

AN EXPLORATION OF CONSERVATION DECISION MAKING BY FARMERS  
OF THE RED RIVER BASIN, MINNESOTA: THE ROLE OF VALUES,  
IDENTITY, AND PERCEIVED BEHAVIORAL CONTROL

A Thesis  
SUBMITTED TO THE FACULTY OF  
THE UNIVERSITY OF MINNESOTA  
BY

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IN PARTIAL FULFILLMENT OF THE REQUIREMENTS  
FOR THE DEGREE OF  
MASTER OF SCIENCE

Advisor: Mae. A. Davenport

December, 2014



## **Acknowledgements**

First and foremost, I would like to express my deepest and most sincere gratitude to my advisor Mae Davenport for her support and guidance throughout this project. As a mentor, colleague, and friend, she has pushed me past my comfort zone while honoring my skills and interests. I am a more focused and proficient student and researcher because of her guidance.

I would like to thank my committee members Kristen Nelson and Valentine Cadieux for committing their expertise and insight to the development of my work. It has been a true privilege to work with you. I am humbled by your dedication.

This work would absolutely not be possible without the cooperation and willingness of the research participants who invited me into their homes to share their lives. Thank you to the farmers and landowners of the Red River Basin.

A hearty thank you to my fellow graduate students and lab mates. It is invaluable to share experiences and learn from others doing the same work. A special thanks to Megan Cross, who I was thrilled to work with through the iterative writing process.

I would like to thank my parents, who fostered my appreciation for the natural environment. I would also like to thank my friends, both near and far, for accommodating my restricted social schedule and for being patient when I wanted to talk about school longer than they were interested listening.

Finally, there are not sufficient words to express my appreciation for the unfailing support of Travis Snider. More than anyone else, he has endured my ups and downs throughout the last two years, always encouraging me to strive for greater goals regardless of challenges and uncertainties, and reminding me to bring balance and perspective to my work. Because of him, I am more than I would have been.

## **Abstract**

This study explores the relationship between values, identity, and perceived behavioral control and their influence on agricultural conservation decision making. Twenty-four qualitative interviews were conducted with farmers and agricultural landowners in two Minnesota sub-watersheds of the Red River Basin. Study findings reveal participants hold values and identities consistent with natural resource conservation. However, they also perceive an inability to act in accordance with their values and identities. This research builds on other farmer behavior studies by investigating perceived control as a moderator of conservation behavior. A better understanding of farmer decision making will enable land managers, resource professionals, and policy makers to enhance conservation initiatives and interventions by addressing constraints to conservation action. Programs and policies more closely aligned with farmer values and identities and providing a greater sense of control will be better received by farmers and agricultural producers.

Keywords: Conservation behavior • Values • Perceived behavioral control • Agriculture • Identity

## Table of Contents

List of Tables.....	iv
List of Figures.....	v
CHAPTER 1: INTRODUCTION .....	1
CHAPTER 2: LITERATURE REVIEW .....	6
CHAPTER 3: STUDY METHODOLOGY .....	16
CHAPTER 4: STUCK: FARMER CONSERVATION DECISION MAKING AND PERCEIVED BEHAVIORAL CONTROL.....	29
CHAPTER 5: DISCUSSION .....	63
REFERENCES.....	71
APPENDICES .....	79
APPENDIX A: RED RIVER BASIN .....	80
APPENDIX B: MUSTINKA RIVER WATERSHED MAP.....	82
APPENDIX C: WILD RICE RIVER WATERSHED (SOUTH BRANCH) MAP.....	84
APPENDIX D: NETWORKING SCRIPT .....	86
APPENDIX E: INITIAL CONTACT SCRIPT.....	88
APPENDIX F: CONSENT FORM .....	92
APPENDIX G: STUDY INTERVIEW GUIDE.....	95
APPENDIX H: BACKGROUND INFORMATION SHEET .....	99
APPENDIX I: CONSERVATION PRACTICES CHECKLIST .....	100

## List of Tables

Table 1. Interview Participant Profile .....	21
Table 2. Interview participant property characteristics .....	22
Table 3. Interview participant farm size.....	22
Table 4. Interview participant reported adoption of best management practices .....	23
Table 5. Prominent Farmer Values .....	44
Table 6. Prominent Farmer Social Identities .....	47
Table 7. Perceived control themes .....	50
Table 8. Perceived behavioral control (PBC) themes and control classifications .....	58
Table 9. Potential behavioral outcomes related to farmer values .....	65
Table 10. Potential behavioral outcomes related to social identities .....	66

## List of Figures

Figure 1. Adapted from the Empowerment Process Model .....	12
Figure 2: Theory of Planned Behavior adapted from Ajzen, 1991 .....	13
Figure 3 Study conceptual framework (adapted from Ajzen, 1991).....	15
Figure 4. Data analysis process.....	25
Figure 5. Adapted from the Empowerment Process Model .....	36
Figure 6. Theory of Planned Behavior adapted from Ajzen, 1991 .....	37
Figure 7. TPB inclusive of values and social identity.....	39
Figure 8. Relationship between behavior outcomes and values/identities .....	57
Figure 9. Spheres of Control.....	58

## CHAPTER 1

### INTRODUCTION

Balancing agricultural production, the protection of natural resources, and implications for water quality and quantity is a challenge facing many policy makers, resource managers, and agricultural producers. In Minnesota, where water and agriculture are both fundamental to the state's heritage and modern day identity, this balance is a particularly wicked problem due to its complexity and the challenge of finding solutions satisfactory to those most concerned (Rittel & Webber, 1973). . . Minnesota is one of the leading agricultural economies in the nation, ranked fifth in total value of agricultural products sold (USDA, 2014). There are over 109,000 farm operators in Minnesota (USDA, 2014), as well as the headquarters of many national and international agro-business corporations (Runge, 2006). The number of farms has dropped in recent years while the average farm size has risen, as has the value of products sold and the amount of government payments. The average Minnesota farm has seen a 75% increase in the value of products sold and a 14% increase in payments received from the government since 2007 (USDA, 2014).

