AN ASSESSMENT OF LANDOWNER CONSERVATION ACTION IN THE LOWER MINNESOTA WATERSHED

Center for Changing Landscapes
University of Minnesota
Driven to Discover℠

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August 23, 2018

Clean Water Land & Legacy Amendment

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A Final Technical Report
Prepared for the
Minnesota Pollution
Control Agency

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Executive Summary

This report describes a social science assessment of landowner conservation behavior in the Lower Minnesota watershed of Minnesota. The study was conducted by the Center for Changing Landscapes, University of Minnesota, in collaboration with Sibley County and the Minnesota Pollution Control Agency (MPCA). The purpose of this study was to understand landowner values, beliefs, norms and behaviors associated with water resources and conservation. This study helps provide resource professionals with a better understanding of the drivers of and constraints to conservation practice adoption among landowners. This project used a mixed-methods approach using both qualitative data gathered through key informant interviews and quantitative data through self-administered surveys.

Key Findings

- Landowners and farmers are influenced in their water-related decision-making by multiple groups including their family, other farmers, and local Soil and Water Conservation Districts.
- The biggest drivers of conservation practice adoption appear to be perceived benefits of conservation practices, stewardship ethic, availability of financial incentives, and conservation program reformation.
- The biggest constraints to conservation action include lack of financial resources, equipment, and community leadership.
- There is a significant gap between private-sphere (e.g., conservation practice adoption) and public-sphere norms and actions (e.g., civic engagement in water protection). While most landowners reported feeling a sense of personal obligation to do whatever they can to prevent water pollution, including using conservation practices, considerably fewer landowners feel obligated to engage in civic actions (e.g., talk to others about conservation practices.
- Lack of social norms around civic engagement appears to be a significant constraint to community action in water resource protection.

Recommendations

We recommend a combination of strategies to promote conservation programming and offer three broad strategies:

- Emphasize environmental and community benefits of conservation practices and encourage personal commitment to conservation
- Address resource constraints such as lack of financial resources and equipment through technical assistance and incentive programs
- Support community-building, and consequent norm development, centering on water engagement

1. Project Background

This report describes a social science assessment of landowner conservation behavior in the Lower Minnesota watershed of Minnesota. The study was conducted by the Center for Changing Landscapes, University of Minnesota (UMN), in collaboration with Sibley County and Minnesota Pollution Control Agency (MPCA).

The major land use in the Lower Minnesota watershed is agricultural. Over 95% of the watershed is owned by private landowners. Non-point source pollution is a concern in the watershed. Major resource concerns in the area include erosion and nutrient and chemical contamination. Stretches of the Minnesota River are listed as impaired due to fecal coliform, dissolved oxygen, turbidity, mercury, and phosphorus (USDA Natural Resources Conservation Service (NRCS), n.d.).

Resource managers in the watershed are increasingly investing scarce resources in outreach and education programs to promote voluntary adoption of conservation practices and to engage community members in water resource protection. Efforts to promote adoption of conservation practices and engage landowners in conservation must be based on an understanding of the values and beliefs of landowners. The purpose of this study was to understand landowner values, beliefs, norms and behaviors associated with water resources and conservation. This study helps provide resource professionals with a better understanding of the drivers of, and constraints to, conservation practice adoption among landowners.

This project included a survey of landowners in the Lower Minnesota watershed, as well as in-depth qualitative interviews, to answer three primary research questions:

1. What are the drivers and constraints to conservation practice adoption among landowners?
2. What factors influence landowners' engagement in local conservation initiatives?
3. How can policymakers and resource professionals design and promote water resource conservation programs that are ecologically and socially relevant, and responsive to the needs and concerns of local landowners?

The information provided in this report is intended to inform and enhance water resource management in the Lower Minnesota watershed. Study findings will be useful in developing and enhancing conservation programs that respond to the needs and concerns of landowners and agricultural producers in the area.

2. Methods

This project used a mixed-methods approach with qualitative data gathered through key informant interviews and quantitative data through self-administered surveys. Qualitative data were gathered through in-depth interviews with agricultural producers. Quantitative data were collected through a mail survey distributed to 1000 landowners who own property within the Lower Minnesota watershed. The Lower Minnesota watershed contains portions of Sibley, Nicollet, Le Sueur, McLeod, Scott, Carver, Hennepin, Ramsey, Renville, Dakota, and Rice counties.

2.1 Landowner Mail Survey

Data were collected through a self-administered mail survey of a random sample of landowners who live within the Lower Minnesota watershed. A list of property owners within the Lower Minnesota watershed was obtained from Nicollet, Sibley, Renville, McLeod, Le Sueur, and Rice counties. The list was based on publicly available county tax records and was restricted to property owners who own 40 acres or more. A total of 1000 surveys were distributed by U.S. mail. The surveys were administered from August 2017 through January 2018.

Survey instruments were designed based on extensive literature review and feedback from project partners. The survey questionnaire included a variety of fixed-choice and scale questions. Several questions were adapted from survey instruments used in previous studies of attitudes, beliefs and values of conservation behaviors (Davenport & Pradhananga, 2012; Davenport, Pradhananga, & Olson, 2014; Pradhananga, Perry, & Davenport, 2014; Pradhananga and Davenport, 2017; Prokopy et al., 2009). Each questionnaire was labeled with a unique identification number to track responses for subsequent mailings.

An adapted Dillman's (2014) Tailored Design Method was used to increase response rates. The survey was administered in three waves: (1) the questionnaire (Appendix A) with a cover letter (Appendix B), watershed map (Appendix C), and a self-addressed, business reply envelope; (2) a replacement questionnaire with a reminder letter (Appendix D), watershed map and envelope; and (3) a third replacement questionnaire with cover letter, watershed map and envelope. Survey protocol for this project was reviewed by the University's Institutional Review Board.

Returned questionnaires were logged into the respondent database. Response data were numerically coded and entered into a database using Microsoft Excel 2010. Statistical analyses were conducted using Statistical Package for Social Sciences (SPSS release 24.0). Basic descriptive statistics were conducted to determine frequency distributions and central tendency of individual variables.

To examine the factors that influence respondents' clean water actions and engagement in community activities, subgroup comparisons were conducted between respondents with varying levels of clean water action (i.e., high action, low action) and levels of civic engagement (i.e., high engagement, low engagement). Respondent subgroups were compared for differences in their socio-demographic and property characteristics, social influences, awareness of water issues, perceived ability, social norms of conservation action, and community and water resource beliefs.

2.2 Farmer Interviews

UMN personnel and partners collaborated to develop a contact script (Appendix E) and interview guide (Appendix F) to facilitate participation. The project was reviewed by the Institutional Review Board (IRB) as designated by both University policy and federal regulations. Partners provided UMN personnel with an initial list of prospective interview participants. The list was made up of individuals who had recently participated in a county cost-share program for either buffer strips, tile inlet alternatives, or cover crops. UMN personnel expanded the list using the Lower Minnesota's watershed newsletter mailing list to include known farmers in the study area.

Sixteen semi-structured interviews were conducted with 16 key informants – in eight instances, a second individual joined the interview. Participants included farmers who farm their own land and/or farm land rented from others. All interviews occurred at the individual's residence. Participants were offered an optional $20 as an incentive to participate.

The interviewer first answered any questions or concerns the interviewee had prior to beginning the interview. The interviewer emphasized that every reasonable effort would be made to ensure confidentiality and that participation was voluntary. Each participant signed a consent form (Appendix G) and completed a conservation practice checklist (Appendix H) prior to the start of the interview. Following the interview, participants were asked to complete a background information survey on an iPad (Appendix I). This information was used to help understand the sample profile and is only reported in an aggregated summary. No identifying personal information is linked to the interview data.

Qualitative data were analyzed using open coding consistent with adapted grounded theory procedures (Charmz, 2006; Corbin & Strauss, 2008). Additional focused coding was used to highlight responses with direct bearing on the research questions. QSR International's NVivo 11 software was used to perform data analysis including the managing, coding, and organizing of the data (NVivo 2016). Multiple researchers analyzed the data including periodic checks for consistency and applicability. A team of researchers triangulated the coding schema and findings during the open coding processes.

The goal of the qualitative analysis was to develop insights, and identify patterns and concepts related to the farmers' decision-making processes and perspectives, grounded in the data, to inform natural resource managers. While the study findings represent the beliefs and opinions of the study participants only, wide-ranging and diverse perspectives were captured. Study participants have differing backgrounds, experiences, and connections to water, their community, and conservation practices.

3. Study Findings

Project findings are organized into two sections: landowner mail survey findings and farmer interview findings. The survey findings are further organized into five sub-sections that respond to 14 unique research questions. Interview findings are organized into two sub-sections.

3.1 Survey Findings

Overall, 304 landowners completed and returned the survey for a response rate of 32% (adjusted for 49 surveys returned undeliverable). Complete statistics for all survey questions in aggregate are presented in tabular form in Appendix J. Findings from subgroup comparisons are presented in tabular form in Appendix K.

3.1.1 **Respondent & Community Profile**

Who are respondents and what are their property ownership characteristics?

Respondents were asked a series of questions about their socio-demographic background and property ownership characteristics. A majority of respondents were male (78%). The respondents ranged in age from 28 to 98 with a median age of 67. A vast majority of respondents characterized their race and ethnicity as white (98%). Almost one-third of respondents (29%) had attained at least a college bachelor's degree. More than half of the respondents (51%) reported an annual household income of $75,000 or more (Appendix J, Table 1).

Most respondents (86%) reported that their property borders a ditch, stream, lake, or river. A vast majority of respondents (91%) used their land for agricultural production. Over half of respondents (59%) reported that 50% or more of their income is dependent on agricultural production. Over one-third of respondents (38%) own and manage their land, and half of the respondents (50%) make their own management decisions. Over one-third of respondents (35%) are currently enrolled in a program that offers financial incentives for conservation practices (Appendix J, Table 2). Almost three-fourths of respondents (71%) own more than 100 acres of land. Among the respondents who rent their land to others, over two-thirds (68%) rent out 100 acres or more. Among respondents who reported using their land for agricultural production, a majority (71%) have 100 acres or more in agricultural production (Appendix J, Table 3).

How do respondents view their community?

Survey respondents were asked to identify what comes to mind first when they think of their community. Several choices were provided including neighborhood, county, city, and watershed. Respondents were also asked to rate the importance of several community qualities on a five-point scale from very unimportant (-2) to very important (+2). Over one-third of respondents (41%) defined their community as their neighborhood. A small minority of respondents (2%) defined their community as their watershed (Appendix J, Table 4). Water appears to be highly valued amenity for respondents. A vast majority of respondents (87%) rated clean streams, rivers, and lakes as somewhat to very important. A majority of respondents also rated good relationships among neighbors (89%), strong family ties (86%), and access to natural areas/views (72%) as important qualities of a community (Appendix J, Table 5, Figure 1).

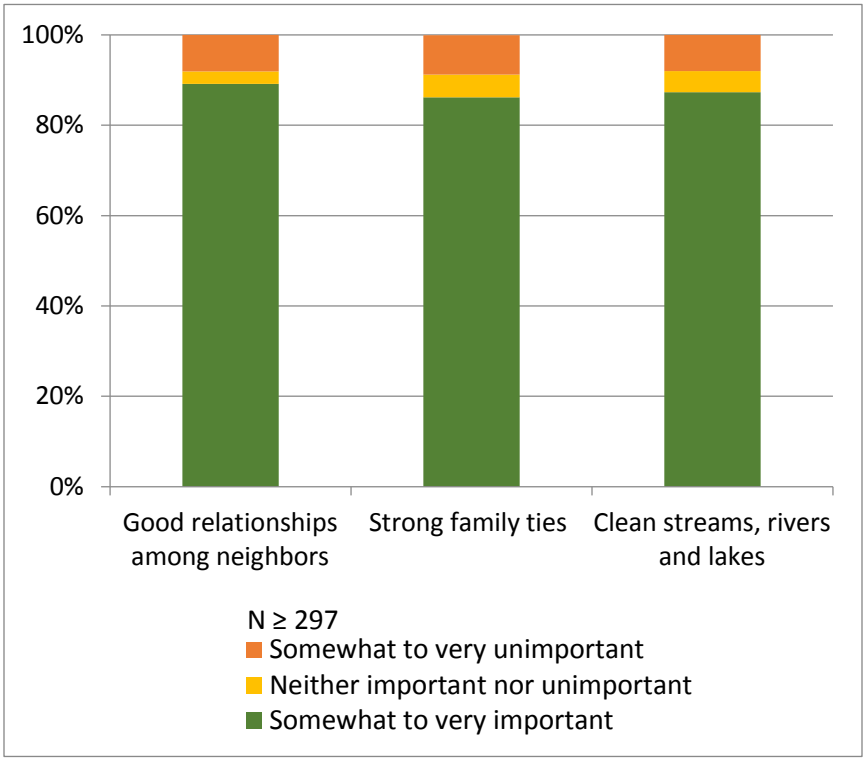

Figure 1. Respondents' ratings of community qualities

3.1.2 Perspectives on Water Resources

What are respondents' beliefs about water resources?

Respondents were asked to report how they use water resources in their watershed. Most respondents reported using water for drinking (83%), observing wildlife (57%), and experiencing scenic beauty (48%) (Appendix J, Table 6).

Respondents were asked to report their familiarity with water issues in their watershed on a four-point scale from not at all familiar (1) to very familiar (4). Respondents were also asked to rate the quality of water in the stream, lake or river closest to them and in the Minnesota River on a five-point scale from very poor (1) to very good (5). A majority of respondents (61%) reported that they are moderately to very familiar with water issues in their watershed (Appendix J, Table 7). Almost three-fourths of respondents (74%) rated the quality of water in the stream, lake or river closest to them as fair to very good. A majority of respondents (52%) also rated the quality of water in the Minnesota River as fair to very good (Appendix J, Table 8).

Respondents were asked to rate a series of statements regarding their beliefs about water pollution, water resource protection, and conservation practices on a five-point scale from strongly disagree (-2) to strongly

agree (+2). A vast majority of respondents (87%) agreed that water pollution affects human health, and that excessive water runoff causes soil and nutrient loss (Figure 2). While a majority of respondents either disagreed or were unsure that water resources in Lower Minnesota are adequately protected (56%), most respondents somewhat to strongly agreed that water resources in Minnesota need better protection (63%) (Appendix J, Table 9).

While a majority of respondents agreed that drainage tiling contributes to higher water flows downstream (62%), a vast majority of respondents also agreed that drainage tiling increases crop yield (88%). A majority of respondents agreed that conservation practices protect aquatic life (82%) and that conservation practices contribute to quality of life in their community (67%) (Figure 2). Over three-fourths of respondents (78%) somewhat to strongly agreed that conservation drainage management reduces runoff from farmland (Appendix J, Table 10).

Respondents were asked to rate the extent to which they agreed or disagreed with a series of statements identifying individuals or groups (e.g., farmers, local government, urban residents) responsible for protecting water resources on a five-point scale from strongly disagree (-2) to strongly agree (+2). A vast majority of respondents (89%) agreed that it is their personal responsibility to make sure that what they do on their land does not contribute to water resource problems. A majority of respondents also agreed that landowners upstream (83%), farmers in their watershed (85%), and urban residents in their watershed (80%) should be responsible for protecting water. Similarly, a majority of respondents agreed that local (62%) and state government (50%) should be responsible for protecting water (Appendix J, Table 11).

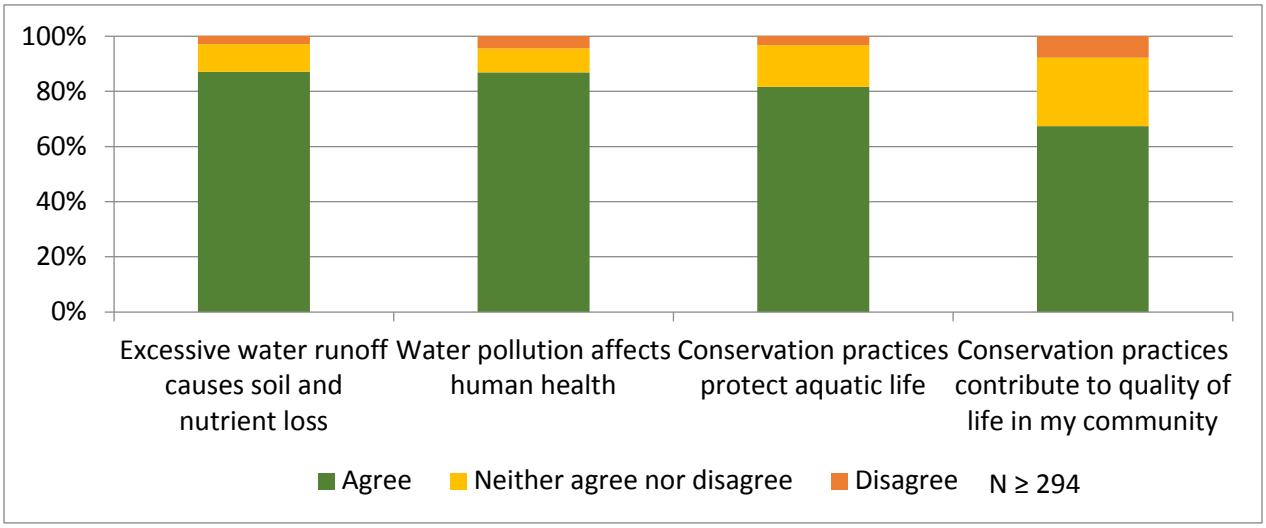

Figure 2. Respondents' beliefs about water pollution and conservation practices

Are respondents concerned about the consequences of water pollution?

Respondents were asked to indicate the extent to which they perceive a series of water pollutants/issues and sources of water pollutants/issues as problems, on a four-point scale from not a problem (1) to severe problem (4). The five pollutants/issues in the watershed rated on average as the biggest problems include nitrogen in surface water, sediment (cloudiness), phosphorus, flooding, and algae (Appendix J, Table 12). On average, respondents rated fertilizer management for lawn/turf care, urban/suburban water runoff, urban land development, increased frequency or intensity of storms, and stream bank erosion as the five biggest sources of pollutants/issues in their watershed (Appendix J, Table 13).

The survey also inquired about respondents' concerns related to the consequences of water pollution for various uses or purposes. Response was on a five-point scale from strongly disagree (-2) to strongly agree (+2). A vast majority of respondents were concerned about the consequences of water pollution for future generations (86%), their or their family's health (80%), and people in their community (77%) (Appendix J, Table 14).

3.1.3 Perspectives on Water Resource Protection

Do respondents and their communities have the ability to protect water resources?

Respondents were asked to rate the extent to which they agreed with a series of statements about their own ability and their community's ability to protect water resources on a five-point scale from strongly disagree (-2) to strongly agree (+2). Most respondents (83%) agreed that their use of conservation practices contributes to healthy water resources. A majority of respondents also agreed that they can learn almost anything about natural resource stewardship if they set their mind to it (76%) and that they have the knowledge and skills to use conservation practices on their land (64%). However, a majority of respondents either disagreed with or were unsure about the statement that they have the financial resources needed to use conservation practices on their land (61%) and that they have the equipment to adopt a new conservation practice (77%). A majority of respondents (54%) agreed that farmers in their community have the ability to work together to change land use practices. However, a majority of respondents either disagreed with or were unsure about the statement that their community has the financial resources (78%) and leadership (74%) it needs to protect water resources (Appendix J, Table 15, Figure 3).

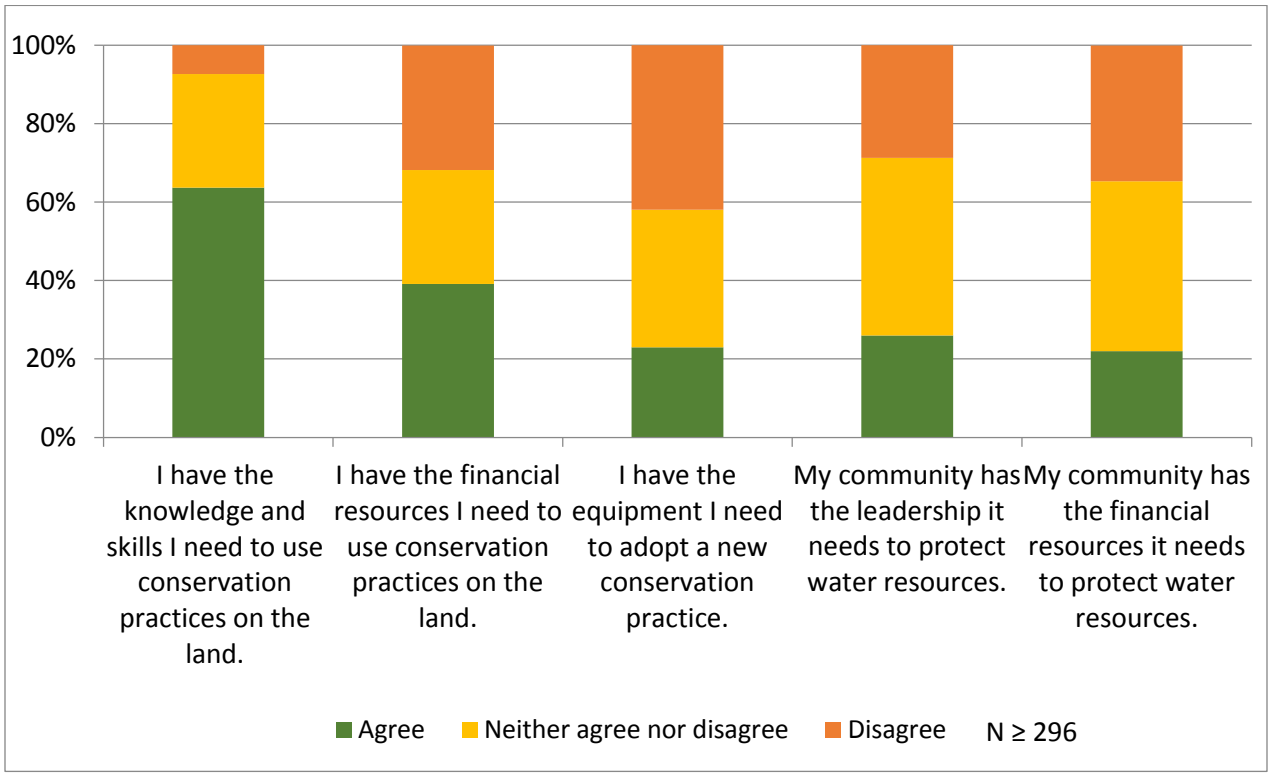

Figure 3. Respondents' perceptions about their and their community's ability to protect water

Do respondents feel personally obligated to protect water resources?

Respondents were asked to rate the extent to which they felt a personal obligation to engage in various actions to protect water resources on a five-point scale from strongly disagree (-2) to strongly agree (+2). A vast majority of respondents reported feeling a personal obligation to maintain their land/farm in a way that does not contribute to water resource problems (85%), do whatever they can to prevent water pollution (81%), and use conservation practices on their land/property (75%). However, fewer respondents felt a personal obligation to talk to others about conservation practices (50%), work with other community members to protect water resources (41%), and attend meetings or public hearing about water (28%) (Appendix J, Table 16, Figure 4).

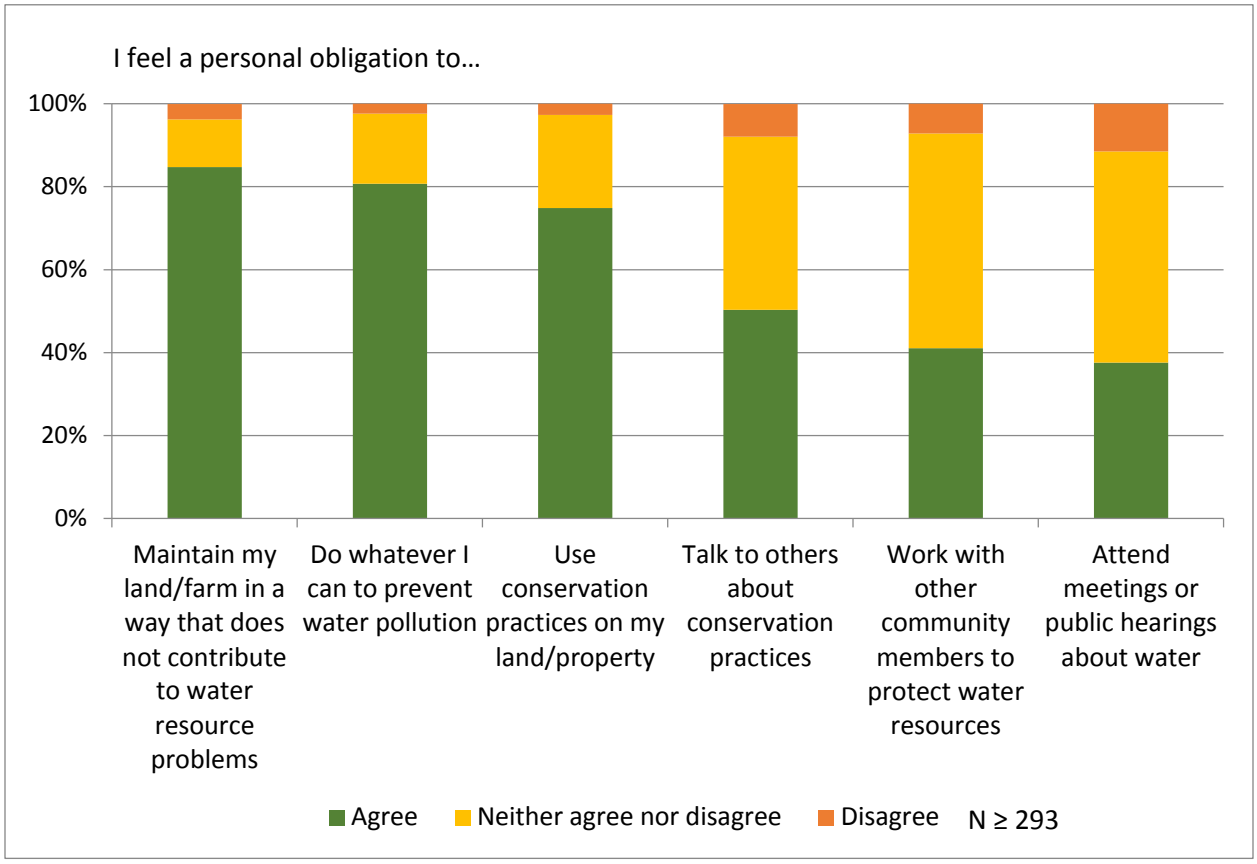

Figure 4. Respondents' feelings of personal obligation to protect water resources

What are respondents' beliefs about their influence on land and water management?

