a month	Every two weeks	Weekly or more
a. Volunteered for a community organization or an event	☐	☐	☐	☐	☐	☐
b. Helped organize a community program	☐	☐	☐	☐	☐	☐
c. Heard about a water resource protection initiative	☐	☐	☐	☐	☐	☐
d. Talked to others about conservation practices	☐	☐	☐	☐	☐	☐
e. Attended a meeting or public hearing about water	☐	☐	☐	☐	☐	☐
f. Worked with other community members to protect water	☐	☐	☐	☐	☐	☐
g. Taken a leadership role around water resource conservation in the community	☐	☐	☐	☐	☐	☐

18. To what extent have you engaged in the following conservation actions in the past 12 months?

	Never	I have in some areas/occasionally	I have wherever and whenever possible
a. Maintained a vegetative buffer along streams, ditches or lakes on my property	☐	☐	☐
b. Used conservation agricultural practices (e.g., no till, cover crops)	☐	☐	☐
c. Donated money to a conservation organization	☐	☐	☐
d. Reduced or changed my personal household water consumption (e.g., turning off faucet while brushing teeth, etc.)	☐	☐	☐
e. Protected or restored wetlands on my land/property	☐	☐	☐
f. Used a rain barrel or cistern to store water	☐	☐	☐
g. Planted or maintained native plants or shrubs in my yard	☐	☐	☐
h. Minimized use of fertilizers/pesticides on lawns and gardens	☐	☐	☐
i. Other (please specify): _____	☐	☐	☐

IV. About you

Finally, we have a few questions about you. As a reminder, your responses to the survey are completely confidential and will only be used in aggregate—or in group form. No individual responses will be published.

19. In what year were you born? _____ [ ] Prefer not to respond

20. How do you describe yourself? [ ] Female [ ] Male [ ] Transgender [ ] Non-binary/gender non-conforming

[ ] Prefer not to respond

21. What is the highest level of formal education you have completed? (Please check one box)

[ ] Did not finish high school
[ ] Completed high school
[ ] Some college but no degree
[ ] Associate degree or vocational degree
[ ] College bachelor's degree
[ ] Some college graduate work
[ ] Completed graduate degree (Master's or PhD)
[ ] Prefer not to respond

22. What category best describes you? (Please check all that apply)

[ ] **White**
For example, German, Irish, English, Italian, Polish, French, Swedish, Norwegian, etc.

[ ] **Hispanic, Latino, or Spanish heritage**
For example, Mexican or Mexican American, Puerto Rican, Cuban, Salvadoran, Dominican, Colombian, etc.

[ ] **Black or African American**
For example, African American, Jamaican, Haitian, Nigerian, Ethiopian, Somalian, etc.

[ ] **Asian**
For example, Chinese, Filipino, Asian Indian, Vietnamese, Hmong, Korean, Japanese, etc.

[ ] **American Indian or Alaska Native**
For example, Anishinaabe, Dakota (Sioux), Navajo Nation, Mayan, Aztec, Nome Eskimo Community, etc.

[ ] **Middle Eastern or North African**
For example, Lebanese, Iranian, Egyptian, Syrian, Moroccan, Algerian etc.

[ ] **Native Hawaiian or other Pacific Islander**
For example, Native Hawaiian, Samoan, Chamorro, Tongan, Fijian, Marshallese, etc.

[ ] **Some other race, ethnicity or heritage (Please specify):**
_____

[ ] Prefer not to respond

23. Which of the following best describes your total household income from all sources in 2017 before taxes? *(Please check one box)*

[ ] Under $20,000
[ ] $20,000 - $49,999
[ ] $50,000 - $74,999
[ ] $75,000 - $99,999
[ ] $100,000 - $149,999
[ ] $150,000 - $199,999
[ ] $200,000 - $249,999
[ ] $250,000 - $299,999
[ ] $300,000 or more
[ ] Prefer not to respond

24. Approximately what percentage of your total household income is dependent on the following areas?

Agricultural production ____% Forest production ____% Nature-based tourism or recreation-related industry ____%