The survey also inquired about respondents' beliefs about their level of influence and control over land/farm and water management. Respondents were asked to rate their level of influence over water protection, farmland preservation, and civic action in their community on a four-point scale from not at all (0) to a lot (3). Respondents were also asked to rate the extent to which they agreed or disagreed with a series of statements regarding their feelings of control over land/farm management.

More than two-thirds of respondents (68%) reported that they have some to a lot of influence over preserving farms and farmland in the area. Most respondents (64%) also believed that they have some to a lot

of influence over protecting clean water in the area. However, a majority of respondents (51%) believed that they have little to no influence over inspiring or organizing others to take action in their community (Appendix J, Table 17).

A vast majority of respondents (85%) agreed that by taking an active part in conservation, people can keep water clean in Minnesota. Most respondents (71%) also agreed that the average farmer/landowner can have an influence on rural community life in the region. Most respondents either disagreed or were unsure (75%) that most of what happens on their farm/land is beyond their control. However, most respondents (65%) agreed that it is difficult to have much control over policies that affect their farms/lands and almost half of the respondents (48%) agreed that there is nothing they can do to keep the costs of farm/land management from going up.

Weather also seemed to be a decision-making factor over which respondents feel little control. A majority of respondents (56%) agreed that weather has a big impact on their decisions about conservation practices on their land. A majority of respondents (69%) disagreed or were unsure whether they can rely on weather forecasts to manage their farm/land (Appendix J, Table 18).

3.1.4 **Conservation Practice Adoption**

What practices do respondents currently use and what practices are they likely to use in the future?

Respondents were asked to indicate if they currently use 19 different practices on their properties. A majority of respondents use drainage tiles (93%), "minimizing use of fertilizers/pesticides on lawns and gardens" (87%), "protect wetlands on the land/property" (75%), buffer strips along streams and ditches or field edges (75%), and "follow a nutrient management plan on the farm" (72%). Smaller proportions of respondents use a rain garden (6%), and rotation grazing (19%), and rain barrel or cistern to store water (20%) (Appendix J, Table 19, Figure 5).

Respondents were also asked to indicate if they intend to use 19 different practices on their properties in the future. A majority of respondents intend to use practices such as drainage tiles (91%), "minimizing use of fertilizers/pesticides on lawns and gardens" (87%), buffer/filter strips along streams and ditches or field edges (86%), "protect wetlands on the land/property" (75%), drainage tiles (76%), and "follow a nutrient management plan on the farm" (69%). Smaller proportions of respondents intend to use a rain garden (6%), rotation grazing (23%), and rain barrel (24%) (Appendix J, Table 19).

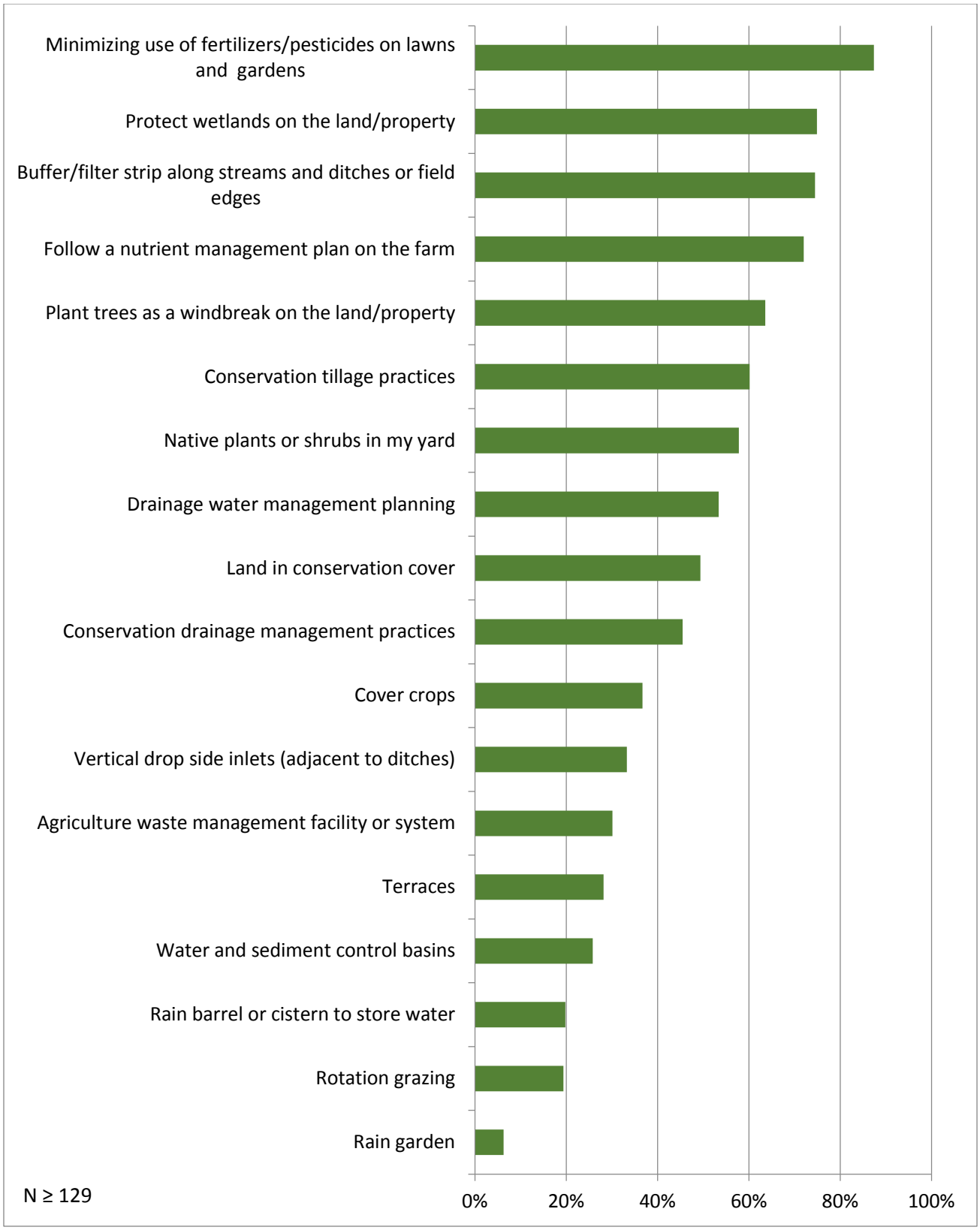

Figure 5. Respondents' current use of conservation practices

What would increase the likelihood that respondents would adopt or maintain conservation practices?

Respondents were asked to rate a series of statements about conditions or actions that might influence their adoption or continued use of conservation practices on a five-point scale from strongly disagree (-2) to strongly agree (+2). Providing payments/financial assistance, reducing complexity of conservation programs, and presenting evidence that conservation practices improve water resources appear to be major factors that would increase the likelihood of conservation practice adoption among respondents. Most respondents (62%) reported that they would be more likely to adopt new conservation practices if they could get higher payments for adopting conservation practices. A majority of respondents also reported that they would be more likely to adopt new conservation practices if they were compensated for lost crop production because of conservation practices (60%), and if they had access to financial resources to help adopt conservation practices (54%). A majority of respondents (59%) agreed that they would be more likely to adopt new conservation practices or continue to use practices if conservation program requirements were less complex. More than half of the respondents (53%) also agreed that they would be more likely to adopt new conservation practices or continue to use practices if they had evidence that conservation practices improved water resources (Appendix J, Table 20, Figure 6).

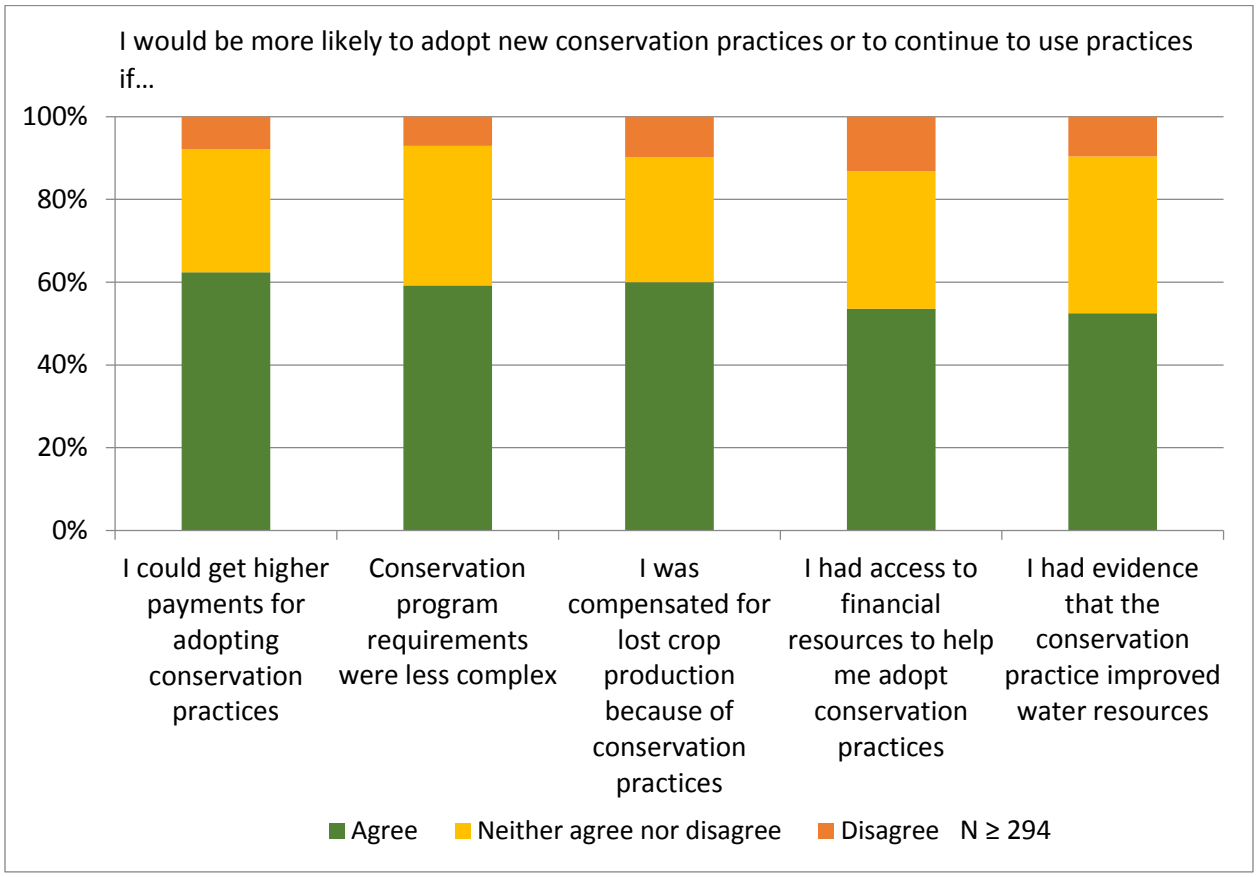

Figure 6. Factors that would increase the likelihood of conservation practice use among survey respondents

3.1.5 **Community Engagement & Action**

How engaged are respondents in their community?

Respondents were asked to indicate the extent to which they had engaged in seven civic actions in the past 12 months on a five-point scale from never (0) to weekly or more (4). More than half of the respondents reported that they had volunteered for community organizations or events (51%) and talked to others about conservation practices (59%) at least every few months in the last 12 months. A vast majority of respondents had not taken a leadership role around water resource conservation in the community (93%), participated in a water resource protection initiative (78%), or worked with other community members to protect water (78%) (Appendix J, Table 21).

How likely are respondents to be engaged in civic actions in the future?

Respondents were asked to indicate the extent to which they intend to engage in six civic actions in the next 12 months on a five-point scale from most certainly not (-2) to most certainly will (+2). Most respondents were either unsure or did not intend to engage in civic actions such as contacting conservation assistance professionals about water resource initiatives (66%), working with other community members to protect water (77%), or attending a meeting or public hearing about water (66%) (Appendix J, Table 22).

Who influences respondents' decisions about conservation?

Respondents were asked to rate the extent to which individuals or groups influence their decisions about conservation on a four-point scale from not at all (1) to a lot (4). On average, the five individuals or groups with the biggest influence on respondents' conservation decision-making are family, farmers, county's Soil and Water Conservation District (SWCD), neighbors, and the Farm Service Agency (FSA). The county's Farm Bureau and Farmers Union were least likely to have an influence on respondents' conservation decision-making (Appendix J, Table 23).

Respondents were also asked to list their three most trusted sources of information regarding water quality issues and solutions. Overall, respondents' three most trusted sources of information were their county's SWCD (30%), farmers (22%), and their family (19%) (Appendix J, Table 24).

To what extent is there a perceived social norm of civic action?

Respondents were asked to rate a series of statements regarding social norms of civic action on a five-point scale from strongly disagree (-2) to strongly agree (+2). A majority of respondents either disagreed or were uncertain that "important others expect them to attend meetings or public hearings about water" (65%), work with other community members to protect water (67%), or talk to others about conservation practices (71%). Similarly, most respondents either disagreed or were unsure that important others expect them to work with other community members about conservation practices (75%), or attend meetings or public hearings about water (74%) (Appendix J, Table 25).

3.1.6 **Subgroup Comparison**

What are important differences between subgroups of respondents?

Levels of clean water action

Survey respondents who used their land for agricultural production (n = 267) were placed into one of two categories based on the number of conservation practices they had adopted: high clean water action (HA) respondents (i.e., respondents who have adopted seven or more of the 14 clean water actions listed), and low clean water action (LA) respondents (i.e., respondents who have adopted fewer than seven of the 14 clean water actions listed).

There were no significant differences between HA and LA respondents in sociodemographic characteristics such as age, gender, and income. Some notable differences emerged between HA and LA respondents in their perceptions of community qualities, familiarity with water resources, beliefs about conservation practices, perceived ability, personal and social norms, levels of civic engagement, motivations for practice adoption, and individuals or groups that influence their conservation decision-making.

HA respondents placed greater importance than LA respondents on community qualities such as good relationships with neighbors, opportunities to be involved in community projects, opportunities to express their culture and traditions, and clean streams, rivers, and lakes (Appendix K, Table 2).

HA respondents were more familiar with water resource issues in their watershed than LA respondents (Appendix K, Table 3). HA respondents agreed to a greater extent than LA respondents that water pollution affects human health. HA respondents agreed to a greater extent than LA respondents that conservation practices protect aquatic life and that conservation practices contribute to quality of life in their community. While HA respondents agreed to a greater extent than LA respondents that drainage tiling increases crop yield, HA respondents also more highly agreed that conservation drainage management reduces water runoff from farmland (Appendix K, Table 3).

HA respondents feel a stronger sense of personal obligation to protect water than LA respondents. HA respondents agreed to a greater extent than LA respondents that they feel a personal obligation to i) maintain their land/farm in a way that does not contribute to water resource problems, ii) use conservation practices on their land, and iii) do whatever they can to prevent water pollution. HA respondents also reported feeling a stronger sense of personal obligation to engage in civic actions. HA respondents agreed to a greater extent than LA respondents that they feel a personal obligation to i) talk to others about conservation practices, ii) work with other community members to protect water resources, and iii) attend meetings or public hearings about water (Appendix K, Table 3). HA respondents also feel greater social pressures than LA respondents. HA respondents agreed to a greater extent than LA respondents that people who are important to them i) expect them to attend meetings or public hearings about water, and ii) attend meetings or public hearings about water (Appendix K, Table 3).

HA respondents agreed to a greater extent that their use of a conservation practice contributes to healthy water resources than LA respondents. HA respondents agreed to a greater extent than LA respondents that by taking an active part in conservation, people can keep water clean in Minnesota. HA respondents agreed to a greater extent that they have the knowledge and skills to use conservation practices on their land than LA

respondents. HA respondents also agreed to a greater extent than LA respondents that they can learn almost anything about natural resource stewardship if they set their mind to it (Appendix K, Table 4).

There were significant differences between HA and LA respondents in their motivations for practice adoption. HA respondents agreed to a greater extent than LA respondents that they would be more likely to adopt new conservation practices or continue to use practices if they i) had access to financial resources to help them adopt new conservation practices, ii) could get higher payments for adopting conservation practices, iii) were compensated for lost crop production because of conservation practices, and iv) could learn how to maintain conservation practices for soil conservation (Appendix K, Table 4).

HA and LA respondents also differed in their levels of civic engagement in community and water-related activities. On average, HA respondents were more likely than LA respondents to have volunteered for community organizations or events, participated in a water resource protection initiative, worked with other community members to protect water, talked to others about conservation practices, and attended a meeting or public hearing about water (Appendix K, Table 5).

Differences also emerged between HA and LA respondents in the extent to which different groups and individuals influence their conservation decision-making. HA respondents reported that they were influenced to a greater extent than LA respondents by their family, farmers, neighbors, their county's SWCD, university researchers, Minnesota Department of Natural Resources, Minnesota Department of Agriculture, the FSA, the NRCS, their local extension agent, certified crop advisors, their local co-op, and their agronomist/agricultural advisor (Appendix K, Table 6).

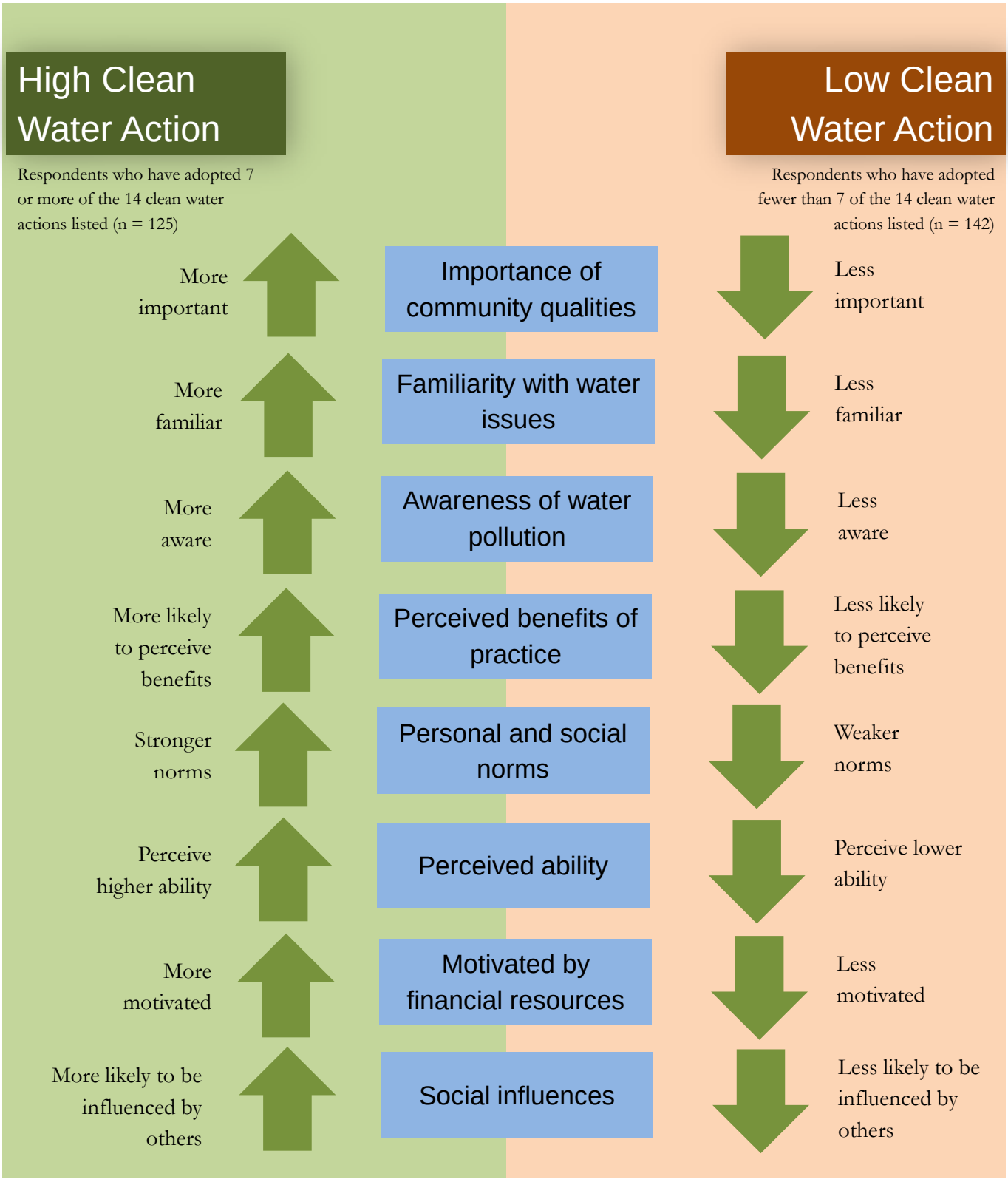

Figure 7. Differences between high water action and low water action respondents

Levels of civic engagement

Survey respondents were placed into one of two categories based on their reported levels of engagement in civic actions in the past 12 months: high civic engagement (HCE) respondents (i.e., respondents who have participated in two or more of the seven community activities listed), and low civic engagement (LCE) respondents (i.e., respondents who have participated in fewer than two of the community activities listed).

There were no significant differences between HCE and LCE respondents in sociodemographic characteristics such as age and education. There was a significant difference between HCE and LCE respondents in gender. A greater proportion of male respondents than female respondents reported participating in two or more community activities in the past 12 months (i.e., were HCE respondents) (Appendix K, Table 8).

Some notable differences emerged between HCE and LCE respondents in their perceptions of community qualities, familiarity with water resources, beliefs about practices, perceived ability, perceived control and influence, personal and social norms, and individuals or groups that influence their conservation decision-making.

HCE respondents placed greater importance on community qualities than LCE respondents. Specifically, HCE respondents placed greater importance on "opportunities to be involved in community projects" than LCE respondents (Appendix K, Table 9).

HCE respondents were more familiar with water resource issues in their watershed than LCE respondents. HCE respondents agreed to a greater extent that drainage tiling increases crop yield than LCE respondents. HCE respondents were more likely to feel a stronger sense of personal responsibility for water resource protection than LCE respondents. HCE respondents agreed to a greater extent than LCE respondents that it is their personal responsibility to i) help protect water, and ii) make sure that that what they do on their land doesn't contribute to water resource problems (Appendix K, Table 10).

HCE and LCE respondents also differed in perceptions of ability, control, and influence. HCE respondents agreed to a greater extent than LCE respondents that their use of conservation practice contributes to healthy water resources. HCE respondents also agreed to a greater extent than LCE respondents that they have the knowledge, skills, and financial resources they need to use conservation practices on their land. HCE respondents agreed to a greater extent than LCE respondents that if there is someone they want to meet in their community, they can usually arrange it. HCE respondents agreed to a greater extent than LCE respondents that they find it easy to play an important role in most group situations within their community. HCE respondents disagreed to a greater extent than LCE respondents that most of what happens on their land is beyond their control. HCE respondents believed to a greater extent than LCE respondents that they have influence over "protecting clean water in the area" and "inspiring or organizing others to take action in the community" (Appendix K, Table 10).

HCE respondents also reported feeling a stronger sense of personal obligation to protect water than LCE respondents. HCE respondents agreed to a greater extent than LCE respondents that they feel a personal obligation to i) maintain their land/farm in a way that does not contribute to water resource problems, ii) use conservation practices on their land, and iii) do whatever they can to prevent water pollution. Differences also emerged between HCE and LCE respondents in their feelings of personal obligation to engage in civic

actions. HCE respondents agreed to a greater extent that they feel a personal obligation to talk to others about conservation practices, and attend meetings or public hearings about water (Appendix K, Table 11).

HCE respondents also reported feeling greater social pressures to engage in civic actions than LCE respondents. HCE respondents agreed to a greater extent than LCE respondents that people who are important to them expect them to i) talk to others about conservation practices, ii) work with other community members to protect water, and iii) attend meetings or public hearings about water. Further, HCE respondents agreed to a greater extent than LCE respondents that people who are important to them i) talk to others about conservation practices, ii) work with other community members to protect water, and iii) attend meetings or public hearings about water (Appendix K, Table 11).

There were significant differences between HCE and LCE respondents in the extent to which different groups influence their conservation decision-making. HCE respondents reported that they were influence to a greater extent than LCE respondents by their county's SWCD, the FSA, the NRCS, agricultural commodity associations, and their agronomist/agricultural advisor (Appendix K, Table 12).

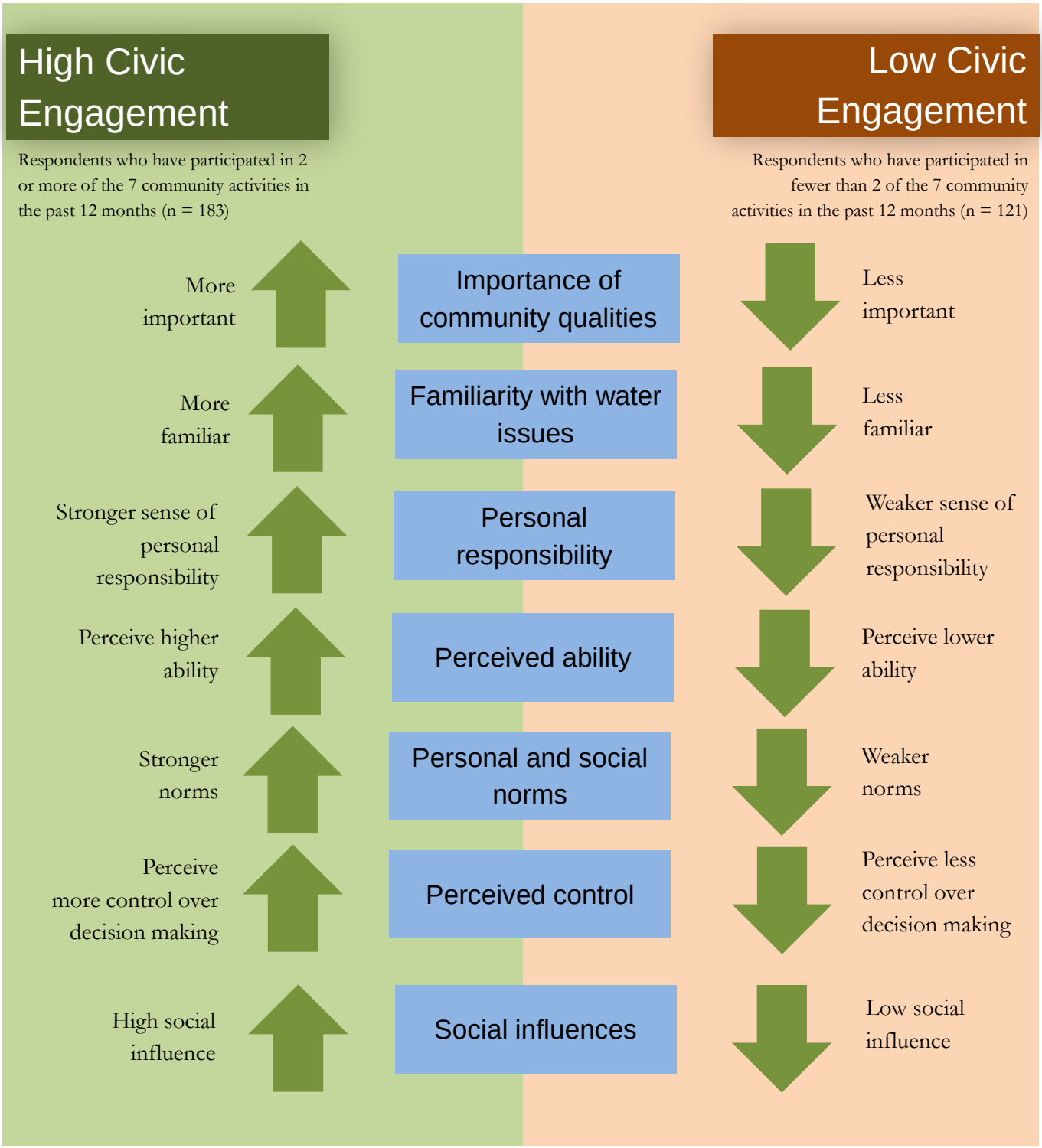

Figure 8. Differences between respondents with varying levels of civic engagement

3.2 Interview Findings

3.2.1 Interview Participant Profile

Interview participants were asked to complete a background information form (n-16) on an iPad provided by the researcher, which included basic sociodemographic questions and questions about their farm. Participants represent varying farm ownership arrangements, farm sizes, and income levels. Interview participants' ages ranged from 31 to 79 with a median age of 58 years. The majority of primary respondents (15 of 16) were male. During 8 interviews either the primary participants' wife, mother, or son also participated in the discussion, but only the primary participant is represented in the profile data. Many of the participants had lived in the community for most of their lives (Table 1). The participants had been farming for a living between 15 and 48 years, with a median 36.5 years farming. On average, the participants' farms had been in the family for more than 80 years. All participants farmed their own land, with over 60% also renting more land from another party (Table 2). Over 80% of participants reported at least 50% of their household income was dependent on farming. Farm operation size ranged from 346 to 2800 acres. All participants farmed corn and soybeans primarily – other crops farmed include alfalfa, wheat, sweet corn, peas, barley, and hay (Table 3). About half the participants also raised livestock, including hogs, cattle, chicken, and sheep. All participants reported involvement in farming-related organizations/associations in their community; the primary organizations mentioned were MN Corn Growers Association (88%), MN Soybean Growers Association (81%) and American and/or MN Farm Bureau (56%).

Table 1. Interview participant profile

Primary Participant Socio-Demographic Characteristics		n	Percent
Gender	Male	15	94
	Female	1	6
Age	Median	58	-
	Minimum	31	-
	Maximum	79	-
Years lived in community	Median	52.5	-
	Minimum	31	-
	Maximum	78	-
Years farming	Median	36.5	-
	Minimum	15	-
	Maximum	48	-
Formal education	Did not finish high school	0	0
	Completed high school	4	25
	Some college but no degree	4	25
	Associate or vocational degree	5	31
	College bachelor's degree	2	13
	Some graduate work	0	0
	Completed graduate degree (MS or PhD)	1	6
Household income	Under $34,999	1	6
	$35,000-$49,000	0	0
	$50,000-$74,999	2	13
	$75,000-$99,999	6	38
	$100,000-$149,999	4	25
	$150,000 or more	3	19

Table 2. Interview participants' property characteristics

Property Characteristics		n	Percent	Mean
Property Size	Under 500 acres	8	50	
	500-1000 acres	5	31	662
	1001 or more acres	3	19	
Percent income dependent on farming	0%	0	0	-
	1-25%	0	0	-
	26-50%	2	13	-
	More than 50%	13	81	-
	Did not answer	1	6	-
Ownership arrangement	I own and farm my own land only	6	38	-
	I own/farm and rent *from* another party	10	62	-
	I own/farm and rent *to* another party	0	0	-
	I rent my land *to* another party	0	0	-
	I rent my land *from* another party	0	0	-
	Does not farm	0	0	-
Years farm has been in the family	Median	70	-	-
	Mean	86	-	-
	Minimum	31	-	-
	Maximum	161	-	-
Acres Farmed	Median	807.5	-	-
	Mean	997	-	-
	Minimum	346	-	-
	Maximum	2800	-	-

Table 3. Interview participants' farming operation characteristics

Farming Operation Characteristics*		n	Percent	Average % of total operation
Crops	Corn	16	100	49
	Soybeans	16	100	34
	Alfalfa	4	25	7
	Wheat	4	25	7
	Sweet Corn	8	50	20
	Peas	5	31	8
	Other (Barley, Hay)	3	19	5
Livestock	Hogs	6	38	75
	Cattle	5	31	89
	Chickens	1	6	2
	Sheep	1	6	1
	No livestock	7	44	-
Farming associations/ organizations involved in	MN Corn Growers Association	14	88	-
	MN Soybean Growers Association	13	81	-
	American and/or MN Farm Bureau	9	56	-
	MN Farmers Union	3	19	-
	Pork Producers	1	6	-
	Cattleman's Association	1	6	-

*Respondents could provide multiple responses.

3.2.2 Decision-making Framework

Data analysis revealed a variety of factors that influence farmers in their decision-making about their land, including both internal and external factors. Understanding these factors can guide resource managers when promoting adoption of conservation practices among local farmers. These influential factors were grouped into six main categories:

1. Perceived Environmental Benefits
2. Economic Considerations
3. Internal Motivations
4. External Motivations
5. Farmer Values
6. Practice Appraisal

Perceived Environmental Benefits

Participants described a breadth of perceived environmental benefits that influence their decision-making including water quality benefits, soil health & productivity, wildlife benefits, and chemical use.

Perceived Environmental Benefits
Water Quality Benefits
• Conservation practices filter and protect water, slow drainage
• Downstream benefits of conservation practices
Soil Health & Productivity
• Conservation practices protect soil, reduces soil compaction, and improves soil fertility
• Conservation practices keep soil too shaded, do not provide erosion control with huge rain
Wildlife Benefits
• Increased wildlife habitat
• Hunting and fishing opportunities
• Benefits of planting natives and prairies
• Concern about livestock disease and pollinator decline
Chemical Use
• Minimize chemical use
• Manage fertilizer types or amounts; variable rate application/grid testing
• Use of chemicals for pests

Water Quality Benefits

The potential benefits to water quality were described by participants as driving their decision-making. The interviewees described benefits that included filtering water by way of conservation practice or tiling, protecting water, slowing drainage to prevent a rush of runoff, and providing downstream benefits. One participant discussed his motivation for implementing tile inlet alternatives:

> Hated all that crappy water going into the ditch, it's not buffered at all. What's coming down is going in, you know? Trash, sediment, nutrients, all the things you don't want going down there. It can't be

> good for the water down the way. Nitrogen, phosphorus, are a couple of probably the biggest ones in water quality - and dirty. It cleans up the water quite a bit.

Another interviewee described what water resources in the area mean to him: "Well it'd be water, lakes, rivers and streams I guess. And we have a county ditch system for draining our fields and stuff, so we'd want to keep them working and, and not polluted or any of that stuff. …I mean we all need to do our part and not pollute them."

Participants also talked about the importance of clean water, but recognized agricultural runoff *can* affect water quality. One participant shared his perspectives on water resources and the potential impacts from farming:

> We've seen what impact it can have. I mean, we've read the articles about some of the algae blooms. You read about some of the lakes or a few lakes if they have poor drainage practices going into them. You raise the levels of phosphorus, which causes high levels of algae blooms, which can really burn out a lake in a hurry and make it [un]inhabitable to some species. So stuff like that is stuff you always keep in the back of your mind. Especially not only being a farmer, but being a sportsman. As a farmer too, just one thing we always like to say to people that talk about runoff. We're putting money into these fertilizers that are going there; we don't want them to go down stream. That's not our goal.

Several participants stressed needing to balance agricultural and water quality needs in order to maintain the farming industry, as described below by one interviewee:

> If we hold soil and reduce the addition of nutrients in the waterways, that's a plus, that's a good thing. It's right now with what we're doing, we're all probably contributing small effects but this is such a large basin and so intensely agricultured (sic) that it may never satisfy the people that watch water quality issues. That part of it I don't get too worked up about. We have to be very realistic.

Soil Health & Productivity

Maintaining soil health and its productivity was the predominant influence associated with environmental benefits. The soil was described as farmers' "livelihood" – and protecting it meant you could continue your way of life. One interviewee shared this perspective when describing erosion on a neighbors land: "…get this to stop, because all of that sediment is going right down in there and it's dumb. Your productive farmland is going away. What you want to get money from - you're costing yourself." Another participant described his feeling when local farmers aren't protecting their soil: "anytime I see a soil that's just tilled black now in the winter time, it just makes me cringe."

If a conservation practice protected soil - whether by maintaining fertility, loosening compaction, or holding it in place to prevent runoff – it was a strong driver for adoption. Soil health was a major reason one participant adopted cover crops: "that is one thing we first tried it a couple years ago and we actually had a really good experience with it. And the fact that we saw not only increased soil health but increased yield because of it, and just overall soil structure, it seemed like it really helped." Similarly, another interviewee described the soil benefits from cover crops: "I want it to loosen up the soil, leave some vegetative growth there so it's going to improve the tilth of the soil. And then because there's a hassle of going through it to do it. But at the same time if that soil isn't blowing away, that's kind of an unseen advantage of it too."

Strong concern about soil health also functioned to deter conservation actions. For example, practices that participants felt kept the soil "too shaded" and prevented spring warm-up were noted as being a constraint to adoption:

> I thought about just going to no till and I mean it always intrigued me and crossed my mind. But because we are in these heavy black soils and it just doesn't warm up sometimes in spring, it wasn't necessarily the best option on corn ground especially, corn stalks. People have tried it but it's been very limited. Nobody stays with it because it doesn't work that well.

Keeping soils well drained is very important so practices must not interfere with drainage in a way that impacts crop production. One interviewee described this as, "if we have a lake in our farm field and they have less water down in their lake or river that they live by, I would rather have less water in my field. And give them more." Another participant expanded on this idea and why field drainage is so important:

> The concern is how to balance out the needs of agriculture and getting surface water off production. So how we deal with excess surface water is our biggest concern….if you are going to have productive soils, you need to tile it. So then there gets to be a controversy on draining and tiling and all those kind of things and how that affects downstream….I have to have a subsurface system that takes the water off the field before it kills the crop because the crop can only be underwater in these areas for a minimum of 24 hours, that waters got to be gone.

Several participants felt it was important to note, however, that no matter what conservation practices you may have in place, if a very large rain comes, you *will* have erosion no matter what: "If you get a ten-inch rain, it doesn't matter what you do. And that's what some of these people, they believe so firmly that if it would rain that much that we should still be able to control what happens out here. And I'm sorry if it's doing that, you have no control. When everything is lakes everywhere you have no control."

Wildlife Benefits

Wildlife benefits, such as increased habitat for the benefit of the animal, or increased hunting and fishing opportunities as a result of wildlife presence, was another driver of decision-making for some interviewees. When asked about the important considerations when making decisions about conservation practices, one interviewee described this: "well it sort of goes back to erosion, water quality, and you can't forget the wildlife out here. I mean I do enjoy seeing some wildlife out here." Another participant shared the advantages of planting the buffer strips on their farm: "we should be getting more pheasants and…deer and turkey, we have some out there…and it gives them more places to live."

Participants also shared concerns that affected potential wildlife benefits, like the decline of pollinators and livestock diseases like bird flu. Connections to wildlife and other environmental benefits were made – such as clean water being important to healthy fish populations and fishing opportunities. When asked what local water resources mean to one pair of interviewees, they responded, "Well, fishing! We love to fish and hunt, so we want the water to be good as what it can be. So, yeah, clean water is good water."

Chemical Use

Reducing the use of chemicals (both nutrient applications and pesticides) was discussed as a perceived environmental benefit. New technologies, such as variable rate application and grid testing, were important

tools to reduce the amount of fertilizer needed or to determine what types are a good fit. One interviewee described the technology he uses to reduce chemical usage:

> We do variable rate technology. We do soil testing. We do tissue testing on the plants so we are not over or under applying, probably more so over applying nutrients to our crops. We spray our fields with herbicide. We have a special monitor where it helps prevent you from over application and the fact that you've got auto-swath so you're not over spraying if you forgot you sprayed some area.

Similarly, another participant described the improvements to his operation: "We're soil testing more. We're doing grid sampling now. We'll be variable rating our fertilizers based on these soil tests so we'd just be putting fertilizer where we need it and not where we don't. We're making all of those improvements. So going forward from here. So we're trying to conserve fertilizer and soil and water and all that stuff."

Economic Considerations

Throughout the interviews, economic considerations were repeatedly stressed as influencing farmer decision-making. Specifically, the cost of implementing a conservation practice was a key consideration in decision-making and the possibility of adverse impact on financial returns functioned as a substantial deterrent to conservation practice adoption. On the other hand, the availability of financial incentives emerged as a notable driver of conservation practice adoption. Specific economic factors mentioned as important include adoption and maintenance costs (of conservation practices), declining profit margin, cost-share opportunities, and maintaining production level.

Economic Considerations
Adoption and Maintenance Costs
• Equipment and machinery costs • Practice is expensive; inputs are expensive • Practice saves money; minimizes expenses
Declining Profit Margin
• Concerns about profitability • Need to farm more acres to stay competitive • Unpredictability of markets and inflation • High land costs and taxes • Need diversified farm • Need off farm income • Health insurance expensive • Need to stay educated • Hard for new gen to compete or get started • Farmers choosing money over environment
Cost-share Opportunities
• Financial incentive to adopt • Need to be compensated • Should reward individuals who adopt
Maintaining Production Level
• Farming is cutthroat • Large corporate farms outcompete • Need to adapt and change • Practice maintains or increases yield

Adoption & Maintenance Costs

The costs associated with adopting and maintaining any conservation practice, or farming practice in general, had an important influence on the decision-making of participants. Profitability was at the heart of every discussion around conservation practices, as described by this participant: "Ultimately, everything kind of comes back to an economic thing. Economics will drive decisions long before government regulation and public perception. And sorry, but that's just kind of the rule now: economic drives the decisions." Another interviewee shared his perspective on conservation practices as simply, "Any program has to walk hand-in-hand with the profitability and productivity of farmers."

Adopting new conservation practice or maintaining current ones carries with it new equipment and machinery costs, as well as the additional inputs sometimes required. "It takes more patience and some up-front investment. You've got some seed costs, you have more machinery cost for planting/seeding," described one participant. Another interviewee shared the new costs that have to be considered before adopting a new conservation practice:

> Anytime you do conservation practice, it always costs money to get into that…if you were to buy seed to plant this cover crop, I mean its 125 dollars an acre. So that's pretty huge itself. And then if you are going to put in filter strip or erosion control strip, I mean it's expensive to have somebody come out there with an excavator and do the work.

Some practices are more expensive to implement because of those costs, and the need to maintain profitability drives participants to minimize as many expenses as possible. However, some participants felt the adoption of a new conservation practice saved money in the long run: "well there's this water quality program that we signed up and in order to qualify for that we needed to change our fall tillage system to leave more residue on top and, but now that we've done it there are a bunch of advantages to it. We used a lot less fuel and it went a lot faster, so between time and fuel savings."

Declining Profit Margin

An overall declining profit margin also emerged as an influence on decision-making of participants. Farming continues to become more and more competitive, leading participants to increase the acres they are farming, diversify their farming portfolio, and even pursue off-farm income to make ends meet: "the reason we went off the farm or working off the farm so it was cheaper for us to hire the neighbor to combine than to own the combine ourselves." One interviewee elaborated on how the modern machinery drives up cost: "nowadays machines get bigger and bigger. Now people can't afford to let the tractors to stand still on a Sunday. Now they work 24 hours a day, 7 days a week."

Another participant described his attempt to diversify his farming operation in order to stay competitive:

> We were looking for something that's totally unrelated to farming…a lot of people in farming tend to get a second business that's still in the agriculture industry. When agriculture hurts, that business hurts too. So we were looking for something just totally removed…something that'll keep [us] busy in the winter too.

Interviewees noted several factors that contribute to this including inflation, high land costs and taxes, expensive health insurance, and the unpredictability of markets. When asked about worries or concerns in today's farming industry, one participant said: "I'd say probably like what I hear from a lot of my cohorts, the uncontrollability of the economics of ag production is always a stressor. I would have to say you have a tendency to take it personally." Another interviewee elaborated with his perspective, "basically, the last couple of years we're in cost-saving mode. So wherever we can cut. I mean I'm doing things totally different than three years ago just for that fact because we have to cut every extra we can cut to try to keep paying the bills."

In order to stay competitive in the industry, participants described the need to stay educated and up-to-date: "you have to keep up with the technology of what's happening today. I mean it has changed in the past years

since when I started to now. You had to keep upgrading or you got left behind. They don't make the old style which you used to use; you had to upgrade all the time to stay with the program."

Interviewees also described how hard it is for new or young farmers to get established and compete in today's industry because of the high costs of starting and the low profit margin. One interviewee described this difficulty:

> One issue that comes to mind is the challenges for the next and or younger generation to get into farming. The size of the farms has become so much larger than it has in the past. It's a very capital intensive occupation to be in and it's very challenging for the next generation to come into it because the farms are so large and every person just cannot come in. It's just very difficult for a person to come in and obtain financing to get started. And the competition is extremely intense.

Cost-share Opportunities

Current and future cost-share opportunities emerged in the decision-making framework as a key economic consideration. The availability of financial incentive to adopt a conservation practice was an important influence for producers as plainly described by one participant: "if we did not have some financial assistance, I mean I'll admit that there would not be as much conservation practices taking place as there are today." Another interviewee said, "yeah if you want to pay me to put this in grass and not farm it, and that makes sense because I had to buy the land, it's not free land that I have," when asked if he would be more likely to adopt a conservation practice if he had a financial incentive to adopt it.

Similarly, interviewees felt they should reward individuals who adopt voluntary practices and be fairly compensated for any practices mandated upon them. The idea of being compensated for practice adoption came up frequently when on the topic of buffer strips: "no one is getting paid. If they would measure this and come up with a figure, I think the whole argument would disappear. Because the way it is now, it's a taking without compensation."

Maintaining Production Level

Maintaining current production levels was another driver of decision-making for participants. At the minimum, any conservation practice that interviewees were considering had to not reduce current yield levels, or better - increase yields. When asked about the important considerations when making decisions about his farm, one interviewee said simply, "Number one: you want to produce the best yield." Another participant described the balance he works to achieve to constantly maintain or increase yields without having a detrimental impact on his farm:

> We're always trying to tweak things to try to increase or maintain production while at the same time not use up our resource in the process. I would have to say that there is an opportunity to increase production at the cost of the resource; we would probably opt to not go there because ultimately, if the resource is destroyed or used up, then we've destroyed our economic viability. If it means we can't maintain our economic viability, I wouldn't say we're going to automatically destroy the resource just to extend our survivability for another short period of time. There's nothing to be gained there either. But on an equal basis, if we can make a decision where we're not going to sacrifice the resource and yet at the same time we can increase our economic advantage, then it's a win - we'll go in that direction.

Participants described the current farming industry as "cutthroat," thus the need to continually adapt to new technologies and change practices to stay modern was an important influencing factor: "out here it's all cutthroat. Backstabbing is all it is, nobody cares about anyone else. Not like it used to be many, many years ago. If I know somebody really well, I won't try to step on their toes and they won't do it to me. But most of the others, I can name a few in the area, that could care less. They're all about #1, that's how it is." Similarly, when another participant was asked what he would change about farming today he said, "That's a hard question because you can never go back to the way it used to be. It was a lot simpler back when we were kids, everybody had 160-240 acres, cows and diversity for income...it was just kind of fun being out there. Now it's just more of a dog-eat-dog world. It's not fun like it used to be."

Interviewees felt large corporate farms were outcompeting family farms and only cared about production level at the expense of everything else:

> I think they're moving it towards bigger and corporate farms which I don't think is a good but maybe it is, I don't know. I don't see it's good because I don't think economically it's going to be good because they don't have the care about the land like the independent farmer does, is my feeling. They're in it for business and just hurry up and get through it. Whereas an independent farmer, or smaller farmer, cares about it. He takes care of it and how it gets done.

Practice Appraisal

The perceived efficacy and suitability of specific conservation practices, as well as the level of trust and credibility of an information source (which together make the theme "practice appraisal"), were important factors that influence participants' decision-making.

Practice Appraisal
Practice Efficacy
• Effectiveness of practice; maximizes efficiency
• Lack of practice effectiveness
• Need for more evidence that practice is effective
Practice Suitability
• Not "one size fits all"
• Practice feasibility for farm
• Suitability to climate and weather conditions
• Contracts for crops and seed types
Trust & Credibility of Information Sources
• Lack of trust- some groups are biased
• Trust in information from university, extension, and local agencies (particularly SWCD)

Practice Efficacy

Whether or not participants felt a practice would be effective in its intended outcomes was an important influence on their decisions. Participants had to believe it would work, first and foremost. One participant described his unwillingness to try a practice after seeing it didn't work for another peer farmer:

> The only thing that I've seen from around here that's bad is like, no till because our soils are so dark right here that, it just doesn't dry out in time. So I would think strip till would be fine here. But I know about five miles away a guy used to do it, he went broke. One year we had a wet late spring and that's all it takes, one bad year. Even with the insurance and that, if you have one really bad year, you might not be able to get going again.

Several participants discussed needing more data evidence that a practice would work for them before they would adopt it. When asked if financial assistance would make one participant more likely to adopt a practice, he responded, "yeah I suppose it would help but boy, somebody has to show me the methodology and the technology to get it done." One interviewee described needing more data evidence before he would adopt cover crops as a conservation practice:

> I would have to see a lot more research on the benefits on either holding nitrogen or my ability to manage lower phosphorus for a soil test because of a much more vigorous rooting system or mycorrhizae system. That's not been quantified very well I don't believe. There's a lot of people who I call 'true believers' who just throw this stuff out there and it's supposed to be everywhere but there has to be a lot more research and on-farm demonstrations.

Interviewees also shared the importance of a practice increasing their efficiency. One interviewee shared his perspective on tile inlet alternatives and how it increases his efficiency: "…it's actually better ground use…so it's more efficient. Any way I look at it, it's more efficient having that area of ground that's not productive because it's a rock then to have a pipe there that doesn't take it quite as fast as a hole in the ground...you build them so that you can farm right over them." When asked if there was anything he didn't like about that practice, he responded, "No. No I think it's kind of like sliced bread…to me it just makes sense." Another participant felt similarly about the increased efficiency of tile inlet alternatives: "It's actually made crop production on those fields easier or more efficient because you don't have to manage around those open inlets. No flags to drive around, no weed problems around the inlets because of something you've got to drive around."

Practice Suitability

Not every practice makes sense for all situations, so whether participants felt a practice was suitable had an impact on their decision-making. Interviewees noted that the practice needs to have benefits to them personally, which is different for every farmer. Participants frequently mentioned that practices are not "one-size-fits-all". Whether a practice was feasible for their individual land was important to evaluate. Many participants said their reason for not adopting a practice on their land was that it just wasn't feasible on their ground. One participant described this about cover crops: "the problem I see is getting them established. You get down to Iowa, Illinois, Indiana, Ohio, you have a longer growing season and a lot of them, they can see them after they're done with the row crops and they're fine. You can't do that here…I thought about it, but I just don't see any part feasible to do it."