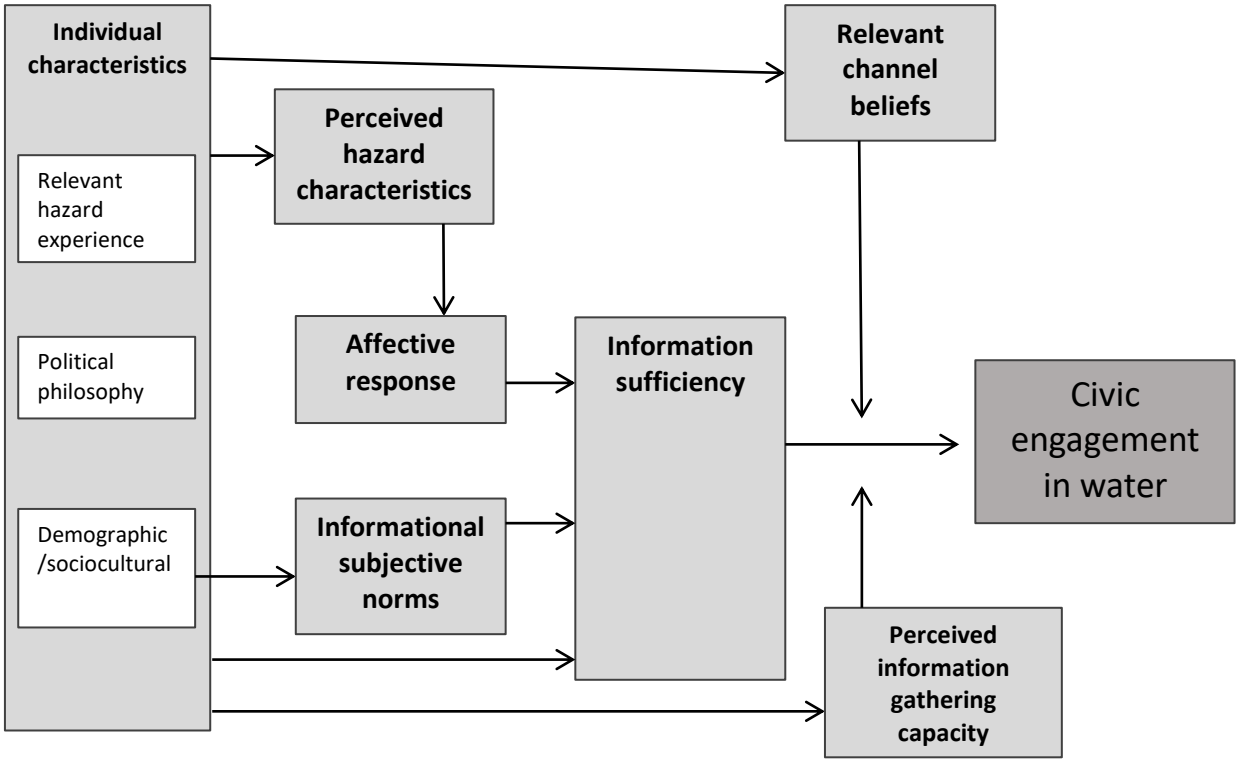
25. Do you have any other comments about water in Minnesota, or comments about this survey?

Thank you for your help!

Please complete the survey, fold it in thirds, and mail it back in the enclosed self-addressed stamped envelope.

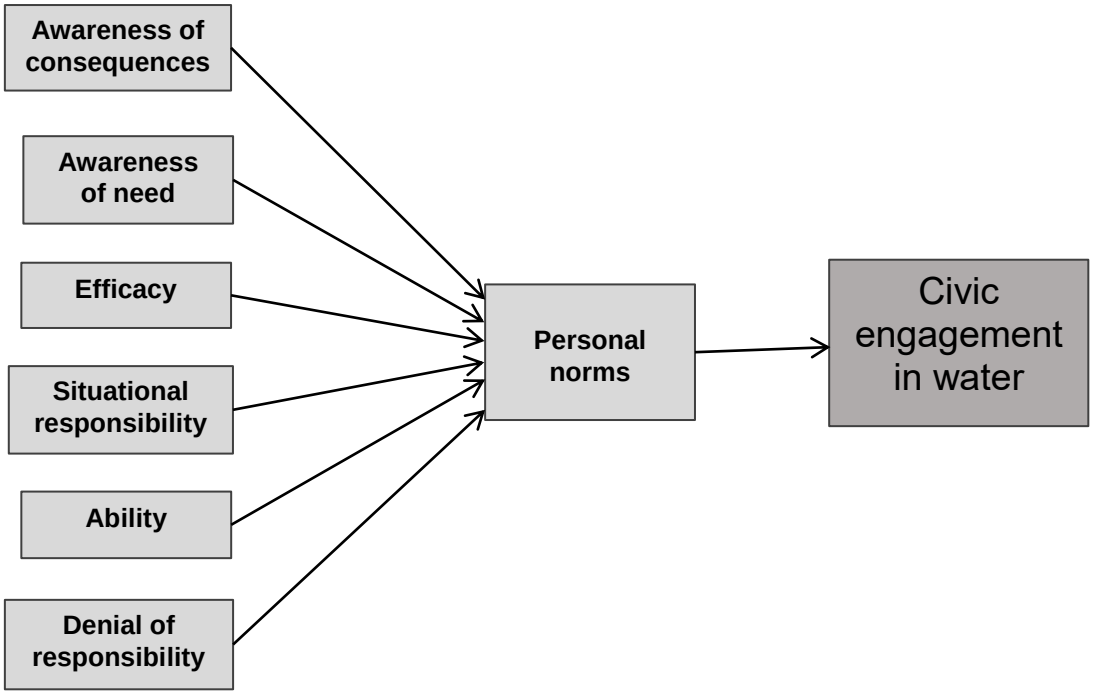
8

APPENDIX D: RISK INFORMATION SEEKING AND PROCESSING MODEL



(Griffin, Dunwoody, and Neuwirth, 1999)

APPENDIX E: NORM ACTIVATION THEORY



(Schwartz, 1973)