Weather conditions and climate played a role in determining if practices were suitable for participants, as described by one participant:

> A lot of the biggest barriers have to do with where we live. We live in Minnesota, where it's a short growing season, it's cold and it's wet. If some of those things would be different we would have we would have a little bit more breadth of opportunities. But we have to do something that warms up our soil, gets suitable for planting, which does help us extend the

> season as much as possible because the more that water sits there, the later we can plant. The colder that the soil is the later we can plant. And we want to plant early, we want to get something growing sooner in the year. We don't have a consistent season too, sometimes we could plant in March, sometimes we couldn't plant until May, so if we're planning for something we have to know that it might not get in until two months later, and we're already short-seasoned.

Similarly, another interviewee described why he didn't believe cover crops were a feasible conservation practice: "then it has to be feasible. We're sitting up here in the northland and we're supposed to harvest a crop and get a cover crop out? We don't generally have enough environment to make that grow and green up before we get freeze down, and then right away we're starting up in the spring, very quickly trying to get the next crop back in place."

Other aspects of evaluating practice suitability included whether a farmer has contracts for the crops he is planting and what the types of seeds are that will be used. One participant described planning for his seeds and crops: "I'm an agronomist so I actually think very deeply about all of these things everyday… we have partners, I mean I rely on experts in my retail that I can rely on for pricing. We've already secured all the inputs for 2018 and we have a plan in place. We check out all the alternatives for crop production, fertility, and certainly I purchased my seeds already and we've fit those to the land."

Trust and Credibility of Information Sources

Lastly, the idea of trust (or lack thereof) emerged as an important factor influencing farmers' appraisal of a conservation practice. Several information sources about conservation practices were discussed by participants with varying levels of trust. The idea of what made an information source 'credible' was an important part of trust. The University of Minnesota and its local Extension offices were two sources noted by several participants to be trustworthy. One participant described why he trusts Extension: "I would say by and large farmers trust Extension, Extension educators, probably because we seem them as not having a financial interest. They're not going to make money by selling us something. We see the Extension as a neutral third party."

Other interviewees felt their local agencies (like SWCD or NRCS) had the most trustworthy information:

> I would have to say the local because they know what's going on. You get to state DNR, look at how diverse even Minnesota is. You get to the flat plains, you have hilly ground. As you go down to the southeast, you have all woods, swamp ground. And then you get some flatter. It varies so you got to keep it on a local basis. You just can't speak for any other [area].

Many participants discussed the need to look at an information source critically to determine if it has bias. For example, some noted any group trying to sell you a product (like a seed dealer) is somewhat biased in the information they provide. One interviewee described the groups he consults with, but needing to understand the potential bias associated with those groups:

> …Agronomists, retail dealers - I always take that in the context that they have an incentive to portray or relay information in a particular way based on what their capacity is. They're trying to sell a product. I also seek out or pay attention to the information which is always made available from what I think are more unbiased sources: research institutes, University of Minnesota.

Internal Motivations

Internal or personal motivations emerged as another key theme that played a role in the decision-making framework of farmers. Influential factors in this theme include awareness, concern, personal responsibility, collective responsibility, and perceived ability.

Internal Motivations
Awareness
• Increased awareness of water quality • Perception that water is not as clean as historically • Awareness that clean water and safe drinking water are important • Awareness that clean water important for fishing • Awareness that soil conservation and field drainage are important • Awareness of water pollution (e.g., local algal blooms, lack of good quality recreational water) • Awareness of the impacts of agricultural and urban runoff on water quality • Perception that the Minnesota River is naturally dirty and runoff is normal • Perception that there is too much water in the Minnesota River • Tradeoffs between agriculture and water quality needs
Concern
• Lack of concerns about water quality, groundwater and flooding
Personal Responsibility
• Farmer and landowner responsibility to take care of land and water • Farmers need to feed people • Sense of 'our land, our right'
Collective Responsibility
• Everyone is responsible for water; need to stop blaming farmers for water issues • Local government is responsible for protecting water • Need to address water quality locally
Perceived Ability
• Practice difficult to do; tough for large farms • Practice needs maintenance • Practice easy to do • Learn about practice from trying • Innovative technology and precision tools increase ability to use practice

Awareness

Awareness of current issues – especially related to water quality – was an internal motivator for decision-making. Participants felt that there is an increased awareness of water quality among their local community and farming community, and that safe drinking water is important. One participant shared his perspective on increased awareness in his community: "farmers for the most part are pretty aware of water and how important it is and are trying their best to protect it in what they can do….I think we do a pretty good job. More than we get credit for sometimes."

However, there were differing opinions on what the current quality of local water is and what the issues are. For example, several interviewees described local waters not being as clean as they were historically, while others described the Minnesota River as being naturally sediment-filled, implying that farming practices cannot be a major contributor to its conditions:

> I can't believe that the Minnesota River was ever this pristine trout stream that everybody thinks it should be. I mean Louis and Clark said it was the muddy Mississippi. This erosion was going on when buffalos roamed the area and the Lake Agassiz broke loose and carved out the Minnesota River bottom. That thing never ran clean - that is not a mountain stream with pristine water, so we need to have baselines to measure off that made sense. You can't turn it into something that it was never meant to be. I mean the upper Mississippi, maybe that looked pretty clean, but once it got down to this rich fertile black ground that's been evolving and changing, what does that baseline look like? And I think that's what we need to establish of what's reasonable and what's not reasonable.

Participants spoke about water not being as clean as it once was, citing issues including local algae blooms and no good recreational water. As one participant elaborated: "well they talk about swimmable, fishable and drinkable, you know, and I think about growing up, we would swim everywhere. I don't think I'd jump in a lake anywhere now, so from my perspective, things aren't as clean looking in this part of the state."

Several participants described runoff as normal, while others viewed the Minnesota River as having too much water due to runoff. One interviewee described this issue: "we're reaching a point where there's got to be some balance downstream. The guys are screaming they can't take any more water or we're trying to get rid of water so are we going to have to go to retention areas. And who's going to pay for those?"

Nearly all interviewees felt urban runoff is an important issue being overlooked: "I think the runoff and the amount of nutrients that are going into our water systems from our developed and urban areas don't get as much attention as they should." One interviewee described this further when asked about who should be responsible for solving water resource problems in the watershed:

> I think everyone contributes to it so everyone should be involved in it. I'm not picking on anybody. I see the town people saying 'oh watch the farmers dumping all that fertilizer on their ground'. Well I look at it the other way and you watch a town person fertilizing their lawn just so they can have a nice green lawn. And they have a half of bag of fertilizer left over, what do they do with it? They just go spread it out here right? Well a farmer doesn't go to town and buy an extra three ton of fertilizer just because I want to put more on. They only put down because that's all they can afford. I'm not picking on the town people but everybody has to be - farmers, town people, whoever - we all have to bite this bullet and turn it around because it's not good.

Concern

Concern for water quality issues, similar to awareness, also played a part in the internal motivation driving decision-making. Many participants noted they were not concerned about local water quality, using what they've seen on their farm as evidence: "actually no [we are not concerned], we've been on this farm for a long time and our water hasn't changed."

A few interviewees noted they were not concerned about groundwater in the area. Others voiced no concern about flooding in the Minnesota River. One interviewee shared that runoff and local water issues might not be problems, depending on the framing:

> Some of the other general just ongoing things, regular rain runoff or what have you, I guess, I mean is that normal or is that a problem? What makes it a problem? So, that's why I'm curious what you're considering a problem. None of us want our rivers and streams polluted, and a lot of the sediment and stuff that is in our rivers from streambank erosion. I mean, it isn't my field that's going in there, it's from the river eroding the sides of the bank as it goes down. That's why the Minnesota River is so dirty. I mean it isn't my field in there, it's the spring banks that are a lot of it that's in there. So is that a problem or isn't it? And what can you do to fix stream bank erosion all along the river? I don't know, so…it would depend on the problem - what you're calling a problem.

Personal Responsibility

Participants described a range of factors that comprised their personal responsibility, which influenced their decision-making. First, farmers need to feed people, so they feel a responsibility to produce at the best yields they can to help feed the world. One interviewee shared this perspective when asked about what local waters mean to him: "not a lot quite frankly. I cross the Minnesota River almost every day when I go to Le Sueur. It is what it is, we feed people, we continue to feed people…I was in extension, I worked the whole water quality interface with agriculture. I understand all the issues. I'm just only going to serve one master."

Interviewees described an individual landowner responsibility to protect water. Many participants felt strongly that all farmers have a responsibility to take care of their land: "you can't blame someone else for something that you do, so you have a responsibility as a landowner to take care of the land." Similarly, another interviewee said, "we obviously play a big role. And the role will not get any less either. We have to do our part. I mean everybody's responsible and I say that about farms we have to do our part."

A few participants also described a feeling of ownership and responsibility – if it is the farmer's land, it is the farmer's right to do with it as he/she wishes. When asked about obstacles in the way of healthy water resources in the area, one interviewee said, "the farmers want to farm their land. I suppose that's the biggest obstacle because it's hard to get it out of their hands and revert it back."

Collective Responsibility

Similar to personal responsibility, participants also were motivated by a collective responsibility. Interviewees felt *everyone* played a role in water protection, not just farmers, so everyone should be held responsible:

> I think it's a whole system-wide approach - I mean the farmers deal and he doesn't want to wreck his ground, but on the other hand he has to get rid of the water otherwise he has huge economic loss. So if somebody thinks that the water's coming too fast, if that water needs to be retained somewhere, well then everybody's got to pay for that…the responsibility falls on the whole population.

Participants felt a continuous blame directed at farmers for water issues: "that's my big problem with all of this. I think we are doing a lot compared to other places and other things, to try and do our part and we still get blamed."

Interviewees suggested that the local community and local government should address and be responsible for protecting water:

> I think it's better off in the local area. I think it's the soil and water thing. I don't think the DNR really has our best interest in far-reaching things. I think it's the Soil and Water Conservation District that should oversee it, I really do. The further you get away in government from a place, you don't even know what's going to, and then you're making decisions based on what? You're in Florida? In Minnesota they're completely different. Local level is got to be way it's got to be done.

Similarly, another participant shared his view on why local government is best suited to address water protection: "they were talking DNR would probably be patrolling [buffers] this but they don't have enough manpower to do something like this. I think it should probably still be up to the county, each county themselves. I think that's where it should be because rather than like the state of Minnesota, sticking everything down our throats."

Perceived Ability

Lastly, an important part of internal motivation in decision-making was participants' perceived ability to adopt a practice. The level of difficulty in implementation was one factor affecting perceived ability, as was the level of difficulty in practice maintenance. Several participants described particular practices as being tough to implement/maintain on a large farm basis and were more geared towards smaller situations: "if you're asking what reasons a crop producer might be reluctant to using cover crops, I would have to say that it doesn't lend itself as well to big agriculture. It takes more hands-on management, you can't just do a one-size-fits-all application on a farm when you're using cover crops."

Innovative technology and precision tools improved participants' perceived ability to adopt or maintain a conservation practice. However, a few interviewees noted that the only way for them to actually know if they have the ability to adopt a practice is to try it themselves, as described by one participant: "I would still evaluate or do some scrutiny to the whole system to determine if it's something I feel there is potential to incorporate long-term.….If I think it's something that we maybe could incorporate or some parts of it, I would be very incentivized to try it."

External Motivations

Participants also described several external motivations that influence their decision-making including regulatory influence, effective community engagement, public perception, and social influences.

External Motivations
Regulatory Influence
• Need flexibility in implementation; too much paperwork • Political concerns; too many regulations and "red tape" • Perception that local agencies are understaffed, underqualified and undertrained • Easy to work with local agencies
Effective Community Engagement
• Need for more effective communication (e.g., get everyone on the same page) about issues and community engagement • Farmers should be consulted for opinions and need to stay involved in community issues • Lack of strong relationships (e.g., people do not know their neighbors)
Public Perception
• Perception that the public does not respect farming and farmers • Appearance of farms important
Social Influences
• Learn about farming and conservation from conferences and meetings, equipment dealers, farmer magazines, other farmers, watershed staff, and SWCD or NRCS • Rely on multiple sources including suppliers and salespeople, agronomist or crop consultant, family, farm manager, and accountant

Regulatory Influence

The variety of factors related to regulation influenced participants' decision-making. First and foremost, participants believed there are too many regulations affecting the Minnesota agricultural industry – in particular the new buffer law. Several participants shared the perspective that they have no problem with buffers themselves, but more the forced "one-size-fits-all" implementation of the rule. When asked about concerns with today's farming industry, one participant shared his discontent with regulatory influences:

> There's not enough of us to speak for legislation. It will just get passed because there is not enough anymore, enough people on the farming side of it. Which it's already doing that with some of these buffer stuff that they're fighting. It was all thrown out there because there's not enough on the farming side to fight any of this. Because there's no common sense to it. It was just a plain old, this is the way it is and it doesn't matter what's going on, this is the way it's got to be. I don't like that. If it's fair, I'm all for it. But if it's just not fair. I'm not for it.

One interviewee was very blunt with his perspective on the buffer law: "It's one more way for the governor to stand on our neck out here in rural areas so that's just what it is. He's offering us up as a political sacrifice to all of his greenies and environmentalists on the other side."

Interviewees stressed the need for flexibility in the buffer law implementation, as well as other regulations. One participant described why the implementation was flawed in his mind: "heaven knows we have got enough productive land that it's not so bad to have some buffers out there. But it goes back to economics…why should somebody be required to give that up with no compensation? That's where the push back comes from on this whole buffer idea. So it's not that the buffers are bad, it's how it was implemented was bad."

Another interviewee also shared why flexibility in implementation was needed because in some areas the required distance is not big enough to serve its intended purpose:

> …those areas that have depressions in the field on a hillside, in a gully or whatever, yes, water runs directly off the field and into the ditch. There we need a buffer strip, and quite frankly we need a bigger one than 16 feet in some places, but that's what the law says: 16 feet along county drainage ditches. You probably know this. 30-50 feet or whatever in other area. So those parts of the thing probably, but even that won't cover it in some of the places, even the required width. Flexibility is what's needed, flexibility not just the rigid rule. A senseless rule that says 16 feet.

Along the same vein, participants described the amount of paperwork associated with participating in certain farming programs (locally or federally) as being a barrier to adoption: "then with my CSP too, there is so much paperwork, I don't know why you need all that paperwork. Can't it be simple? I mean, I have a folder like that thick of all the stuff. But that's the way it is. If you want to do it, you got to go through that." One interviewee shared an example where the cost-share participation was so tedious that it deterred a farmer from participating in the program, but he still adopted the practice:

> I heard from others that have looked into using a cost share for a manure lagoon or something that the cost ended up being about the same. So if you'd use their plan but then they cover apart of the cost, it actually ends up being the same cost to you or if you do it yourself and kind of do your own design…but yeah, sometimes it's just the extra paperwork and the extra hassle, if the cost is going to be the same you'd just as soon do it on your own.

The relationships that participants have with local agencies was also discussed. Many described why they like working with local agency staff: "very easy to work with. Willing to come out and answer questions if you have them," and "seem to be very informative…want to help you out. They want to see you do things right."

However, several interviewees shared complaints about those agencies including that the agency is understaffed and undertrained. One participant said, "I would say that in general they need to extend themselves and become better sales people. They need to go where the farmers are," in reference to his experiences working with local NRCS and SWCD staff. Another participant felt similarly:

> They probably could have been a little more knowledgeable. By no means am I trying to throw them under the bus or anyone under the bus by making that statement but these guys, at least in our county, they're farmers and I don't know how much continuing education they do. I think they do some but I was a little disappointed in that I felt they weren't as knowledgeable on some of the issues or some of the topics that we have discussed in the past.

Effective Community Engagement

The need for increased and effective community engagement emerged among external motivators affecting decision-making. Interviewees described a current lack of effective communication and engagement in their community. The desire to get everyone on the same page and to participate in discussions was mentioned by several participants:

> It's a process and just if we ever get to a point where we think 'okay now we're where we need to be and now we can just coast' then we're going backwards. We always need to keep working at it and I don't think it does any good to literally throw anybody under the bus on any of these issues because then they're going to disengage. And the better job we can do of keeping people engaged and keeping them trying and striving to do better, the better chance we have of making improvements and getting to a better place than where we are at.

Participants also wished that those making decisions that affected their community would consult farmers for opinions to help inform those decisions. When asked about the keys to achieving healthy water resources locally, one participant said, "consult with the landowners and the operators for their opinions; they know that land better than anyone. They're on it; they see first-hand what is going on."

Participants shared the feeling of not knowing their neighbors anymore – like farming families used to – and how that constrains effective communication and engagement. One interviewee elaborated on this feeling: "I know back in the days the farmers were a lot happier than they are now because you had a good neighborhood. Everybody helped each other where now you don't even know your neighbor that's out there."

Public Perception

The public perception of farmers also played a role in participants' decision-making. Farmers want to have a good appearance before others – they want the public to think they are doing the right thing on their land. One participant, when asked about the important considerations when making decision on his land, shared his desire to make a good appearance to others:

> …it goes back to how am I taking care of my farmland, my building site? Am I positioning it for the future? And I see that as being fairly important because I want the farm to go on whether I'm farming it or not. And I want to see whoever comes by can say, 'that's still a quality farm.' That [participant name] did a good job of taking care of it and nurturing it over the years. So that's how I would see that.

Many of the interviewees felt the public doesn't respect farming or farmers, mostly because they are uninformed of that lifestyle. One interviewee shared his perspective: "we as farmers, and I may be speaking for myself, I think 95% of us try and do our part to protect our water quality and prevent soil erosion. We want to be able to farm and enjoy our farms, we don't necessarily want to be dictated to, telling us this is how you have to farm. We need to be treated with respect."

Social Influences

Participants described a variety of individuals and groups that influence their decision-making on a regular basis. Several sectors of the agricultural industry influence their farming decisions including agronomists, crop consultants, equipment dealers, suppliers, and farm managers. One interviewee described the array of individuals with whom he consults on a regular basis to make decisions about his farm:

> We've got a crop consultant that we usually sit down with during the winter and kind of lay out a plan as far as what we are going to use for chemicals, what we're going to use for seed. Also the main person that we buy seed from, kind of pick his brain as to what seeds, as far as like corn seeds, work best on what type of land. I have a dairy consultant that we work with as far as nutrition. And then the crop consultant also goes through manure results and gives us a plan as far as what manure we're going to apply, at what rates, and also commercial fertilizers.

Participants' also relied on tax consultants or accountants to assist in financial decision-making. Local agencies, including SWCDs, the NRCS, or watershed districts, also provided information and programming that informed decision-making. Interviewees mentioned learning frequently from farming magazines: "we've been reading about them…you see it in a bunch of farm magazines. You go back three years ago, everyone was talking about cover crops." Similarly, many participants mentioned learning from conferences and meetings geared towards farmers: "I try to attend management seminars every year as time allows. You get to rub shoulders with other producers and also hear presentations from agronomists, University personnel."

Participants' family members were another important group that influenced decisions. In addition, many participants spoke of other farmers being a major influence on their decisions:

> Bottom line is farmers sell to farmers. It works that way in our seed business. If we have a really good customer, he tells other customers about us and that's how we grow. And I think that same thing applies to conservation practices. I think people hear, read, or investigate things a bit on their own. But really when it comes right down to it, they pretty much are talking to other people about it…. But really what it comes down to - it's their neighbor or their acquaintance that they know from someplace that they trust or admire, and it goes up from there.

Farmer Values

Values that farmers hold also emerged as a major theme influencing decision-making. Farmer values include a stewardship ethic, family values, personal satisfaction, independence, and livelihood.

Farmer Values
Stewardship Ethic • Perception that current way of farming is not sustainable • Investing in the land and not being wasteful important to farmers • Better conservationists than previous generation • Farmers won't ruin their own ground • Don't farm land that shouldn't be farmed • Lack of personal attachment to the land • Care about more than just money • Some farmers are not doing the right thing; young farmers do not care about the land
Livelihood • Farming as a means of livelihood, to have the necessities to live, and increase comfort
Independence • Flexibility and independence of being a farmer • "Being your own boss"
Personal Satisfaction • Enjoyment of being outdoors, plants, flora, wildlife, and watching crops grow • Enjoyment of the hands-on work, farm equipment, and the challenges of farming
Family Values • Family heritage • Simplicity of life in previous generations • Good place to raise a family • Continue to farm in future years

Stewardship Ethic

A strong driver of decision-making for participants was an ethic of being a good steward to the land. Participants frequently discussed this as caring about more than just money and investing in the land, which in turn means they can continue to farm productively: "We do respect the land here that we farm and want to take care of it, I really believe. So that's pretty huge to me, to make sure we take care of the land and be good stewards of the land." One interviewee shared his vision for the future of farming and how it parallels his stewardship ethic:

> I think there will be a niche for young people coming into agriculture that are able to meet the vision or ethics of the landowners. We have some sons and a couple of them want to farm and our business model would probably be that you're not just going to go out there and compete on land with high land rent costs because that's just really tough. But could you sell a vision to a landowner of stewardship and conservation and whatever that means. Is it cover crops? Is it more residue? Is it no till or ridge till systems or strip till? So I see that as being an opportunity but it'll be different based on what people value. Right now, people

> value dollars. The people that own the land down here value the dollar bill. Certainly there are relationships built on family and friendships and the land as a resource and taking care of it, because we communicate that with our landowners. We don't talk about the price of the land. I try to tell them what we've done, why we're doing it and how we're taking care of their resource. And over time hopefully I can build that stewardship ethic within them too so that it isn't just a conversation about dollars because someone else will always pay the dollars.

Interviewees described situations where land shouldn't be farmed and that this stewardship ethic means knowing the difference and not farming those areas. The stewardship ethic also was reflected in not being wasteful with resources, such as chemicals or water, or ruining your own ground. One interviewee in response to being asked what "conservation" means to him, shared his definition and why it is so important:

> Conservation: it's about protecting the resource. So my number one resource protection concern is the productivity of the land. To hold it, maintain it and build it. That's going to be the first thing that I actually think about in conservation because that's an ethical issue related to food production for future generations. If you're farming hills and your soil is bare and you continue to lose top soil, that's a huge ethical issue for me because you're basically pretending like you're the last generation that's going to farm.

Several participants believe that the current generation of farmers are much better conservationists than their fathers were, just because technology and new information allows them to be. Participants also shared that there are a small number of farmers out here who are *not* doing the right thing in terms of stewardship. One participant shared his perspective on this when asked if he was concerned about water resources in the area: "Well I think it's only going to get worse down the road, I won't argue that. That's why we have got to try and do it now. Some people really don't care if something runs into a ditch, whatever. They say most do, but there's always a few in every bunch that's kind of a bad apple that spoils it for everybody else."

Some interviewees felt young, new farmers don't care about the land in the way older generations do. One interviewee expressed his frustration at the young farmers who in his mind don't care about the land:

> I know from some of the younger farmers that I know and some of others, I'm just going to say it the way it is: they don't give a shit. It's like they don't want to try their best and it's like they don't even like it. They don't even research anything. They don't look at anything. They don't look at the soil. They don't look at the environment. And they're worried about the paint color on their tractor more so than they are anything else.

Others attributed this lack of ethic to large farmers and not having a personal attachment to the land if you farm thousands of acres: "I think sometimes if farms are too large, there isn't a personal attachment to that… it's just a dollar-driven business. As the conservation part of it, is it can't be just dollars. And so helping and keeping the family farmer is a better conservation than big farmers. They're just after big business."

Livelihood

Maintaining participants' livelihoods as farmers also influenced their decision-making. Most had been farming for most of their lives, so ensuring they could continue to farm influenced their decisions. One interviewee said about making a living as a farmer: "it's just something that gets in your blood, to me it means a whole lot."

In order to maintain their livelihood, participants described the need to make enough money to have the necessities to live or to increase the comfort of their current way of life. Participants were asked how they evaluate the success of their farm operation. One interviewee said simply, "I guess that you keep doing it again the next year, doing what you like to do." Similarly, another participant said, "given the times that we are experiencing presently, we still have a warm home to be in, plenty to eat, so we have the necessities."

Independence

The independence of being a farmer was an important value that drives participants' decision-making: "We like the freedom. We like the ability to make our own decisions." Interviewees valued being their own boss. When asked what he likes about being a farmer, one interviewee said: "independence. I don't like people telling me what to do." They also shared that they valued the flexibility associated with being a farmer and making your own schedule.

Personal Satisfaction

Participants shared a variety of other factors in farming that bring personal satisfaction, which in turn drives their decisions. Interviewees shared their love of being outdoors – and enjoying the plants, nature, and watching crops grow, as one participant shared: "The farming is just going out there and planting the crops and seeing them grow and it's your pride. It's a big accomplishment at the end of the year."

Many participants also love wildlife and enjoyed that farming gave them an opportunity to see it and even provide habitat to increase those viewing opportunities. One interviewee described what he likes about being a farmer: "I like nature, I like watching the pheasants, I like watching deer and the wildlife and just everything about nature. And it involves nature for me than anything and it just…I like that."

The challenges associated with farming, and working through them, along with using the farm equipment were other enjoyments shared by participants. Another participant identified his reasons for becoming a farmer: "The ability to make my own decisions I guess, being able to work outside. Those are some of my goals that I identify when I was in the discerning stage of trying to identify a career path. I guess those are the primary things, I like hands-on. I like to see things grow so production is very satisfying to me."

Family Values

Family values were intertwined with the values participants shared as a farmer. Being a farmer was part of their family heritage – farms were often in a family for multiple generations and participants hoped that tradition would continue. Participants shared their desire to continue to farm for future years to keep it in their family: "I farm with my sons and my grandfather started it so definitely multigenerational…hopefully it's definitely going to make the next generation someone that I haven't met yet. They're probably a real need that's still going. So keeping it going is kind of a big deal."

Several interviewees shared why they felt the farm was a good place to raise a family: "There's something about it that keeps you closer to nature and God everyday you're out here. That's kind of what it equals to. And it's a great place to raise a family. That's probably as important as anything."

Another participant elaborated on the family values intertwined with farming:

> I grew up farming with my father and we farmed and had livestock, so to us it's a lifestyle. It's a way to raise your family and it's a connection to the land. It encompasses even our

> spiritual life. There's planting, there's harvest; there's times of death and times of renewal. Everything about our lives and how we've directed our kids, we have four children. It's been living on a farm and having those values, caring for things and following through and having big gardens. We've raised livestock, we probably do a lot of things we wouldn't have to do, but we like having them because we want our family to understand these things.

However, many also commented that they believed life to have been simpler on the farm in previous generations than it is now.

3.2.3 Conservation Practice Perspectives

Farmers interviewed were also asked about their perspectives on individual conservation practices. Drivers of and constraints to the adoption of select conservation practice are summarized in the table below.

Table 4. Drivers of and constraints to adoption of cover crops

Cover crops: Crops planted primarily to prevent soil erosion & runoff, improve soil health, and provide wildlife habitat by providing seasonal cover on cropland.	
Drivers	**Constraints**
• Provides soil cover, prevents erosion/soil loss • Reduces runoff • Loosens soil up/increases organic matter • Good after canning crops/short season crops (peas, sweet corn, wheat) • Doesn't reduce yield of other crops/increase yield • Easy to implement • Good alternative if primary crop is destroyed early (weather event) • Incentive from cost-share program	• Minnesota weather/growing season • Soil too heavy/cold, cover crop would prevent soil warm-up • Not enough time after corn/soybean harvest • Additional cost of seeds (esp. types req. by cost-share programs) & planting • Tough for very large farms to implement – more hands-on management • Conflicts with contracts for other crops (ex. Ethanol plant) • Cost-share program is overbearing

Table 5. Drivers of and constraints to adoption of tile inlet alternatives

Tile inlet alternatives: An alternative to traditional tile inlet which instead slows water flow and allows sediment to settle out before entering into a subsurface drainage system, including French drains or rock inlets, and slotted risers.	
Drivers	**Constraints**
• Filter out more soil/trash/chemicals than open intakes • Reduces/cleans runoff, better for water quality • Drain just as well as open intakes • Easier to farm around/more efficient/can drive right over • Little maintenance – functions well for 10+ years • Smaller area out of production than open intake • Financial incentive to put in/take out open intakes	• Have to be redone after so many years to keep water flow effective • Can be tough to find after combining (get buried) • Drains slower than open intakes • Need multiple in areas with heavy ponding (expensive to implement)

Table 6. Drivers of and constraints to adoption of alternative tillage practices

Alternative tillage practices: Soil cultivation that leaves the previous year's crop residue on fields before and after planting the next crop to reduce soil erosion and runoff.		
	Drivers	**Constraints**
Conservation Tillage	• Protects soil/reduces erosion • More efficient/easier to do • Equipment/fuel savings • "Responsible" thing to do/good stewardship	• Conflicts with manure application • Unsure if yields will be maintained
Strip Tillage	• Improves soil/seed bed • Residue looks nice • Financial incentive to adopt • Equipment/fuel savings	• Require certain weather conditions • Requires well-drained fields/tiling • Very expensive to implement • Need level fields
Mulch Tillage	• Protects soil/reduces erosion • Equipment/fuel savings • Don't need much training to do it (easy to hire) • Residue (size) is easy to manage	• Keeps soil too cold/prevents warm-up • Some farmers who rent land won't let their tenants leave "trash" on the field • Can be tough on corn/corn rotation
No Tillage	• Water infiltrates faster • Saves money/fuel	• Keeps soil too cold/prevents warm-up • Requires different equipment (tracks vs tires) • Requires well-drained fields • Not necessary on flat lands

4. Conclusions

This project's aim was to provide a social science-based assessment of conservation behavior among landowners and farmers in the Lower Minnesota watershed. Specifically, this study investigated the drivers of, and constraints to, conservation action among watershed landowners and farmers. Findings from this study are intended to inform and enhance the conservation programming of local and state agencies and to facilitate future communication about conservation. The following conclusions are based on a synthesis of survey and interview findings.

Social influences drive conservation decision-making.

According to the survey findings, the biggest influencers on landowners' conservation decision-making are family, farmers, the county's SWCDs, neighbors, and the FSA. However, a comparison between two survey respondent subgroups, which differed in level of practice adoption, reveal significant differences between groups in the extent to which others influence their conservation decision-making. High clean water action (HA) respondents (i.e., those who have adopted 7 or more of the 14 clean water actions listed) were influenced to a greater extent than low clean water action (LA) respondents (i.e., those who have adopted fewer than 7 of the 14 clean water actions listed) by their family, other landowners, their county's SWCD, and state agencies (e.g., Minnesota Department of Agriculture, Minnesota Department of Natural Resources). The most trusted sources of information for survey respondents on water quality issues were their county's SWCD, other farmers, and family. Interviewees revealed that they rely on various agricultural professionals (e.g., agronomist, farm manager), seed and chemical suppliers, and SWCD professionals. Interviewees also identified local agencies, University of Minnesota, and UMN Extension as trusted sources of information. Further, the interview findings reinforce that landowners learn about conservation practices from other landowners and trust information coming from them.

Landowners and farmers are clearly influenced in their conservation decision-making by multiple actors from their communities. Thus, those actors should be included in community discussions about water resources and conservation. Promoting information exchange among various stakeholders through formal and informal networks is likely to be effective in increasing landowner conservation behaviors. Because farmers are more trusting of information from other farmers, promoting farmer-to-farmer networks for sharing information about conservation practices may be a useful strategy.

Stewardship ethic and perceived benefits to land and community drive conservation practice adoption.

Survey findings suggest that landowners are aware of, and concerned about, the consequences of water pollution on human health, soil health, and aquatic life. Most landowners also believe that it is their personal and collective responsibility to protect water resources, and feel a personal obligation to do so. Survey respondents' norms and civic actions varied by level of practice adoption (i.e., High clean water action (HA) vs low clean water action (LA) respondents). Personal norms or feelings of personal obligation appear to be a significant motivator for conservation action for both HA and LA respondents. HA respondents reported feeling a stronger sense of personal obligation to protect water resources than LA respondents. Interview findings also reveal that a strong stewardship ethic among farmers drives their conservation behavior. Many farmers expressed that being a good steward to the land, and not being wasteful in terms of resource use, was important to them.

Survey and interview findings suggest that landowners perceive multiple environmental and community benefits of conservation practices. Comparisons between HA and LA respondents suggest that beliefs about

the benefits of conservation practices is a significant motivator of practice adoption. Similarly, farmers who were interviewed identified several water quality (e.g., downstream benefits), soil health (e.g., soil fertility), and wildlife (e.g., wildlife habitat) benefits of conservation practices.

Financial incentives and conservation program reformation are important drivers of conservation practice adoption.

Providing financial assistance and reducing the complexity of conservation programs appear to be major factors that would increase the likelihood of conservation practice adoption among survey respondents. Both HA and LA respondents indicate that higher payments for practice adoption, compensation for lost crop production, and access to financial resources are significant drivers of conservation practice adoption. Findings from interviews suggest that despite the perceived benefits of conservation practices and farmers' stewardship ethic, farmers are less likely to adopt practices if doing so would adversely impact farm profitability. Farmers reported that the practices would have to be economically viable for them to use on their land. The adoption and maintenance costs (e.g., input, equipment costs) of conservation practices were of concern for farmers. Financial incentives appear to be a motivator for farmers interviewed. However, not all participants were willing to work with a cost-share program because of program complexity. Efforts to streamline enrollment and increase program flexibility may be useful strategies to increase participation.

Conservation action can be constrained by perceptions of multiple factors including lack of equipment, personal financial resources, community financial resources, and/or community leadership.

Perceptions of knowledge and skills varied by landowners' level of practice adoption and their level of engagement in water resource protection (i.e., high civic engagement (HCE) vs. low civic engagement (LCE)). Landowners who are more engaged in conservation through private-sphere actions (e.g., practice adoption) or civic actions (e.g., engagement in water protection) are more likely to believe that they have the knowledge and skills needed to protect water resources. Lack of equipment, personal financial resources, community financial resources, and community leadership also emerged as constraints to conservation action. A comparison of respondents by levels of civic engagement shows that landowners who are more engaged in civic actions to protect water are more likely to believe that they have the financial resources to protect water. Study findings also indicate that most landowners believe that they do not have control over policies that affect their land. This is particularly true for landowners who are not highly engaged in civic actions to protect water. Landowners who are not highly engaged in community activities, including civic actions to protect water, are more likely to believe that they have little influence over water protection in their area.

Lack of personal and social norms for civic action is a major constraint to community engagement in water resource protection.

This study reveals a significant gap between private-sphere (e.g., practice adoption) and public-sphere (e.g., civic engagement in water) norms and behaviors. While most landowners reported feeling a sense of personal obligation to do whatever they can to prevent water pollution, including using conservation practices, considerably fewer landowners feel obligated to engage in civic actions (e.g., talk to others about conservation practices, attend meetings or public hearings about water). Further, landowners who are not highly engaged in water protection (i.e., HCE respondents) are less likely to feel a sense of obligation to be civically engaged in water protection. Over two-thirds of participants had never attended a meeting or public hearing about water, or participated in a water resource protection initiative. This is in contrast to a majority of landowners who reported that they currently use practices and intend to use practices such as buffer strips and conservation tillage in the future.

Lack of social norms of civic action emerged as a constraint to landowners' engagement in water resource protection. Survey findings suggest that social norms related to expectations of civic action are generally low. Most landowners did not feel any social pressure to engage in water resource protection. Comparisons between landowners by levels of civic engagement revealed that landowners who are more engaged are more likely to feel greater social pressure to engage in civic actions.

5. Recommendations

We recommend a multi-strategy approach to conservation programming that emphasizes the benefits of conservation practices, encourages personal commitment to conservation, addresses resource constraints, and supports community-building and social norm development for civic engagement, around water.

Emphasize benefits of conservation practices and encourage personal commitment to conservation.

This study shows that landowners and farmers in the Lower Minnesota watershed perceive the benefits of conservation practices. Study participants identified water quality, soil health, wildlife, and community benefits of conservation practices. Communication campaigns that aim to engage landowners and farmers in conservation should emphasize these benefits of conservation programs. Study findings also suggest that landowners and farmers are concerned about the impacts of water pollution on their health, future generations, and aquatic life. Thus, communication campaigns should also highlight the connections between water pollution and its impacts on community and environmental health, and the effectiveness of conservation practices in alleviating or reducing those impacts. We recommend tailored informational strategies that provide information about practices that are relevant to targeted stakeholders. Communication campaigns should draw connections between local water conditions (e.g., impairment in stream reach A), their potential consequences (e.g., impacts to aquatic life), and effectiveness of practices (e.g., water quality benefits of buffers, soil erosion prevention benefits of cover crops).

Another major finding from this study is that sense of responsibility for water protection, personal norms, or feelings of personal obligation to protect water resources, and social pressures or norms drive conservation action. Strategies that promote conservation as an individual and social norm, and appeal to landowners' sense of personal obligation are likely to be effective in increasing conservation practice adoption. Norm-based intervention strategies such as encouraging personal commitments has been shown to influence conservation behavior (e.g., Abrahamse, Steg, Vlek, & Rothengatter, 2005; De Snoo et al., 2010). Commitments in the form of a verbal or written pledge can establish personal norms, if made to oneself, and social norms, if made public. Further, commitments with a specific plan of action (e.g., I pledge to plant cover crop in the next growing season) can be particularly successful. This strategy can be especially effective if paired with goal setting, and tailored feedback about conservation (e.g., Abrahamse, Steg, Vlek, & Rothengatter, 2005; De Snoo et al., 2010; Steg and Vlek, 2009). Benchmarking or providing feedback about behaviors compared to others leads to normative pressure to keep up with others, and may result in behavior change (De Snoo et al., 2010). For example, setting specific goals on adoption of practices (e.g., 25% of farmland in cover crops) along with frequent feedback to landowners about farm and local environmental conditions, and the extent to which the goals are being met, can reinforce conservation norms. In similar studies on energy conservation and farmer conservation behavior, a combination of strategies that ask participants to set specific conservation goals, commit to conservation efforts, and provide feedback on practices, has been effective at promoting behavior change (e.g., Abrahamse et al., 2007; De Snoo et al., 2010).

Address resource constraints through technical assistance and incentive programs.

The biggest constraints at the individual and community levels appear to be lack of financial resources, equipment, and community leadership. Lack of knowledge and skills to use conservation practices also constrains practice adoption, particularly for landowners who are not already engaged in conservation actions. Availability of financial incentives is a primary driver of practice adoption. Payments for conservation practices and availability of cost-share opportunities are motivators for many landowners and farmers.

Technical assistance programs, particularly those that target landowners who are not highly engaged in conservation can enhance landowner knowledge and skills needed to adopt conservation practices. While many landowners and farmers are driven by their stewardship ethic, the costs associated with adopting and maintaining conservation practices is a significant burden for them. Programs that provide payments for conservation and cost-share resources can help offset some of the capital and maintenance costs, thus reducing the risks associated with adopting a new practice. Programs that provide equipment through rental agreements or trial periods also look promising.

Study findings also suggest that while conservation programs can be an important source of financial support, the complexities involved in program participation constrain many landowners and farmers from taking part. Thus, reducing program complexity by streamlining and simplifying the process of enrollment, and increasing flexibility in implementation can lead to greater program participation. Most landowners also perceive that their community lacks the financial resources and leadership to address water issues. There seemed to be some skepticism about the capacity (e.g., staffing and training levels) of local government units to protect water resources. Leadership development trainings and capacity-building at the local level may be necessary, and may help to bolster confidence and engagement among landowners.

Support community-building, and consequent norm development, centering on water engagement.

This study highlights a significant gap between private-sphere (e.g., practice adoption) and public-sphere (e.g., civic engagement) norms and actions. While most landowners feel a sense of personal obligation to use conservation practices, and intend to continue to use practices in the future, considerably fewer landowners are currently engaged in civic actions, or intend to engage in civic actions in the future. Further, there appears to be a lack of social pressure to engage with others around conservation and water resource issues. Landowners who are not engaged in their community, may not know what others are doing in regards to water resource protection. The lack of community engagement can stymie diffusion of innovation (Rogers, 1995), which could be a significant constraint in terms of practice adoption.

Landowner engagement in water protection can be influenced by the "citizen effect" or social norms that favor conservation action (Morton and Brown, 2011). Strategies that build social support and model conservation behavior through demonstration projects, community events, and recognition programs can help build social norms around conservation. Demonstration projects can be used to model the effectiveness of conservation practices. Further, sharing information about successes in conservation can reduce perceptions of risk and uncertainty by demonstrating that others in the community have successfully implemented practices. Community events that include recognition of those who have civically engaged to protect water, and the impacts of their engagement, can be a useful strategy to help establish community engagement as a social norm. Landowner recognition programs that show appreciation for engagement in conservation action also helps reinforce conservation as a community norm, and may provide additional incentive for participation.

Finally, both survey and interview findings highlight the importance and role of multiple community actors in influencing landowners' conservation decision-making. Creating opportunities to instill water protection themes into community gatherings involving diverse participants can serve to normalize the topic and promote information exchange between landowners and other community stakeholders.

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Appendices

Appendix A: Survey Questionnaire

ID# _____

Your Perspectives on Local Water Resources

A survey of landowners in Lower Minnesota Watershed

Center for Changing Landscapes

University of Minnesota

Driven to Discover℠

Before you begin:

We are conducting this survey **to better understand landowner opinions and practices** and to improve conservation programming. **This survey is voluntary and confidential.** It should take **about 20 minutes to complete** this questionnaire. Please answer the questions as completely as possible.

As you complete the survey, please keep in mind the following definitions:

Buffer/filter strip: A strip of vegetation (grasses, trees, and shrubs) planted and maintained adjacent to streams, ditches and lakes that filters water, stabilizes the stream bank, and provides wildlife habitat.

Conservation drainage management: Technologies and practices that remove excess water from lands while reducing potential pollutants (includes controlled drainage, shallow drainage, bioreactors, saturated buffers, rock inlets, storage basins, and ditch designs).

Conservation cover: Converting environmentally sensitive areas to vegetative cover to reduce soil erosion, improve water quality, and enhance forest and wetland resources (includes Conservation Reserve Program and land retirement).

Conservation tillage: Soil cultivation that leaves the previous year's crop residue on fields before and after planting the next crop to reduce soil erosion and surface runoff (includes no, minimum, strip, ridge, mulch-till).

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 would like to know your thoughts on your community.

1. Approximately how many years have you lived in your current community? _____

2. When you think of <u>your community</u>, what first comes to mind? *(Please check one)*

[ ] My neighborhood [ ] My township [ ] My city [ ] My county [ ] My watershed

3. How important are the following qualities of <u>a community</u> to you? *(Circle one number in each row.)*

	Very unimportant	Somewhat unimportant	Neither important nor unimportant	Somewhat important	Very important
a. Strong family ties	-2	-1	0	1	2
b. Good relationships among neighbors	-2	-1	0	1	2
c. Opportunities to be involved in community projects	-2	-1	0	1	2
d. Opportunities to express my culture and traditions	-2	-1	0	1	2
e. Clean streams, rivers and lakes	-2	-1	0	1	2
f. Access to natural areas/views	-2	-1	0	1	2
g. Opportunities for outdoor recreation	-2	-1	0	1	2

4. To what extent do you agree or disagree with the following statements? *(Please circle one number for each row)*

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
a. If there is someone I want to meet in my community, I can usually arrange it.	-2	-1	0	1	2
b. When I need assistance with something on my farm/land, I often <u>find it difficult</u> to get others to help.	-2	-1	0	1	2
c. I find it easy to play an important role in most group situations within my community.	-2	-1	0	1	2
d. The average farmer/landowner can have an influence on rural community life in the region.	-2	-1	0	1	2

II. Water (Streams, Lakes, Wetlands and Groundwater)

In the next section, we ask more specific questions related to your perspectives on water.

5. How familiar are you with water issues in your watershed? [*see enclosed watershed map*]

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

6. <u>Before this survey</u>, did you know your property is in the watershed shown on the map?

[ ] Yes [ ] No [ ] My property is not in the shaded watershed

7. To what extent do you agree or disagree with the following statements? *(Please circle one number for each row)*

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
a. Water resources in the Lower Minnesota watershed are adequately protected.	-2	-1	0	1	2
b. Water resources in Minnesota need better protection.	-2	-1	0	1	2
c. Water resource protection will threaten jobs for people like me.	-2	-1	0	1	2
d. Laws to protect the environment limit my choices and personal freedom.	-2	-1	0	1	2
e. Water pollution affects human health.	-2	-1	0	1	2
f. Excessive water runoff causes soil and nutrient loss.	-2	-1	0	1	2
g. Conservation practices protect aquatic life.	-2	-1	0	1	2
h. Conservation practices contribute to quality of life in my community.	-2	-1	0	1	2
i. Conservation drainage management reduces water runoff from farmland.	-2	-1	0	1	2
j. Drainage tiling increases crop yield.	-2	-1	0	1	2
k. Drainage tiling contributes to higher water flows downstream.	-2	-1	0	1	2
l. Conservation tillage decreases crop yield.	-2	-1	0	1	2

8. To what extent do you agree or disagree with the following statements? *(Please circle one number for each row)*

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
a. It is my personal responsibility to help protect water.	-2	-1	0	1	2
b. It is my personal responsibility to make sure that what I do on the land doesn't contribute to water resource problems.	-2	-1	0	1	2
c. Landowners upstream should be responsible for protecting water downstream.	-2	-1	0	1	2
d. The state government should be responsible for protecting water.	-2	-1	0	1	2
e. Local government should be responsible for protecting water.	-2	-1	0	1	2
f. Urban residents in my watershed should be responsible for protecting water.	-2	-1	0	1	2
g. Farmers in my watershed should be responsible for protecting water.	-2	-1	0	1	2

9. In your opinion, how much of a problem are the following water pollutants/issues in your watershed *[see map]*? *(Please circle one number for each row)*

	Not a problem	Slight problem	Moderate problem	Severe problem	Don't know
a. Sediment (cloudiness)	1	2	3	4	DK
b. Phosphorus	1	2	3	4	DK
c. Nitrogen in surface water	1	2	3	4	DK
d. Nitrogen in drinking water	1	2	3	4	DK
e. Algae	1	2	3	4	DK
f. Flooding	1	2	3	4	DK
g. Drought	1	2	3	4	DK
h. *E. coli* (bacteria)	1	2	3	4	DK
i. Pesticides	1	2	3	4	DK

10. In your opinion, how much of a problem are the following potential sources of water pollutants/issues in your watershed *[see map]*? *(Please circle one number for each row)*

	Not a problem	Slight problem	Moderate problem	Severe problem	Don't know
a. Industrial discharge to streams, rivers, and lakes	1	2	3	4	DK
b. Urban land development	1	2	3	4	DK
c. Improperly sized/maintained septic systems	1	2	3	4	DK
d. Soil erosion from farmland	1	2	3	4	DK
e. Wind erosion	1	2	3	4	DK
f. Stream bank erosion	1	2	3	4	DK
g. Fertilizer management for lawn/turf care	1	2	3	4	DK
h. Fertilizer management for crop production	1	2	3	4	DK
i. Livestock operations	1	2	3	4	DK
j. Tile drainage	1	2	3	4	DK
k. Surface ditch drainage	1	2	3	4	DK
l. Grass clippings and leaves entering storm drains	1	2	3	4	DK
m. Urban/suburban water runoff	1	2	3	4	DK
n. Unregulated contaminants (e.g., pharmaceuticals, personal care products)	1	2	3	4	DK
o. Natural causes (e.g., natural erosion, wildlife)	1	2	3	4	DK
p. Increased frequency or intensity of storms	1	2	3	4	DK

11. To what extent do you agree or disagree with the following statements? *(Please circle one number for each row)*

I am concerned about the consequences of <u>water pollution</u> for…	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
a. My or my family's health	-2	-1	0	1	2
b. Future generations	-2	-1	0	1	2
c. Wildlife	-2	-1	0	1	2
d. Farmland	-2	-1	0	1	2
e. Aquatic life	-2	-1	0	1	2
f. People in my community	-2	-1	0	1	2

12. To what extent do you agree or disagree with the following statements? *(Please circle one number for each row)*

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
a. My use of a conservation practice contributes to healthy water resources.	-2	-1	0	1	2
b. By taking an active part in conservation, people can keep water clean in Minnesota	-2	-1	0	1	2
c. I have the knowledge and skills I need to use conservation practices on the land.	-2	-1	0	1	2
d. I can learn almost anything about natural resource stewardship if I set my mind to it.	-2	-1	0	1	2
e. I have the financial resources I need to use conservation practices on the land.	-2	-1	0	1	2
f. I have the equipment I need to adopt a new conservation practice.	-2	-1	0	1	2
g. I <u>do not</u> have the time to use conservation practices	-2	-1	0	1	2
h. Farmers in my community have the ability to work together to change land use practices.	-2	-1	0	1	2
i. My community has the financial resources it needs to protect water resources.	-2	-1	0	1	2
j. My community has the leadership it needs to protect water resources.	-2	-1	0	1	2
k. Weather has a big impact on my decisions about conservation practices on the land.	-2	-1	0	1	2

13. How much influence do you think people like you have over the following? *(Please circle one number for each row)*

	Not at all	Little	Some	A lot
a. Protecting clean water in the area	0	1	2	3
b. Preserving farms and farmland in the area	0	1	2	3
c. Inspiring or organizing others to take action in the community	0	1	2	3

14. To what extent do you agree or disagree with the following statements? *(Please circle one number for each row)*

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
a. There is nothing that we can do to keep the costs of farm/land management from going up.	-2	-1	0	1	2
b. I can usually achieve what I want on my farm/land when I work hard for it.	-2	-1	0	1	2
c. Most of what happens on my farm/land is beyond my control.	-2	-1	0	1	2
d. It is difficult for us to have much control over policies that affect our farms/lands.	-2	-1	0	1	2
e. I can usually rely on weather forecasts to manage my farm/land.	-2	-1	0	1	2
f. The weather is so variable that it is difficult to make decisions on my farm/land.	-2	-1	0	1	2
g. By adapting farm/land management practices, people can become more resilient to changes in weather patterns.	-2	-1	0	1	2

15. To what extent do you agree or disagree with the following statements? *(Please circle one number for each row)*

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
a. People who are important to me expect me to talk to others about conservation practices.	-2	-1	0	1	2
b. People who are important to me talk to others about conservation practices.	-2	-1	0	1	2
c. People who are important to me expect me to attend meetings or public hearings about water.	-2	-1	0	1	2
d. People who are important to me attend meetings or public hearings about water.	-2	-1	0	1	2
e. People who are important to me expect me to work with other community members to protect water.	-2	-1	0	1	2
f. People who are important to me work with other community members to protect water.	-2	-1	0	1	2

III. Conservation Practices and Community Engagement

Now, we have a few questions about your conservation practices and community engagement. Remember, your responses to all of the survey questions are confidential.

16. Do you use the following practices on your land/property? Do you intend to use these practices on your land/property in the future? *(Please check yes/no for each)*

	Do you use the practice on your land/property now?		**Do you intend to use the practice on your land/property in the future?**		Not Applicable
	Yes	No	Yes	No	
a. Buffer/filter strip along streams and ditches or field edges	☐	☐	☐	☐	☐
b. Conservation drainage management practices (e.g., controlled drainage, storage basins)	☐	☐	☐	☐	☐
c. Conservation tillage practices (e.g., no till, minimum till)	☐	☐	☐	☐	☐
d. Land in conservation cover (e.g., Conservation Reserve Program)	☐	☐	☐	☐	☐
e. Drainage tiles	☐	☐	☐	☐	☐
f. Terraces	☐	☐	☐	☐	☐
g. Vertical drop side inlets (adjacent to ditches)	☐	☐	☐	☐	☐
h. Water and sediment control basins	☐	☐	☐	☐	☐
i. Agriculture waste management facility or system	☐	☐	☐	☐	☐
j. Rotation grazing	☐	☐	☐	☐	☐
k. Cover crops	☐	☐	☐	☐	☐
l. Drainage water management planning	☐	☐	☐	☐	☐
m. Protect wetlands on the land/property	☐	☐	☐	☐	☐
n. Plant trees as a windbreak on the land/property	☐	☐	☐	☐	☐
o. Follow a nutrient management plan on the farm	☐	☐	☐	☐	☐
p. Rain barrel or cistern to store water	☐	☐	☐	☐	☐
q. Rain garden	☐	☐	☐	☐	☐
r. Native plants or shrubs in my yard	☐	☐	☐	☐	☐
s. Minimizing use of fertilizers/pesticides on lawns and gardens	☐	☐	☐	☐	☐

17. To what extent do you agree or disagree with the following statements? *(Please circle one number for each row)*

I would be more likely to adopt new conservation practices or to continue to use practices if…	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
a. I knew more about how to implement and maintain conservation practices.	-2	-1	0	1	2
b. I knew more about the wildlife benefits of conservation practices.	-2	-1	0	1	2
c. I had help with the physical labor of implementing and maintaining conservation practices.	-2	-1	0	1	2
d. I had access to financial resources to help me adopt conservation practices.	-2	-1	0	1	2
e. I could talk to other landowners or farmers who are using conservation practices.	-2	-1	0	1	2
f. I could attend a workshop or field day on conservation practices.	-2	-1	0	1	2
g. I could be enrolled in a program that recognizes local conservation stewards.	-2	-1	0	1	2
h. My neighbors maintained conservation practices.	-2	-1	0	1	2
i. There were regulations that mandated using a conservation practice.	-2	-1	0	1	2
j. Conservation programs were more flexible.	-2	-1	0	1	2
k. I could get higher payments for adopting conservation practices.	-2	-1	0	1	2
l. I could learn how to maintain conservation practices for soil conservation.	-2	-1	0	1	2
m. I had evidence that the conservation practice improved water resources.	-2	-1	0	1	2
n. I was compensated for lost crop production because of conservation practices.	-2	-1	0	1	2
o. Conservation program requirements were less complex.	-2	-1	0	1	2
p. I had evidence that conservation practices <u>did not</u> reduce crop yield.	-2	-1	0	1	2
q. A conservation assistance professional would visit my land to discuss conservation practice options.	-2	-1	0	1	2

18. How often have you engaged in the following actions <u>in the past 12 months</u>? *(Please circle one response for each row)*

In the <u>past 12 months</u> how often have you…	Never	Every few months	Every month	Every two weeks	Weekly or more
a. Volunteered for community organizations or events?	0	1	2	3	4
b. Heard about a water resource protection initiative?	0	1	2	3	4
c. Participated in a water resource protection initiative?	0	1	2	3	4
d. Worked with other community members to protect water?	0	1	2	3	4
e. Talked to others about conservation practices?	0	1	2	3	4
f. Attended a meeting or public hearing about water?	0	1	2	3	4
g. Taken a leadership role around water resource conservation in the community?	0	1	2	3	4

19. Please rate your <u>intentions to engage</u> in the following actions in the next 12 months. *(Please circle one number for each row)*

In the <u>next 12 months</u>, I intend to…	Most certainly not	Probably not	Uncertain	Probably will	Most certainly will
a. Learn more about water resource issues in my watershed	-2	-1	0	1	2
b. Talk to others about conservation practices	-2	-1	0	1	2
c. Work with other community members to protect water	-2	-1	0	1	2
d. Attend a meeting or public hearing about water	-2	-1	0	1	2
e. Contact conservation assistance professionals (e.g. my soil and water conservation district or the Natural Resources Conservation Service) about water resource initiatives	-2	-1	0	1	2
f. Learn more about conservation practices	-2	-1	0	1	2

20. To what extent do you agree or disagree with the following statements? *(Please circle one number for each row)*

I feel a personal obligation to…	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
a. Do whatever I can to prevent water pollution	-2	-1	0	1	2
b. Maintain my land/farm in a way that <u>does not</u> contribute to water resource problems	-2	-1	0	1	2
c. Talk to others about conservation practices	-2	-1	0	1	2
d. Use conservation practices on my land/property	-2	-1	0	1	2
e. Work with other community members to protect water resources	-2	-1	0	1	2
f. Attend meetings or public hearings about water	-2	-1	0	1	2

21. To what extent do the following individuals or groups <u>influence your decisions about conservation on your land</u>? *(Please circle one number for each row)*

	Not at all	Slightly	Moderately	A lot	Don't know/Not applicable
a. My family	1	2	3	4	DK/NA
b. Farmers	1	2	3	4	DK/NA
c. My neighbors	1	2	3	4	DK/NA
d. Environmental advocacy organizations	1	2	3	4	DK/NA
e. My county's Soil and Water Conservation District	1	2	3	4	DK/NA
f. My financial institution (e.g., financial advisor, loan officer, mortgage lender, etc.)	1	2	3	4	DK/NA
g. University researchers	1	2	3	4	DK/NA
h. The MN Department of Natural Resources	1	2	3	4	DK/NA
i. The MN Pollution Control Agency	1	2	3	4	DK/NA
j. The MN Department of Agriculture	1	2	3	4	DK/NA
k. The Farm Service Agency (USDA)	1	2	3	4	DK/NA
l. The National Resource Conservation Service (NRCS)	1	2	3	4	DK/NA
m. My local extension agent	1	2	3	4	DK/NA
n. My county's Farm Bureau	1	2	3	4	DK/NA
o. Agricultural commodity associations (e.g., Minnesota Corn Growers Association)	1	2	3	4	DK/NA
p. Certified crop advisors (CCA)	1	2	3	4	DK/NA
q. Seed/input dealer	1	2	3	4	DK/NA
r. Farmer's Union	1	2	3	4	DK/NA
s. My local co-op	1	2	3	4	DK/NA
t. My agronomist/agricultural advisor	1	2	3	4	DK/NA
u. Other (please specify): _____	1	2	3	4	DK/NA

22. From the previous list (Question 21, a-u), what are your three most <u>trusted sources of information</u> regarding water quality issues and solutions? (*Please list in order of first, second, and third most trusted*)

1. _____ 2. _____ 3. _____

IV. Information about You and Your Land/Farm

Finally, we want to know a little bit about you in order to better understand who responded to this survey. Remember, your responses to all of the survey questions are confidential.

23. How do you use water resources in your watershed? (*Check all that apply*)

[ ] Drinking water
[ ] Canoeing/kayaking/other boating
[ ] Fishing
[ ] Swimming
[ ] Hunting
[ ] Watering livestock
[ ] Irrigation
[ ] Picnicking and family gatherings
[ ] Observing wildlife
[ ] Experiencing scenic beauty
[ ] Storing excess water from drainage system

24. How would you characterize the quality of water in the ditch, stream, lake, or river closest to you? *(Please check one box)*

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

25. How would you characterize the quality of water in the Minnesota River? *(Please check one box)*

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

26. Does the land you own or rent touch a ditch, stream, lake, or river? *(Please check yes or no)*

[ ] Yes [ ] No

27. Do you use your land/property for agricultural production? *(Please check yes or no)*

[ ] Yes *(If yes, answer question 27a)* [ ] No *(If no, skip to question 28)*

Q27a. How many acres are in agricultural production? _____acres

28. What is your experience with programs that offer financial incentives to farmers for conservation practices? *(Please check one box)*

[ ] Not relevant for my property [ ] Never heard of any [ ] Familiar but not enrolled [ ] Currently enrolled

29. Please describe the ownership arrangement and size of your property. *(Please check all that apply and include acreage)*

Ownership	Approximate Acreage
[ ] I own and manage my own land.	_____
[ ] I rent land to another party.	_____
[ ] I rent land from another party.	_____
[ ] Other (please specify): _____	_____

30. Who makes the management decisions on the land? *(Please check one box)*

[ ] I make my own decisions.
[ ] I leave it up to my renter.
[ ] I leave it up to the landowner/property owner.
[ ] I work together with the renter/landowners to make decisions.

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

32. Are you… [ ] Male [ ] Female [ ] Prefer not to respond

33. 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 (Masters or PhD)
[ ] Prefer not to respond

34. 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, Minnesota Chippewa Tribe, Shakopee Mdewakanton 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

35. Which of the following best describes your total household income from all sources in <u>2015</u> 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

36. Approximately what percentage of your income is dependent on agricultural production? ____%

37. Do you have any other comments about your community or water management?

Thank you for your help!

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

If you have questions please contact Dr. Amit Pradhananga, Department of Forest Resources, 115 Green Hall, 1530 Cleveland Avenue N., St. Paul, MN 55108. Phone: (612) 624-6726 or by email at prad0047@umn.edu.

Appendix B: Survey Cover Letter

[Date]

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

Lower Minnesota Landowner Survey
Information and Consent Form

Dear [First Name] [Last Name],

I am writing to ask for your help in a study about landowners and water resources. The study is being conducted by the Center for Changing Landscapes, University of Minnesota in partnership with the Minnesota Pollution Control Agency. I am contacting you because you are a landowner in the Lower Minnesota watershed and we want to know what you think about water.

The findings from this study will be used to help local resource managers and community leaders better understand landowners' views and to facilitate communication and outreach programs in the area. We really appreciate you taking the time to help us with this study. It should take you only about 20 minutes to complete the questionnaire.

For your reference, a map of the Lower Minnesota watershed is enclosed.

This survey is voluntary and completely confidential. The risks of participating in this study are minimal. There are no direct benefits to you for participating in this study. You are free to withdraw at any time. Completion of this survey 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.**

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 612-624-6726, or by email at prad0047@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.

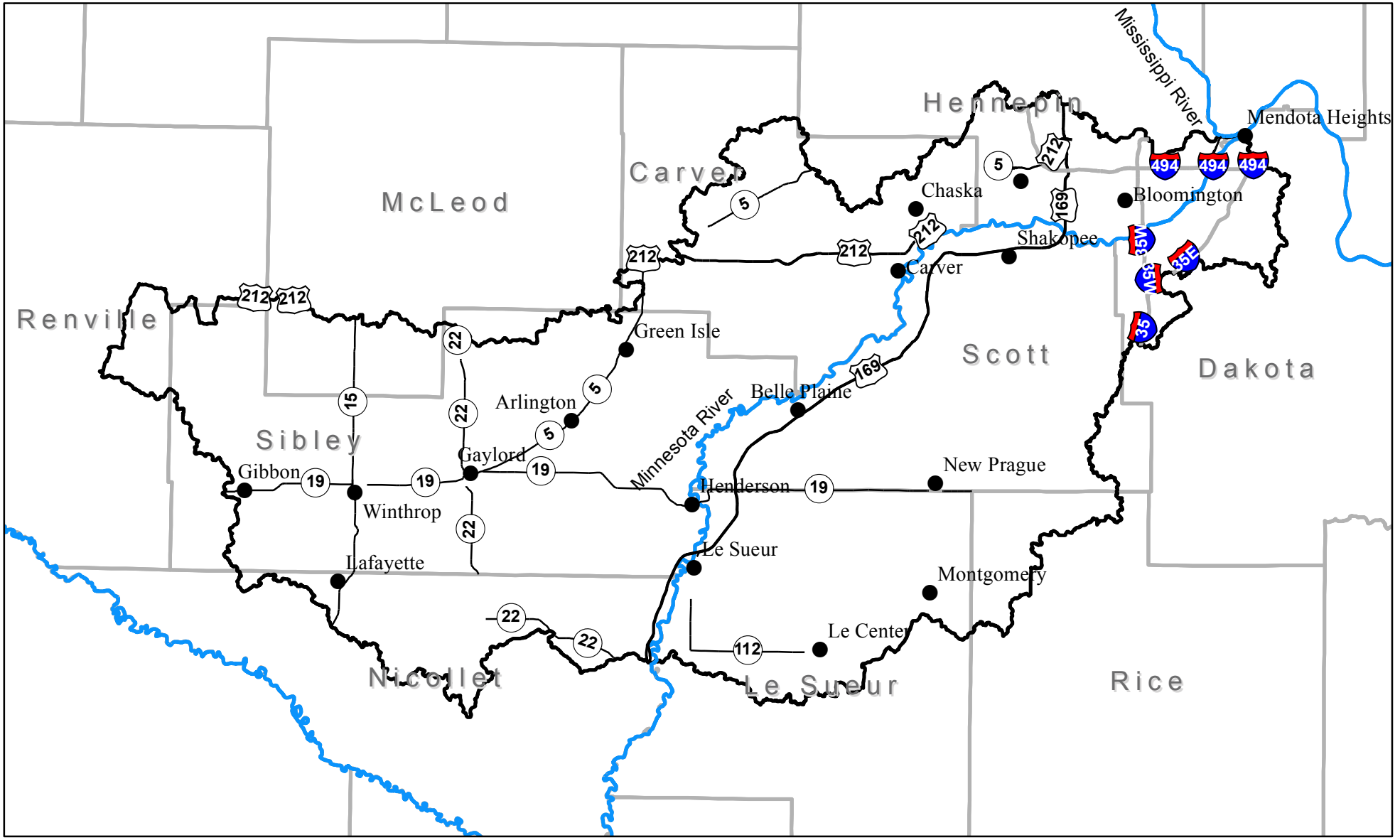
I hope you enjoy completing the questionnaire and I look forward to receiving your response.

Sincerely,

Amit Pradhananga
Center for Changing Landscapes
University of Minnesota

Appendix C: Lower Minnesota Watershed Map

Lower Minnesota Watershed



Appendix D: Survey Reminder Letter

[Date]

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

Lower Minnesota Landowner Survey
Information and Consent Form

Dear [First Name] [Last Name],

About a month ago, I sent you a questionnaire that asked about your perspectives on your community and its water resources. If you have already returned your questionnaire, thank you for your response. We sincerely appreciate your input!

If you have not yet responded, I am writing again because of the importance of your participation to the study and its intended outcomes. It should take you only about 20 minutes to complete the questionnaire. The responses we have already received from other landowners in your watershed show a range of beliefs about water resources and support for watershed management initiatives. We want to ensure that your opinions are represented, too!

The purpose of this survey is to learn more about how landowners in the Lower Minnesota watershed perceive and interact with their community, their environment, and specifically water resources. Your input will inform water and land management decisions in the area. The study is being conducted by the Center for Changing Landscapes, University of Minnesota in partnership with the Minnesota Pollution Control Agency.

For your reference, a map of the Lower Minnesota watershed is enclosed.

This survey is voluntary and completely confidential. 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.**

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 612-624-6726, or by email at prad0047@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,

Amit Pradhananga
Center for Changing Landscapes
University of Minnesota

Appendix E: Interview Contact Script

Lower Minnesota Watershed Study

Script for Initial Contact

"Hello, my name is _____. I am a graduate student/researcher with the Center for Changing Landscapes at the University of Minnesota. I am working on a study that involves farmers in the Lower Minnesota Watershed. This project will help us better understand perspectives around conservation practices and clean water. Study findings will inform conservation program development, outreach and planning. I have been [will be] interviewing farmers to gather their insights about their farms and the decisions they make regarding conservation practices and was hoping you would be able to assist me by participating in the study and sharing your perspectives with me. We are offering a $20 reimbursement for your participation. The interview takes about one and a half hours. Would you be willing to participate?"

If yes: "Thank you. I am available on _____ (days of week, times, have alternates ready) is there a time that would work best for you? [Set date, time, location (get directions)]. I would like to send you a confirmation email with date, time and location information. The email will include all of my contact information, in case you have any questions or concerns. Do you have an email address I can send the confirmation to?

a. **If yes**, take it down or confirm we have the correct email address for them. "Thank you. I look forward to meeting with you on ___(agreed upon date)___."

b. **If no**, "Is __(phone # you contact them with)___ the best way for me to get a hold of you? In case you need to get a hold of me with questions or concerns, my phone number is _____." I look forward to meeting with you on ___(agreed upon date)___.

If no: "Ok, thank you for your time. Good bye."

If they seem unsure: "Just to be clear, participation is completely voluntary and if you decide to participate you can withdraw at any time. Your identity will remain confidential and we won't include any information that would make it possible to identify you in any published reports. We're only talking to a limited number of key representatives, so capturing your perspective is important. Can I ask what your concerns about participating are?" [Try to address their concerns]

If they want to know why they are being asked to participate: "We're interviewing a variety of farmers to try to get diverse perspectives and a range of experiences. I've talked to others in your community and your name came up as someone who is familiar with these issues. Since we are only able to conduct a limited number of interviews, capturing your perspective is important."

If they want to know how the information will be used: "We are trying to better understand farmers' perspectives on their farms, challenges they face, and decisions associated with conservation practices. We'll be putting together a final report that identifies those drivers and constraints to share with community leaders, educators and resource professionals. Your information will be kept confidential and there will not be any identifying information in the report."

If they want to know what the study is for: "This project is aimed at informing outreach and education programs to promote voluntary adoption of conservation practices in the Lower Minnesota Watershed. Landowner input is critical to making these programs work for both water resource protection and for landowners."

If they want to know who is supervising the research: "Mae Davenport is the supervisor for this study. She is a Professor in the Department of Forest Resources at the U of M. If you would like to contact her directly I can give you her phone number [612-624-2721] or email address [mdaven@umn.edu]."

If they ask about IRB: The research project has been reviewed by the IRB/Human Subjects Committee.

Appendix F: Interview Guide

ID #_____

Lower Minnesota Watershed Interview Guide
University of Minnesota
January 16, 2018

First, I'd like to start with a few questions about your farm and farming in general.

1. **Tell me about your farm and what it means to you.**
    a. What do you like about being a farmer/landowner?

2. **What worries or concerns you the most about farming today?**

3. If you could change anything about farming today, what would you change?

Next, I would like to learn more about your decision making process on your farm.

4. **Who makes the decisions about your farm and land?**

5. **Do you consult with others when making decisions? Or do others influence your decisions?**
    a. If so, who do you talk to?

6. **What are the most important considerations when making decisions about your farm?**

7. How do you evaluate the success of your farm operation?
    a. What kinds of outcomes are you looking for in judging success?
    b. What issues challenge or limit you in making your farm operation a greater success?

8. **Have you changed the way you farm in the past 5 years in attempt to make your farm more successful?**
    a. If so, please describe what changes you have made.

As you may know, there is increasing concern about water resources in the Lower Minnesota watershed. In turn, resource professionals are promoting conservation practices throughout the watershed to address these problems. Farmers, in particular, have been encouraged to consider conservation practices to reduce the impacts farming has on water resources. I have a few questions for you about water resources in this area.

9. **What do water resources in the area mean to you?**

10. **Are you concerned about water resources in the watershed? Please explain.**
    a. [If yes] What concerns you the most?

11. **Who do you think should be responsible for solving water resource problems in the watershed?**
    a. What role should farmers/landowners play in water resource protection?

The next set of questions inquires about your experiences with and opinions about conservation practices.

12. First, a broad question: What does the term "conservation" mean to you?
    a. What do you see as your role in conservation?

13. **Do you use practices on your farm/land that reduce the impacts your farm has on water resources? Please describe those practices for me. [Write down practices, then for each practice ask the following]**
    a. How long have you used this practice on your farm?
    b. Where did you hear about this practice?
    c. What first motivated you to use this practice?
    d. What do you like about this practice?
    e. What don't you like about this practice?
    f. Is this practice doing what it was intended to do? Please explain.
    g. Do you plan to maintain this practice on your land over the next five years? Please explain.

14. **Are there any other conservation practices you have been considering?** [If yes, ask questions a-c for each, if no skip to 15]
    a. What have you heard about this practice?
    b. What factors have kept you from adopting this practice?
    c. Would you adopt this practice if things were different? Please explain.
    d. [If not already discussed] Have you considered using cover crops? Please explain.

15. Do you budget for implementing conservation practices each year?
    a. [If yes] Approximately what proportion of your budget would you say is devoted to conservation practices?

16. **Have you worked with your local SWCD or NRCS when considering or implementing conservation practices?**
    a. [If yes] Why did you choose to work with the county (SCWD or NRCS)?
    b. How would you describe working with the county (SWCD or NRCS)?

17. **Overall, what are the most important considerations for you when making decisions about conservation practices on your farm?**

18. **Would you be more likely to adopt or maintain conservation practices if…**
    a. You knew they had benefits downstream?
        i. Which benefits would be most important to you? (e.g. reduced flooding, increased water quality, enhanced wildlife habitat)
    b. You had financial assistance to implement the practices?
    c. You had evidence that the practices would not reduce yield?
    d. Most farmers/landowners you knew had adopted the practices?
    e. You could talk to other farmers how to make the practices work on your farm?

19. **Do you talk to others about conservation practices? Who do you talk to?**

20. **Who do you consider to be the most trusted source of information about conservation practices?**

Finally, I have a few general questions for you about water resource conservation in the Lower Minnesota watershed.

21. **What do you think are the 3 biggest obstacles in the way of healthy water resources in the area?**

22. **What do you think are the 3 keys to success to achieve healthy water resources in the area?**

23. Is there anything you would like to add about your farm, conservation practices or water resources in general that we haven't covered?

Appendix G: Interview Consent Form

Lower Minnesota Watershed Landowner Conservation Study
Consent Form

You are invited to participate in a study of agricultural conservation action in the Lower Minnesota Watershed from the perspectives of local farmers/landowners. You were selected as a possible participant for an interview because you are a farmer/landowner in the watershed. We ask that you read this form and ask any questions you may have before agreeing to be in the study. This study is being conducted by: Amit Pradhananga, Research Associate and Mae Davenport, Professor in the Department of Forest Resources, University of Minnesota.

Background Information
The purpose of this study is to better understand what influences landowners' decisions about conservation practices and their engagement in water resource issues.

Procedures:
If you agree to be in this study, we would ask you to participate in an interview lasting approximately 90 minutes. The interview will be audio-recorded and transcribed.

Risks and Benefits of being in the Study
Risks associated with this study are minimal; responses are confidential and participants' names will not be linked to any information in any publications. Benefits of participation may include increased awareness of agricultural conservation practices. Study results will be made available to the public and all participants will have access to them.

Compensation:
$20 reimbursement will be offered for participation in an interview.

Confidentiality:
The records of this study will be kept private. In any sort of report we might publish, we will not include any information that will make it possible to identify a subject. Research records will be stored securely and only researchers will have access to the records. Your responses to the interview questions will be audio-recorded, transcribed and kept for three years in a locked office. Afterward, these recordings will be destroyed. A participant database with your name and address will be stored in a password protected computer. Only those directly involved with the project will have access to the project files including audio recordings and the interview notes.

Voluntary Nature of the Study:
Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with the University of Minnesota. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships.

Contacts and Questions:
The researcher conducting this study is: Amit Pradhananga. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact him at address: 37 McNeal Hall, 1985 Buford Avenue,, St. Paul, MN 55108, phone: 612-624-6726, email:

prad0047@umn.edu.

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, **you are encouraged** to contact the Research Subjects' Advocate Line, D528 Mayo, 420 Delaware St. Southeast, Minneapolis, Minnesota 55455; (612) 625-1650.

You will be given a copy of this information to keep for your records.

Statement of Consent:

I have read the above information. I have asked questions and have received answers. I consent to participate in the study.

"I agree_____ I disagree_____ to have my responses audio-recorded"

"I agree_____ I disagree_____ that Mae Davenport may quote me anonymously in her papers"

Signature:_____Date: _____

Signature of Investigator:_____Date: _____

Appendix H: Interview Conservation Checklist

ID#: _____

Agricultural Conservation Practices Checklist

Conservation Practices:	Definition/Benefit:	Do you use? Yes (Y) or No (N)
Buffer/filter strips	Vegetation (grasses, trees, and shrubs) planted and maintained adjacent to streams, ditches and lakes that filters water, stabilizes the stream bank, and provides habitat for wildlife.	
Conservation tillage (no-till, strip-till, ridge-till, mulch-till)	Soil cultivation that leaves the previous year's crop residue on fields before and after planting the next crop to reduce soil erosion and runoff.	
Cover Crops	Crops planted primarily to prevent soil erosion & runoff, improve soil health, and provide wildlife habitat by providing seasonal cover on cropland.	
Grade (gully) stabilization	An embankment or spillway built across a drainageway to prevent soil erosion by controlling the way water falls to lower elevations.	
Grass waterways	Downhill grassed channels, generally broad and shallow, designed to prevent soil erosion while draining runoff water from adjacent cropland.	
Side water inlets	Structure on the bank of a stream or ditch that temporarily stores water, settles sediment and nutrients, and reduces erosion from overland flow, including drop inlets.	
Tile inlet alternative	An alternative to traditional tile inlet which instead slows water flow and allows sediment to settle out before entering into a subsurface drainage system, including french drains or rock inlets, and slotted risers.	
Water and sediment control basins	A series of small earthen ridge-and-channels or embankments built across a watercourse within a field to trap agricultural runoff water and sediment.	

Agricultural Conservation Practices: Practices on agricultural lands that prevent and/or minimize degradation of ground and surface water.

Appendix I: Interview Background Information Form

Lower MN - Interview Background Information Form

---

1. How many years have you lived in your community? _____

2. Approximately, how many acres is your own land/property? _____

3. Do you farm your land or other rented property?

[ ] Yes [ ] No

4. Approximately, how many acres in total do you farm? _____

5. Which of the following best describes the ownership arrangement of the land you farm?

[ ] I own and farm my own land

[ ] I own and farm part of my own land and rent land to another party

[ ] I own and farm my own land and rent more land from another party

[ ] I rent my land to another party

[ ] I rent land from another party

[ ] Other (please specify): _____

6. How many years have you been farming? _____

7. Approximately, how many years has your farm been in your family? _____

8. Do you have crops on your farm?

[ ] Yes [ ] No

9. What types of crops do you have?

[ ] Corn

[ ] Soybeans

[ ] Alfalfa

[ ] Wheat

[ ] Sweet corn

[ ] Peas

[ ] Other (please specify): _____

10. Approximately, what percentage of your total farming enterprise is made up of each crop?

Corn: _____
Soybeans: _____
Alfalfa: _____
Wheat: _____
Sweet corn: _____
Peas: _____
Other: _____
Other : _____
Total: _____

11. Do you have livestock on your farm?

[ ] Yes [ ] No

12. What type of livestock do you have? *(Please check all that apply)*

[ ] Pigs
[ ] Cattle
[ ] Chickens
[ ] Sheep
[ ] Other (please specify): _____

13. Approximately, what percent of your total livestock is made up of each?

Pigs: _____
Cattle: _____
Chickens: _____
Sheep: _____
Other: _____
Total: _____

14. Are you involved in any farming-related organization/associations in your community?

[ ] MN Corn Growers Association
[ ] MN Soybean Growers Association
[ ] MN Farmers Union
[ ] American and/or MN Farm Bureau
[ ] Other (please specify):_____

15. How do you get information about available conservation programs or events? (Please check all that apply)

[ ] Word of mouth (1)
[ ] Postcard from a local agency (2)
[ ] Website of a local agency (3)
[ ] Local newsletter or newspaper
[ ] Website of a state or federal agency (5)
[ ] Other agricultural organizations (Please specify): _____
[ ] Other environmental organizations (Please specify): _____

16. What is your gender?

[ ] Male [ ] Female

17. In what year were you born? _____

18. What is the highest level of formal education you have completed?

[ ] Did not finish high school
[ ] Completed high school/GED
[ ] Some college but no degree
[ ] Associate degree or vocational degree
[ ] College bachelor's degree
[ ] Some graduate work
[ ] Completed graduate degree (Masters or PhD)

19. What percent of your income is dependent on agricultural production?

[ ] 0% (1)
[ ] 1-25% (2)
[ ] 26-50% (3)
[ ] More than 50% (4)

20. Which category best describes your total household income from all sources in 2017 before taxes?

[ ] Under $10,000 (1)
[ ] $10,000 - $24,999 (2)
[ ] $25,000 - $34,999 (3)
[ ] $35,000 - $49,999 (4)
[ ] $50,000 - $74,999 (5)
[ ] $75,000 - $99,999 (6)
[ ] $100,000 - $149,999 (7)
[ ] $150,000 or more (8)

21. How would you describe your race? (Please check all that apply)

[ ] White
[ ] Black or African American
[ ] American Indian or Alaska Native
[ ] Asian Indian
[ ] Native Hawaiian
[ ] Pacific Islander
[ ] Chinese
[ ] Japanese
[ ] Korean
[ ] Vietnamese
[ ] Filipino
[ ] Other Race (Please specify)

Appendix J: Survey Findings, Descriptive Analyses

Table 1. Respondents' sociodemographic characteristics

Socio-Demographic characteristics		N	Percent
Gender	Male	202	78.3
	Female	56	21.7
Race*	White	292	98.3
	Hispanic, Latino or Spanish Heritage	0	0
	Black or African American	0	0
	Asian	1	0.003
	American Indian or Alaska Native	0	0
	Middle Eastern or North African	0	0
	Native Hawaiian or Other Pacific Islander	0	0
	Other (e.g., American, human)	4	0.01
Age	Median	67	-
	Minimum	28	-
	Maximum	98	-
Years lived in community	Median	54	-
	Minimum	0	-
	Maximum	90	-
Formal education	Did not finish high school	8	2.8
	Completed high school	91	32.3
	Some college but no degree	38	13.5
	Associate or vocational degree	63	22.3
	College bachelor's degree	49	17.4
	Some college graduate work	10	3.5
	Completed graduate degree (MS or PhD)	23	8.2
Household income	Under $20,000	8	3.7
	$20,000-$49,999	45	20.5
	$50,000-$74,999	54	24.7
	$75,000-$99,999	41	18.7
	$100,000-$149,999	39	17.8
	$150,000-$199,999	15	6.8
	$200,000-$249,999	5	2.3
	$250,000-$299,999	2	0.9
	$300,000 or more	10	4.6

Source: Your Perspectives on Local Water Resources: A Survey of Landowners in Lower Minnesota Watershed, Questions 1, 31, 32, 33, 34, and 35

*Respondents could give more than one response.

Table 2. Respondents' property characteristics

Property Characteristics		**N**	**Percent**
Land/property borders a ditch, stream, lake, or river	Yes	255	85.9
	No	42	14.1
Property used for agricultural production	Yes	267	91.8
	No	24	8.2
Percent income dependent on land/property	0-49.9%	107	41.3
	50% or more	152	58.7
Ownership arrangement*	I own and manage my own land	149	37.7
	I rent my land to another party	175	44.3
	I rent my land from another party	63	15.9
	Other	8	2.1
Management decisions on land/property	I make my own decisions	147	49.7
	I leave it up to my renter	75	25.3
	I leave it up to the landowner/property owner	2	0.7
	I work together with renter/landowner to make decisions	72	24.3
Experience with programs that offer financial incentives to farmers for conservation practices	Not relevant for my property	35	12.3
	Never heard of any	38	13.4
	Familiar but not enrolled	112	39.4
	Currently enrolled	99	34.9

Source: Your Perspectives on Local Water Resources: A Survey of Landowners in Lower Minnesota Watershed, Questions 26, 27, 28, 29, 30, 36

*Respondents could give more than one response.

Table 3. Respondents' property size and acres of land in agricultural production

	N	Median	Under 100 acres[a]	100 - 200 acres	200 - 500 acres	501 acres or more
Size of property owned	130	180	29.2	22.3	30.0	18.5
Size of property rented out	134	170	32.1	34.3	23.1	10.4
Size of property rented	59	400	16.9	10.2	33.9	39.0
Other	8	270	37.5	0.0	50.0	12.5
Acres in agricultural production*	253	165	29.2	23.7	22.1	24.9

Source: Your Perspectives on Local Water Resources: A Survey of Landowners in Lower Minnesota Watershed, Questions 27a and 29

[a]Percent

*Acres in agricultural production among respondents that use their land for agricultural production

Table 4. Respondents' perception of their community

Response	N	Percent
My neighborhood	123	40.5
My city	66	21.7
My township	48	15.8
My county	45	14.8
My watershed	6	2.0

Source: Your Perspectives on Local Water Resources: A Survey of Landowners in Lower Minnesota Watershed, Question 2

Table 5. Respondents' perceived importance of the qualities of a community

	N	Mean*	SD[a]	Very unimportant[b]	Somewhat unimportant	Neither important nor unimportant	Somewhat important	Very important
Good relationships among neighbors	297	1.40	1.07	6.1	2.0	2.7	24.6	64.6
Strong family ties	298	1.37	1.13	6.7	2.0	5.0	19.8	66.4
Clean streams, rivers and lakes	299	1.32	1.06	5.4	2.7	4.7	29.4	57.9
Access to natural areas/views	297	0.96	1.12	5.4	4.7	18.2	32.0	39.7
Opportunities for outdoor recreation	298	0.92	1.18	6.7	5.7	16.4	31.5	39.6
Opportunities to be involved in community projects	298	0.65	0.98	4.4	6.0	27.2	44.6	17.8
Opportunities to express my culture and traditions	299	0.48	1.05	4.7	10.7	34.8	31.8	18.1

Source: Your Perspectives on Local Water Resources: A Survey of Landowners in Lower Minnesota Watershed, Question 3

*Responses based on a 5-point scale from very unimportant (-2) to very important (2)

[a] SD=Standard deviation

[b] Percent

Table 6. Respondents' uses of water resources in their watershed

	N	Percent[a]
Drinking water	226	83.4%
Observing wildlife	153	56.5%
Experiencing scenic beauty	131	48.3%
Hunting	100	36.9%
Watering livestock	87	32.1%
Fishing	75	27.7%
Picknicking and family gatherings	62	22.9%
Canoeing/kayaking/other boating	43	15.9%
Swimming	39	14.4%
Storing excess water from drainage system	20	7.4%
Irrigation	13	5%

Source: Your Perspectives on Local Water Resources: A Survey of Landowners in Lower Minnesota Watershed, Question 23

[a]Percentages based on the number of respondents that responded to the survey question; Respondents could give more than one response; Rank ordered by percent

Table 7. Respondents' familiarity with water resource issues in their watershed

Response	N	Percent
Not at all familiar	31	10.3
Slightly familiar	85	28.3
Moderately	120	40.0
Very familiar	64	21.3
Total	300	100.0

Source: Your Perspectives on Local Water Resources: A Survey of Landowners in Lower Minnesota Watershed, Question 5

Table 8. Respondents' perceptions about water quality in the ditch, stream, lake, or river water closest to them and in the Minnesota River

	N	Mean*	SD[a]	Very poor[b]	Poor	Fair	Good	Very good	Don't know
Water quality in the ditch, stream, lake, or river water closest to them	296	3.54	0.96	2.0	10.1	26.7	34.8	12.8	13.5
Water quality in the Minnesota River	293	2.75	0.90	6.8	24.2	36.9	13.0	2.0	17.1

Source: Your Perspectives on Local Water Resources: A Survey of Landowners in Lower Minnesota Watershed, Questions 24 and 25

*Responses based on a 5-point scale from very poor (1) to very good (5)

[a] SD=Standard deviation

[b] Percent

Table 9. Respondents' beliefs about water pollution and water resource protection

	N	Mean*	SD[a]	Strongly disagree[b]	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Excessive water runoff causes soil and nutrient loss.	294	1.35	0.84	1.7	1.4	9.9	34.7	52.4
Water pollution affects human health.	299	1.34	0.86	1.3	3.0	8.7	34.1	52.8
Water resources in Minnesota need better protection.	298	0.71	1.04	4.0	7.7	25.8	38.3	24.2
Laws to protect the environment limit my choices and personal freedom.	297	0.24	1.22	10.4	18.2	23.6	32.7	15.2
Water resources in the Lower Minnesota watershed are adequately protected.	299	0.16	1.10	9.4	17.7	28.8	36.1	8.0
Water resource protection will threaten jobs for people like me.	299	-0.19	1.09	16.1	15.1	48.2	13.4	7.4

Source: Your Perspectives on Local Water Resources: A Survey of Landowners in Lower Minnesota Watershed, Question 7

*Responses based on a 5-point scale from strongly disagree (-2) to strongly agree (+2)

[a] SD=Standard deviation

[b] Percent

Table 10. Respondents' beliefs about conservation practices

	N	Mean*	SD[a]	Strongly disagree[b]	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Drainage tiling increases crop yield.	296	1.51	0.79	0.7	1.7	9.5	22.3	65.9
Conservation practices protect aquatic life.	299	1.14	0.85	1.7	1.7	15.1	44.5	37.1
Conservation drainage management reduces water runoff from farmland.	299	1.03	0.96	3.0	3.7	15.1	43.5	34.8
Conservation practices contribute to quality of life in my community.	298	0.88	1.00	3.0	4.7	24.8	36.2	31.2
Drainage tiling contributes to higher water flows downstream.	300	0.62	1.32	11.0	10.3	16.3	30.7	31.7
Conservation tillage decreases crop yield.	298	-0.17	1.09	14.4	20.5	38.3	21.1	5.7

Source: Your Perspectives on Local Water Resources: A Survey of Landowners in Lower Minnesota Watershed, Question 7

*Responses based on a 5-point scale from strongly disagree (-2) to strongly agree (+2)

[a] SD=Standard deviation; [b] Percent

Table 11. Respondents' beliefs about responsibility for water resource protection

	N	Mean*	SD[a]	Strongly disagree[b]	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
It is my personal responsibility to make sure that what I do on the land doesn't contribute to water resource problems.	297	1.35	0.72	0.3	1.0	9.4	41.8	47.5
It is my personal responsibility to help protect water.	300	1.28	0.76	0.7	0.3	13.3	41.7	44.0
Landowners upstream should be responsible for protecting water downstream.	300	1.25	0.81	0.3	2.3	14.3	38.3	44.7
Farmers in my watershed should be responsible for protecting water.	300	1.22	0.80	1.0	1.7	12.0	44.7	40.7
Urban residents in my watershed should be responsible for protecting water.	299	1.05	1.00	4.3	2.7	13.4	43.1	36.5
Local government should be responsible for protecting water.	300	0.51	1.17	9.3	9.7	19.3	43.7	18.0
The state government should be responsible for protecting water.	299	0.23	1.24	14.0	12.0	23.7	37.1	13.0

Source: Your Perspectives on Local Water Resources: A Survey of Landowners in Lower Minnesota Watershed, Question 8

*Responses based on a 5-point scale from strongly disagree (-2) to strongly agree (+2)

[a] SD=Standard deviation

[b] Percent

Table 12. Respondents' perceptions about pollutants/issues in their watershed

	N	Mean*	SD[a]	Not a problem[b]	Slight problem	Moderate problem	Severe problem	Don't know
Nitrogen in surface water	188	2.56	0.95	8.4	22.9	19.9	12.1	36.7
Sediment (cloudiness)	224	2.56	0.90	9.1	26.9	27.6	11.8	24.6
Phosphorus	184	2.52	0.94	8.9	23.2	19.8	10.9	37.2
Flooding	251	2.51	0.95	12.4	31.5	25.5	14.8	15.8
Algae	204	2.48	1.02	15.0	18.7	23.5	12.2	30.6
Pesticides	204	2.41	1.03	16.1	20.5	19.8	12.1	31.5
Nitrogen in drinking water	180	2.22	1.05	19.3	18.0	14.6	9.2	39.0
E. coli (bacteria)	164	2.07	0.99	19.7	18.3	11.9	5.8	44.4
Drought	230	1.96	0.94	30.2	27.1	14.6	6.1	22.0

Source: Your Perspectives on Local Water Resources: A Survey of Landowners in Lower Minnesota Watershed, Question 9

*Responses based on a 4-point scale from not a problem (1) to severe problem (4);

[a] SD=Standard deviation

[b] Percent

Table 13. Respondents' perceptions about potential sources of water pollutants/issues in their watershed

	N	Mean*	SD[a]	Not a problem[b]	Slight problem	Moderate Problem	Severe problem	Don't know
Fertilizer management for lawn/turf care	246	2.88	0.99	9.7	17.1	29.2	26.5	17.4
Urban/suburban water runoff	245	2.74	0.97	10.8	19.9	32.0	19.9	17.5
Urban land development	244	2.62	0.99	13.8	20.2	31.6	16.5	17.8
Increased frequency or intensity of storms	243	2.52	0.92	12.7	24.4	33.1	11.0	18.7
Stream bank erosion	254	2.46	0.96	14.4	31.2	25.8	13.8	14.8
Soil erosion from farmland	263	2.44	0.92	13.1	36.6	25.5	13.1	11.7
Unregulated contaminants (e.g., pharmaceuticals, personal care products)	210	2.42	1.05	16.4	21.4	19.1	13.4	29.8
Fertilizer management for crop production	262	2.34	0.91	17.1	32.6	29.2	9.1	12.1
Industrial discharge to streams, rivers, and lakes	224	2.28	1.01	21.1	21.5	22.8	9.7	24.8
Improperly sized/maintained septic systems	224	2.26	0.94	18.0	28.1	22.0	7.8	24.1
Natural causes (e.g., natural erosion, wildlife)	247	2.19	0.86	19.5	32.6	26.2	4.7	17.1
Surface ditch drainage	255	2.19	0.90	19.6	38.5	19.9	8.1	13.9
Grass clippings and leaves entering storm drains	236	2.19	1.04	25.1	25.1	17.4	11.4	21.1
Livestock operations	260	2.15	0.95	26.0	30.7	23.3	7.8	12.2
Wind erosion	256	2.11	0.88	22.7	36.1	21.1	5.7	14.4
Tile drainage	262	2.08	1.03	32.7	26.3	18.9	10.4	11.8

Source: Your Perspectives on Local Water Resources: A Survey of Landowners in Lower Minnesota Watershed, Question 10

*Responses based on a 4-point scale from not a problem (1) to severe problem (4)

[a] SD=Standard deviation

[b] Percent

Table 14. Respondents' concern about the consequences of water pollution for the following

I am concerned about the consequences of water pollution for…	N	Mean*	SD[a]	Strongly disagree[b]	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Future generations	299	1.26	0.93	3.0	2.0	9.4	36.8	48.8
My or my family's health	299	1.09	1.00	4.0	2.7	13.4	39.8	40.1
People in my community	298	1.05	1.03	4.0	4.0	14.8	37.6	39.6
Aquatic life	299	0.99	1.09	5.4	2.7	19.1	33.1	39.8
Farmland	299	0.97	1.08	5.0	4.0	17.7	35.8	37.5
Wildlife	298	0.93	1.06	5.0	3.4	19.8	37.2	34.6

Source: Your Perspectives on Local Water Resources: A Survey of Landowners in Lower Minnesota Watershed, Question 11

*Responses based on a 5-point scale from strongly disagree (-2) to strongly agree (+2)

[a] SD=Standard deviation

[b] Percent

Table 15. Respondents' perceptions about their and their community's ability to protect water resources

	N	Mean*	SD[a]	Strongly disagree[b]	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
My use of a conservation practice contributes to healthy water resources.	299	1.17	0.75	0.3	1.0	15.7	47.2	35.8
I can learn almost anything about natural resource stewardship if I set my mind to it.	301	1.03	0.85	1.3	2.0	20.6	44.2	31.9
I have the knowledge and skills I need to use conservation practices on the land.	300	0.81	0.93	1.0	6.3	29.0	38.0	25.7
Farmers in my community have the ability to work together to change land use practices.	297	0.54	0.90	2.7	7.4	35.7	41.4	12.8
I have the financial resources I need to use conservation practices on the land.	299	0.04	1.16	12.0	19.7	29.1	30.1	9.0
My community has the leadership it needs to protect water resources.	300	-0.06	0.98	8.7	20.0	45.3	21.0	5.0
My community has the financial resources it needs to protect water resources.	300	-0.19	1.02	11.3	23.3	43.3	16.7	5.3
I have the equipment I need to adopt a new conservation practice.	296	-0.32	1.13	18.9	23.0	35.1	17.6	5.4
I do not have the time to use conservation practices	299	-0.40	0.93	14.0	27.4	45.8	10.4	2.3

Source: Your Perspectives on Local Water Resources: A Survey of Landowners in Lower Minnesota Watershed, Question 12

*Responses based on a 5-point scale from strongly disagree (-2) to strongly agree (+2)

[a] SD=Standard deviation

[b] Percent

Table 16. Respondents' feelings of a personal obligation

I feel a personal obligation to…	N	Mean*	SD[a]	Strongly disagree[b]	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Maintain my land/farm in a way that does not contribute to water resource problems	295	1.15	0.84	2.0	1.7	11.5	48.8	35.9
Do whatever I can to prevent water pollution	295	1.09	0.79	1.0	1.4	16.9	49.2	31.5
Use conservation practices on my land/property	295	1.02	0.81	0.3	2.4	22.4	44.7	30.2
Talk to others about conservation practices	294	0.50	0.85	2.7	5.1	41.8	39.8	10.5
Work with other community members to protect water resources	294	0.41	0.82	2.4	4.8	51.7	31.6	9.5
Attend meetings or public hearings about water	293	0.29	0.86	4.1	7.5	50.9	30.4	7.2

Source: Your Perspectives on Local Water Resources: A Survey of Landowners in Lower Minnesota Watershed, Question 20

*Responses based on a 5-point scale from strongly disagree (-2) to strongly agree (2)

[a] SD=Standard deviation

[b] Percent

Table 17. Respondents' beliefs about their level of influence over the following

	N	Mean*	SD[a]	Not at all[b]	Little	Some	A lot
Preserving farms and farmland in the area	298	1.77	0.89	10.7	21.5	48.0	19.8
Protecting clean water in the area	297	1.74	0.81	6.4	29.6	47.5	16.5
Inspiring or organizing others to take action in the community	297	1.42	0.82	13.8	37.4	41.8	7.1

Source: Your Perspectives on Local Water Resources: A Survey of Landowners in Lower Minnesota Watershed, Question 13

*Responses based on a 4-point scale from not at all (0) to a lot (3)

[a] SD=Standard deviation

[b] Percent

Table 18. Respondents' perceptions of control over farm/land management

	N	Mean*	SD[a]	Strongly disagree[b]	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
By taking an active part in conservation, people can keep water clean in Minnesota	300	1.22	0.79	1.0	1.3	12.7	44.3	40.7
If there is someone I want to meet in my community, I can usually arrange it.	298	1.02	0.88	1.0	4.0	19.5	42.6	32.9
The average farmer/landowner can have an influence on rural community life in the region.	299	0.79	1.07	5.4	7.0	17.1	44.5	26.1
It is difficult for us to have much control over policies that affect our farms/lands.	296	0.74	1.00	1.4	12.2	21.3	41.6	23.6
I can usually achieve what I want on my farm/land when I work hard for it.	296	0.66	0.83	0.7	8.1	28.7	49.7	12.8
Weather has a big impact on my decisions about conservation practices on the land.	300	0.63	1.01	4.0	6.0	34.0	35.0	21.0
There is nothing that we can do to keep the costs of farm/land management from going up.	298	0.36	1.07	5.0	16.4	30.5	33.9	14.1
By adapting farm/land management practices, people can become more resilient to changes in weather patterns.	296	0.36	0.90	3.4	11.1	38.9	38.9	7.8
I find it easy to play an important role in most group situations within my community.	300	0.31	0.91	3.0	11.0	48.0	27.7	10.3
The weather is so variable that it is difficult to make decisions on my farm/land.	298	-0.01	0.98	7.7	21.1	39.9	27.2	4.0
I can usually rely on weather forecasts to manage my farm/land.	297	-0.03	1.00	9.1	20.5	39.1	27.3	4.0
Most of what happens on my farm/land is beyond my control.	296	-0.35	1.09	14.9	33.8	26.7	20.6	4.1
When I need assistance with something on my farm/land, I often find it difficult to get others to help.	299	-0.44	1.20	25.1	22.4	30.1	16.4	6.0

Source: Your Perspectives on Local Water Resources: A Survey of Landowners in Lower Minnesota Watershed, Questions 4, 12, and 14

*Responses based on a 5-point scale from strongly disagree (-2) to strongly agree (+2)

[a] SD=Standard deviation

[b] Percent

Table 19. Respondents' current use and intentions for future use of conservation practices

	Current use of practice			Intentions to use practice in the future		
	N	Yes[a]	No	N	Yes	No
Drainage tiles	274	93.1	6.9	192	91.1	8.9
Minimizing use of fertilizers/pesticides on lawns and gardens	238	87.4	12.6	174	87.4	12.6
Protect wetlands on the land/property	207	74.9	25.1	156	75.0	25.0
Buffer/filter strip along streams and ditches or field edges	247	74.5	25.5	188	85.6	14.4
Follow a nutrient management plan on the farm	225	72.0	28.0	161	68.9	31.1
Plant trees as a windbreak on the land/property	247	63.6	36.4	179	59.8	40.2
Conservation tillage practices (e.g., no till, minimum till)	249	60.2	39.8	173	60.1	39.9
Native plants or shrubs in my yard	230	57.8	42.2	171	57.9	42.1
Drainage water management planning	208	53.4	46.6	165	58.2	41.8
Land in conservation cover (e.g., Conservation Reserve Program)	241	49.4	50.6	180	52.2	47.8
Conservation drainage management practices (e.g., controlled drainage, storage basins)	235	45.5	54.5	180	45.6	54.4
Cover crops	207	36.7	63.3	163	50.9	49.1
Vertical drop side inlets (adjacent to ditches)	198	33.3	66.7	152	32.2	67.8
Agriculture waste management facility or system	146	30.1	69.9	112	29.5	70.5
Terraces	220	28.2	71.8	165	27.3	72.7
Water and sediment control basins	209	25.8	74.2	167	29.9	70.1
Rain barrel or cistern to store water	212	19.8	80.2	157	23.6	76.4
Rotation grazing	129	19.4	80.6	103	23.3	76.7
Rain garden	192	6.3	93.8	145	5.5	94.5

Source: Your Perspectives on Local Water Resources: A Survey of Landowners in Lower Minnesota Watershed, Question 16

[a]Percent

Table 20. Respondents' views about factors that would enhance their use of conservation practices

I would be more likely to adopt new conservation practices or to continue to use practices if…	N	Mean*	SD[a]	Strongly disagree[b]	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I could get higher payments for adopting conservation practices.	295	0.79	1.01	3.4	4.4	29.8	34.9	27.5
Conservation program requirements were less complex.	294	0.76	0.98	2.7	4.4	33.7	32.7	26.5
I was compensated for lost crop production because of conservation practices.	295	0.74	1.08	5.1	4.7	30.2	31.2	28.8
I had access to financial resources to help me adopt conservation practices.	295	0.55	1.06	5.1	8.1	33.2	33.9	19.7
I had evidence that the conservation practice improved water resources.	293	0.53	0.91	3.1	6.5	37.9	39.2	13.3
I had evidence that conservation practices did not reduce crop yield.	295	0.52	0.91	2.4	5.8	46.1	29.5	16.3
Conservation programs were more flexible.	291	0.51	0.90	2.7	6.2	41.9	36.1	13.1
I could learn how to maintain conservation practices for soil conservation.	294	0.36	0.82	2.7	5.8	51.7	32.0	7.8
I knew more about how to implement and maintain conservation practices.	295	0.35	0.82	2.4	8.5	47.8	34.6	6.8
I could talk to other landowners or farmers who are using conservation practices.	291	0.34	0.82	3.4	6.2	49.1	35.4	5.8
I had help with the physical labor of implementing and maintaining conservation practices.	291	0.27	0.97	5.5	11.7	41.6	32.6	8.6
I could attend a workshop or field day on conservation practices.	294	0.27	0.96	6.1	8.8	46.3	29.9	8.8
I knew more about the wildlife benefits of conservation practices.	293	0.25	0.96	5.5	10.9	45.4	29.4	8.9
My neighbors maintained conservation practices.	293	0.21	0.96	5.8	11.3	48.1	25.9	8.9
A conservation assistance professional would visit my land to discuss conservation practice options.	291	0.13	1.09	10.3	10.7	45.7	22.0	11.3
I could be enrolled in a program that recognizes local conservation stewards.	293	0.09	0.99	8.2	11.9	51.2	20.1	8.5
There were regulations that mandated using a conservation practice.	294	-0.19	1.16	19.0	15.0	38.1	21.8	6.1

Source: Your Perspectives on Local Water Resources: A Survey of Landowners in Lower Minnesota Watershed, Question 17

*Responses based on a 5-point scale from strongly disagree (-2) to strongly agree (+2)

[a] SD=Standard deviation

[b] Percent

Table 21. Respondent's engagement in civic actions in the past 12 months

In the past 12 months how often have you…	N	Mean*	SD[a]	Never[b]	Every few months	Every month	Every two weeks	Weekly or more
Volunteered for community organizations or events?	292	0.88	1.10	49.0	27.4	16.1	2.1	5.5
Talked to others about conservation practices?	292	0.76	0.82	41.1	46.6	8.9	1.7	1.7
Heard about a water resource protection initiative?	292	0.72	0.92	51.0	33.6	10.3	3.1	2.1
Attended a meeting or public hearing about water?	293	0.36	0.57	67.6	30.0	1.7	0.3	0.3
Participated in a water resource protection initiative?	290	0.30	0.69	77.6	18.6	1.7	0.3	1.7
Worked with other community members to protect water?	289	0.27	0.58	78.2	18.3	2.8	0.0	0.7
Taken a leadership role around water resource conservation in the community?	293	0.11	0.47	93.2	4.1	2.0	0.0	0.7

Source: Your Perspectives on Local Water Resources: A Survey of Landowners in Lower Minnesota Watershed, Question 18

*Responses based on a 5-point scale from never (0) to weekly or more (4)

[a] SD=Standard deviation

[b] Percent

Table 22. Respondents' intentions to engage in civic actions in the next 12 months

In the past 12 months, I intend to…	N	Mean*	SD[a]	Most certainly not[b]	Probably not	Uncertain	Probably will	Most certainly will
Learn more about conservation practices	293	0.26	0.94	3.8	17.4	33.8	39.2	5.8
Talk to others about conservation practices	294	0.14	0.96	4.4	21.8	34.4	34.7	4.8
Attend a meeting or public hearing about water	295	0.04	0.98	5.8	23.4	36.9	28.5	5.4
Learn more about water resource issues in my watershed	294	0.01	0.95	5.4	24.1	38.8	27.2	4.4
Contact conservation assistance professionals (e.g. my soil and water conservation district or the Natural Resources Conservation Service) about water resource initiatives	293	-0.03	1.07	9.6	23.5	33.1	27.6	6.1
Work with other community members to protect water	295	-0.11	0.90	6.4	23.7	46.4	20.7	2.7

Source: Your Perspectives on Local Water Resources: A Survey of Landowners in Lower Minnesota Watershed, Question 19

*Responses based on a 5-point scale from most certainly not (-2) to most certainly will (2)

[a] SD=Standard deviation

[b] Percent

Table 23. Individuals or groups that influence respondents' decisions about conservation on their land

	N	Mean*	SD[a]	Not at all[b]	Slightly	Moderately	A lot	Don't know/not applicable
My family	279	2.79	1.01	11.9	24.4	29.8	28.5	5.4
Farmers	279	2.62	0.95	13.9	25.9	37.1	18.0	5.1
My county's Soil and Water Conservation District	275	2.58	0.92	12.1	32.1	34.5	16.2	5.2
My neighbors	276	2.45	0.95	17.7	29.4	34.5	12.6	5.8
The Farm Service Agency (USDA)	272	2.38	0.97	20.5	28.4	32.2	12.0	6.8
The MN Department of Agriculture	272	2.25	0.95	23.8	31.0	28.6	9.2	7.5
The National Resource Conservation Service (NRCS)	260	2.21	1.02	28.8	22.9	27.4	9.9	11.0
Other (e.g., news, articles)	25	2.16	1.31	15.4	5.1	2.6	9.0	67.9
The MN Department of Natural Resources	270	2.10	0.99	32.4	25.9	25.6	8.2	7.8
My agronomist/agricultural advisor	247	2.05	1.04	35.3	18.7	23.2	8.3	14.5
My local extension agent	261	2.03	0.97	32.9	29.1	19.5	7.9	10.6
The MN Pollution Control Agency	268	2.00	0.95	34.8	28.3	21.8	6.5	8.5
Environmental advocacy organizations	268	1.96	0.93	36.6	28.3	22.4	5.2	7.6
University researchers	267	1.91	0.91	37.5	29.7	18.8	5.1	8.9
My local co-op	261	1.85	0.92	40.3	27.0	17.1	4.8	10.9
Certified crop advisors (CCA)	253	1.81	0.96	43.0	22.2	15.4	5.8	13.7
Agricultural commodity associations (e.g., Minnesota Corn Growers Association)	252	1.77	0.89	42.8	24.3	15.8	3.4	13.7
My financial institution (e.g., financial advisor, loan officer, mortgage lender, etc.)	262	1.74	0.96	48.8	21.5	12.6	6.5	10.6
Seed/input dealer	254	1.73	0.91	46.1	22.2	14.0	4.4	13.3
My county's Farm Bureau	253	1.69	0.89	47.6	22.3	12.7	4.1	13.4
Farmer's Union	245	1.50	0.80	55.3	17.4	8.2	2.7	16.4

Source: Your Perspectives on Local Water Resources: A Survey of Landowners in Lower Minnesota Watershed, Question 21

*Responses based on a 4-point scale from not at all (1) to a lot (4)

[a] SD=Standard deviation

[b] Percent

Table 24. Respondents' most trusted sources of information

	N	Percent*
My county's Soil and Water Conservation District	93	30.6%
Farmers	67	22.0%
My family	59	19.4%
My neighbors	51	16.8%
The Farm Service Agency (USDA)	47	15.5%
The MN Department of Natural Resources	44	14.5%
The National Resource Conservation Service (NRCS)	38	12.5%
My local extension agent	38	12.5%
My agronomist/agricultural advisor	37	12.2%
The MN Department of Agriculture	35	11.5%
University researchers	34	11.2%
The MN Pollution Control Agency	31	10.2%
My county's Farm Bureau	27	8.9%
My local co-op	21	6.9%
Certified crop advisors (CCA)	19	6.3%
Agricultural commodity associations (e.g., Minnesota Corn Growers Association)	13	4.3%
Seed/input dealer	11	3.6%
Environmental advocacy organizations	10	3.3%
Other (e.g., news, renters, articles)	5	1.6%
Farmer's Union	3	0.9%
My financial institution (e.g., financial advisor, loan officer, mortgage lender, etc.)	1	0.3%

Source: Your Perspectives on Local Water Resources: A Survey of Landowners in Lower Minnesota Watershed, Question 22

*Percent of all survey respondents (N = 304); Respondents could give more than one response; Rank ordered by percent

Table 25. Respondents' perceived social norms of conservation action

	N	Mean*	SD[a]	Strongly disagree[b]	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
People who are important to me attend meetings or public hearings about water.	296	0.16	0.92	6.4	11.1	47.3	30.1	5.1
People who are important to me work with other community members to protect water.	295	0.16	0.92	6.4	9.5	51.5	26.4	6.1
People who are important to me talk to others about conservation practices.	296	0.11	0.86	5.4	11.1	54.4	24.7	4.4
People who are important to me expect me to work with other community members to protect water.	296	0.08	0.87	7.1	7.4	60.8	19.3	5.4
People who are important to me expect me to attend meetings or public hearings about water.	295	-0.01	0.95	9.8	11.9	52.2	22.0	4.1
People who are important to me expect me to talk to others about conservation practices.	296	-0.02	0.92	8.8	12.8	54.4	19.6	4.4

Source: Your Perspectives on Local Water Resources: A Survey of Landowners in Lower Minnesota Watershed, Question 15

*Responses based on a 5-point scale from strongly disagree (-2) to strongly agree (+2)

[a] SD=Standard deviation

[b] Percent

Appendix K: Survey Findings, Subgroup Comparisons

Subgroup comparisons: Levels of clean water action

Table 1. Number of respondents by adoption of clean water actions

Levels of clean water action[a]	n	Percent
Low action	142	53.2
High action	125	46.8
Total	267	100.0

Source: Your Perspectives on Local Water Resources: A Survey of Landowners in Lower Minnesota Watershed, Question 16

[a]Based on an index of survey questions 16a through 16o. High action = respondents who have used 7 or more of the 14 clean water actions, low action = respondents who have used 6 or fewer of the 14 clean water actions

Note: Only respondents who reported using their land for agricultural production (n = 267) are used for this analysis; drainage tiles (survey question 16e) is also removed from these analyses.

Table 2. Differences between high and low adopters of clean water actions in their beliefs about neighborhood qualities

Survey item[a]	Levels of clean water action[b]	n	Mean	SD	t[c]
Good relationships among neighbors	Low	138	1.22	1.18	2.593
	High	123	1.56	0.93	
Opportunities to be involved in community projects	Low	139	0.47	1.02	3.131
	High	124	0.85	0.93	
Opportunities to express my culture and traditions	Low	139	0.32	1.08	2.613
	High	124	0.66	1.05	
Clean streams, rivers and lakes	Low	139	1.12	1.14	2.929
	High	124	1.49	0.92	

[a]Items measured on a five-point scale from very unimportant (-2) to very important (+2)

[b]Based on an index of survey questions 16a through 16o. High action = respondents who have used 7 or more of the 14 clean water actions, low action = respondents who have used 6 or fewer of the 14 clean water actions

[c]T-test statistic for testing differences in means. Only items with statistical differences at a significance level of $p \leq 0.01$ reported here.

SD = Standard deviation

Table 3. Difference between high and low adopters of clean water actions in their familiarity with water issues, beliefs about water pollution and conservation practices, personal and social norms

Survey item	Levels of clean water action[c]	n	Mean	SD	t[d]
Familiarity with water issues[a]					
Familiarity with water issues in their watershed	Low	141	2.60	0.99	2.958
	High	123	2.92	0.75	
Beliefs about water pollution and conservation practices[b]					
Water pollution affects human health	Low	140	1.19	0.97	3.156
	High	124	1.52	0.64	
Conservation practices protect aquatic life	Low	141	0.94	0.95	3.317
	High	123	1.29	0.72	
Conservation practices contribute to quality of life in my community	Low	140	0.69	1.10	3.321
	High	124	1.08	0.85	
Conservation drainage management reduces water runoff from farmland	Low	141	0.87	1.01	2.665
	High	123	1.18	0.84	
Drainage tiling increases crop yield	Low	141	1.44	0.81	3.067
	High	122	1.71	0.60	
Personal norms[b] (I feel a personal obligation to…)					
Do whatever I can to prevent water pollution	Low	139	0.87	0.80	4.441
	High	122	1.28	0.67	
Maintain my land/farm in a way that <u>does not</u> contribute to water resource problems	Low	139	0.91	0.87	5.587
	High	122	1.43	0.59	
Talk to others about conservation practices	Low	139	0.32	0.80	4.120
	High	121	0.74	0.84	
Use conservation practices on my land/property	Low	138	0.71	0.77	7.047
	High	123	1.33	0.65	
Work with other community members to protect water resources	Low	139	0.24	0.75	3.743
	High	121	0.60	0.79	
Attend meetings or public hearings about water	Low	139	0.10	0.85	4.321
	High	120	0.54	0.79	
Social norms[b]					
People who are important to me expect me to attend meetings or public hearings about water	Low	138	-0.17	0.92	2.811
	High	124	0.15	0.96	
People who are important to me attend meetings or public hearings about water	Low	138	-0.01	0.90	3.248
	High	124	0.35	0.90	

[a]Item measured on a four-point scale from not at all familiar (1) to very familiar (4)
[b]Items measured on a five-point scale from strongly disagree (-2) to strongly agree (+2)
[c]Based on an index of survey questions 16a through 16o. High action = respondents who have used 7 or more of the 14 clean water actions, low action = respondents who have used 6 or fewer of the 14 clean water actions
[d]T-test statistic for testing differences in means. Only items with statistical differences at a significance level of $p \leq 0.01$ reported here
SD = Standard deviation

Table 4. Difference between high and low adopters of clean water actions in their perceived ability and motivations for practice adoption

Survey item	Levels of clean water action[b]	n	Mean	SD	t[c]
Perceived ability[a]					
My use of a conservation practice contributes to healthy water resources	Low	139	0.98	0.74	-3.736
	High	125	1.32	0.75	
By taking an active part in conservation, people can keep water clean in Minnesota	Low	140	1.04	0.82	-3.282
	High	125	1.35	0.74	
I have the knowledge and skills I need to use conservation practices on the land	Low	140	0.52	0.93	-5.215
	High	125	1.09	0.83	
I can learn almost anything about natural resource stewardship if I set my mind to it	Low	141	0.86	0.89	-3.032
	High	125	1.17	0.76	
Weather has a big impact on my decisions about conservation practices on the land	Low	141	0.46	0.99	-3.556
	High	124	0.90	0.99	
Motivators of practice adoption[a] (I would be more likely to adopt new conservation practices or continue to use practices if…)					
I had access to financial resources to help me adopt conservation practices	Low	137	0.34	1.04	-2.703
	High	123	0.69	1.08	
I could get higher payments for adopting conservation practices	Low	137	0.52	1.00	-4.264
	High	123	1.04	0.97	
I could learn how to maintain conservation practices for soil conservation	Low	137	0.22	0.71	-2.712
	High	122	0.48	0.86	
I was compensated for lost crop production because of conservation practices	Low	137	0.59	1.06	-3.052
	High	123	0.99	1.05	

[a]Items measured on a five-point scale from strongly disagree (-2) to strongly agree (+2)

[b]Based on an index of survey questions 16a through 16o. High action = respondents who have used 7 or more of the 14 clean water actions, low action = respondents who have used 6 or fewer of the 14 clean water actions

[c]T-test statistic for testing differences in means. Only items with statistical differences at a significance level of $p \leq 0.01$ reported here

SD = Standard deviation

Table 5. Differences between high and low adopters of clean water actions in their levels of civic engagement

Survey item[a]	Levels of clean water action[b]	n	Mean	SD	t[c]
Volunteered for community organizations or events?	Low	139	0.69	1.03	3.137
	High	119	1.12	1.16	
Participated in a water resource protection initiative?	Low	137	0.15	0.36	3.838
	High	120	0.45	0.82	
Worked with other community members to protect water?	Low	136	0.15	0.36	3.640
	High	120	0.37	0.59	
Talked to others about conservation practices?	Low	138	0.57	0.74	4.640
	High	121	1.02	0.80	
Attended a meeting or public hearing about water?	Low	139	0.27	0.51	2.941
	High	120	0.47	0.55	

[a]Items measured on a five-point scale from never (0) to weekly or more (4)
[b]Based on an index of survey questions 16a through 16o. High action = respondents who have used 7 or more of the 14 clean water actions, low action = respondents who have used 6 or fewer of the 14 clean water actions
[c]T-test statistic for testing differences in means. Only items with statistical differences at a significance level of $p \leq 0.01$ reported here.
SD = Standard deviation

Table 6. Differences between high and low adopters of clean water actions in the extent to which their conservation decisions are influenced by individuals or groups

Survey item[a]	Levels of clean water action[b]	n	Mean	SD	t[c]
My family	Low	130	2.49	1.02	4.537
	High	119	3.05	0.91	
Farmers	Low	131	2.49	0.97	3.115
	High	118	2.86	0.88	
My neighbors	Low	128	2.27	0.95	3.247
	High	119	2.66	0.93	
My county's Soil and Water Conservation District	Low	128	2.31	0.90	4.027
	High	118	2.77	0.88	
University researchers	Low	128	1.70	0.78	4.034
	High	114	2.16	0.97	
The MN Department of Natural Resources	Low	128	1.85	0.86	3.440
	High	113	2.27	1.05	
The MN Department of Agriculture	Low	127	2.06	0.87	3.050
	High	118	2.42	0.98	
The Farm Service Agency (USDA)	Low	127	2.12	0.91	4.251
	High	117	2.62	0.94	
The National Resource Conservation Service (NRCS)	Low	122	1.89	0.93	5.292
	High	112	2.55	1.00	
My local extension agent	Low	124	1.85	0.90	3.341
	High	112	2.26	0.99	
Certified crop advisors (CCA)	Low	119	1.63	0.85	3.797
	High	111	2.10	1.02	
My local co-op	Low	122	1.71	0.83	2.742
	High	116	2.03	0.98	
My agronomist/agricultural advisor	Low	115	1.74	0.94	5.381
	High	111	2.44	1.02	

[a]Items measured on a four-point scale from not at all (1) to a lot (4)

[b]Based on an index of survey questions 16a through 16o. High action = respondents who have used 7 or more of the 14 clean water actions, low action = respondents who have used 6 or fewer of the 14 clean water actions

[c]T-test statistic for testing differences in means. Only items with statistical differences at a significance level of $p \leq 0.01$ reported here.

SD = Standard deviation

Subgroup comparisons: Levels of civic engagement

Table 7. Number of respondents by levels of civic engagement

Levels of civic engagement[a]	N	Percent
Low	121	39.8
High	183	60.2
Total	304	100.0

Source: Your Perspectives on Local Water Resources: A Survey of Landowners in Nicollet County, Question 18
[a]Based on an index of survey questions 18a through 18g. High = respondents who have participated in 2 or more of the 7 community activities in the past 12 months, low = respondents who have participated in 1 or fewer of the 7 community activities in the past 12 months

Table 8. Difference between respondents with varying levels of civic engagement in their gender

Levels of civic engagement[a]	Gender[b]		χ^2
	Male	Female	
Low	33.2	53.6	7.780
High	66.8	46.4	
	100	100	

[a]Based on an index of survey questions 18a through 18g. High = respondents who have participated in 2 or more of the 7 community activities in the past 12 months, low = respondents who have participated in 1 or fewer of the 7 community activities in the past 12 months
[b]Percent
χ^2 Chi-square statistic for testing differences in proportions; $p \leq 0.01$

Table 9. Difference between respondents with varying levels of civic engagement in their perceived importance of the qualities of a community

Survey item[a]	Levels of civic engagement[b]	N	Mean	SD	t[c]
Opportunities to be involved in community projects	Low	119	0.47	1.05	2.656
	High	179	0.78	0.92	

[a]Items measured on a five-point scale from very unimportant (-2) to very important (+2)
[b]Based on an index of survey questions 18a through 18g. High = respondents who have participated in 2 or more of the 7 community activities in the past 12 months, low = respondents who have participated in 1 or fewer of the 7 community activities in the past 12 months
[c]T-test statistic for testing differences in means. Only items with statistical differences at a significance level of $p \leq 0.01$ reported here.
SD = Standard deviation

Table 10. Difference between respondents with varying levels of civic engagement in their familiarity with water issues, beliefs about practices, responsibility, perceived ability, perceived control, and perceived influence

Survey item	Levels of civic engagement[d]	n	Mean	SD	t[e]
Familiarity with water issues[a]					
Familiarity with water issues in their watershed	Low	119	2.34	0.92	6.167
	High	181	2.97	0.83	
Beliefs about practices[b]					
Drainage tiling increases crop yield	Low	117	1.32	0.85	3.479
	High	179	1.64	0.72	
Responsibility[b]					
It is my personal responsibility to help protect water	Low	1.04	0.83	1.04	4.530
	High	1.43	0.66	1.43	
It is my personal responsibility to make sure that what I do on the land doesn't contribute to water resource problems	Low	1.21	0.79	1.21	2.660
	High	1.44	0.66	1.44	
Perceived ability[b]					
My use of a conservation practice contributes to healthy water resources	Low	117	1.01	0.80	3.049
	High	182	1.27	0.69	
I have the knowledge and skills I need to use conservation practices on the land	Low	117	0.47	1.00	5.312
	High	183	1.03	0.80	
I have the financial resources I need to use conservation practices on the land	Low	117	-0.25	1.11	3.552
	High	182	0.23	1.15	
Perceived control[b]					
If there is someone I want to meet in my community, I can usually arrange it	Low	118	0.77	0.95	4.105
	High	180	1.19	0.80	
I find it easy to play an important role in most group situations within my community	Low	120	0.10	0.91	3.380
	High	180	0.46	0.88	
Most of what happens on my farm/land is beyond my control	Low	116	-0.13	1.11	-2.808
	High	180	-0.49	1.05	
Perceived influence[c]					
Protecting clean water in the area	Low	116	1.59	0.86	2.667
	High	181	1.84	0.76	
Inspiring or organizing others to take action in the community	Low	117	1.21	0.84	3.761
	High	180	1.56	0.77	

[a]Item measured on a four-point scale from not at all familiar (1) to very familiar (4)
[b]Items measured on a five-point scale from strongly disagree (-2) to strongly agree (+2)
[c]Items measured on a four-point scale from not at all (0) to a lot (3)
[d]Based on an index of survey questions 18a through 18g. High = respondents who have participated in 2 or more of the 7 community activities in the past 12 months, low = respondents who have participated in 1 or fewer of the 7 community activities in the past 12 months
[e]T-test statistic for testing differences in means. Only items with statistical differences at a significance level of $p \leq 0.01$ reported here
SD = Standard deviation

Table 11. Differences between respondents with varying levels of civic engagement in their personal and social norms

Survey item	Levels of civic engagement[b]	n	Mean	SD	t[c]
Personal norms[a] (I feel a personal obligation to…)					
Do whatever I can to prevent water pollution	Low	113	0.88	0.81	3.546
	High	182	1.21	0.75	
Maintain my land/farm in a way that does not contribute to water resource problems	Low	113	0.87	0.88	4.702
	High	182	1.32	0.76	
Talk to others about conservation practices	Low	112	0.26	0.77	3.947
	High	182	0.65	0.87	
Use conservation practices on my land/property	Low	113	0.81	0.80	3.678
	High	182	1.15	0.79	
Attend meetings or public hearings about water	Low	111	0.07	0.81	3.432
	High	182	0.42	0.87	
Social norms[a]					
People who are important to me expect me to talk to others about conservation practices	Low	115	-0.30	0.87	4.201
	High	181	0.15	0.92	
People who are important to me talk to others about conservation practices	Low	115	-0.11	0.85	3.713
	High	181	0.26	0.84	
People who are important to me expect me to attend meetings or public hearings about water	Low	115	-0.20	0.95	2.731
	High	180	0.11	0.93	
People who are important to me attend meetings or public hearings about water	Low	115	-0.11	0.91	4.213
	High	181	0.34	0.89	
People who are important to me expect me to work with other community members to protect water	Low	115	-0.14	0.86	3.582
	High	181	0.23	0.86	
People who are important to me work with other community members to protect water	Low	114	-0.05	0.91	3.260
	High	181	0.30	0.89	

[a]Items measured on a five-point scale from strongly disagree (-2) to strongly agree (+2)

[b]Based on an index of survey questions 18a through 18g. High = respondents who have participated in 2 or more of the 7 community activities in the past 12 months, low = respondents who have participated in 1 or fewer of the 7 community activities in the past 12 months

[c]T-test statistic for testing differences in means. Only items with statistical differences at a significance level of $p \leq 0.01$ reported here

SD = Standard deviation

Table 12. Difference between respondents with varying levels of civic engagement in the extent to which their conservation decisions are influenced by individuals or groups

Survey item[a]	Levels of civic engagement[b]	n	Mean	SD	t[c]
My county's Soil and Water Conservation District	Low	102	2.32	0.92	3.608
	High	173	2.73	0.88	
The Farm Service Agency (USDA)	Low	99	2.14	0.97	3.154
	High	173	2.52	0.94	
The National Resource Conservation Service (NRCS)	Low	94	1.94	1.00	3.295
	High	166	2.36	1.00	
Agricultural commodity associations (e.g., Minnesota Corn Growers Association)	Low	90	1.51	0.77	3.475
	High	162	1.91	0.92	
My agronomist/agricultural advisor	Low	90	1.76	0.99	3.487
	High	157	2.22	1.03	

[a]Items measured on a four-point scale from not at all (1) to a lot (4)

[b]Based on an index of survey questions 18a through 18g. High = respondents who have participated in 2 or more of the 7 community activities in the past 12 months, low = respondents who have participated in 1 or fewer of the 7 community activities in the past 12 months

[c]T-test statistic for testing differences in means. Only items with statistical differences at a significance level of $p \leq 0.01$ reported here

SD = Standard deviation