Water is also important in Minnesota. Much of the State's identity is built around water, "The Land of 10,000 Lakes," with recreation, tourism, commerce, transportation, and development all dependent on water resources. Estimating the economic impact of changes in water quality is complicated (Wiebe & Gollehon, 2006); however there is evidence that reduced water quality has negative consequences for state and local economies and quality of life for Minnesotans. Since the passage of the Clean Water Act in 1972, there have been improvements in water quality throughout the United States in regard to point source pollutants. However, non-point source pollution, primarily from



urban and agricultural sources, remains a significant contributor of pollution to water resources. A 2006 report by the United States Department of Agricultural Economic Research Service cites agricultural land uses as the leading source of impairments for lakes and rivers the United States, with concerns including sedimentation, excess nutrient and pesticide loading, pathogen transmission, and salinization. Central and southern Minnesota contain the headwaters of the Mississippi River Basin. Fifteen percent of nitrogen fertilizer and three percent of pesticides applied to farmland in the Basin end up in the Gulf of Mexico (Wiebe & Gollehon, 2006).

The Red River Basin of the north is a prime example of a region facing the many challenges of effectively managing both water and agricultural resources. The waters of the Red River Basin flow east from Saskatchewan, Canada through southern Manitoba and north from South Dakota, through Minnesota and North Dakota, eventually reaching the southern end of Lake Winnipeg. The Basin is flat, wide, and slow draining under natural conditions. It is also highly susceptible to flooding, with southerly spring melt accumulating behind frozen northern waters during seasonal snowmelt (Red River Basin Commission (RRBC), 2005). The basin is characterized by fine silt and clay soils, and as such is vulnerable to sedimentation from disturbed soils (Minnesota PCA, 2006). Nutrient pollution levels in the basin are largely dependent on adjacent land cover; however the U.S. portion of the river is estimated to contribute 30% of total nitrogen and 43% of total phosphorous occurring in Lake Winnipeg (Minnesota PCA, 2006). Agricultural uses dominate the local economy, but many of the environmental concerns of the Basin are attributed to agricultural land uses (RRBC, 2005).

There is a complex overlay of governmental management bodies across the three states and two provinces managing urban growth and other land uses in this watershed. Major population centers in the Red River Basin include Fargo, North Dakota; Grand

Forks, North Dakota; Crookston, Minnesota; and Winnipeg, Manitoba. The Red River Basin Commission was organized to facilitate a basin wide approach to management across political boundaries. A 2005 Natural Resources Framework Plan by the Basin Commission outlines the slate of challenges facing the natural resources of the area, in particular water resources, and the related impacts to the land and communities. The report also includes goals and suggested actions for addressing the challenges. The framework plan does not, however, address the decisions and actions of property owners. A better understanding of the motivations of decision making and behavior, especially those behaviors with negative environmental consequences, may help in future strategies and initiatives to address challenges.

Understanding the conservation motivations and decision making of farmers becomes increasingly complex due to the nature of farms and farming. A single farm may be composed of hundreds of acres, and between owned and rented land, a single farmer or land owner may have direct influence of thousands of acres. In short, the decisions of a single individual farmer or farmland owner could have significant impacts on the land and water. For example, in the Mustinka River Watershed, 793 individuals farm over 450,000 acres (NRCS, 2014).

Several studies have explored farmer behavior and decision making. According to Ahnstrom, et al. (2008), there are three approaches identified that influence agricultural producers' conservation decision making: regulations, incentives, and changing mindset. The regulation and incentive options (i.e. the carrots and sticks) are well represented in current interventions and programs. The author additionally asserts that farmers, however, generally identify as being independent, and may be reluctant to participate in regulatory or incentive programs with oversight that is perceived to be onerous. They may

not necessarily be opposed to conservation, but are opposed to the programs, “they balk at the form, not the content.” (Ahnstrom, et al. 2008, p. 44).

Incentive programs, the second of the three approaches identified by Ahnstrom, et al. (2008), also have limitations. Although funding for conservation programs has been rising since the 1980s, it is unclear that this trend will continue as local, state, and federal governments reexamine budgets (Osteen, Gottlieb, & Vasavada, 2012). This trend concerns policy experts who assert that as voluntary incentive based programs do not lead to an actual change in attitude towards environmental behaviors and that pro-environmental behaviors may end when voluntary programs end (Burton, Kuczera, & Schwarz, 2008). If conservation programs are cut as budgets contract, there may be a loss of conservation gains if participants have not shifted their attitude towards environmental issues. Ahnstrom, et al.’s (2008) third approach, changing mind set to promote pro-environmental or conservation behavior, could have promise as a way to advance existing efforts, but there is more to be learned about how to increase the effectiveness of efforts in agricultural contexts.

This study examines the behaviors and decision making of farmers in two sub-watersheds of the Red River Basin in Minnesota. Though there has been extensive biophysical research on the environmental impacts of agriculture, this has not been sufficient to fully address the challenges at hand. A better understanding of human decision-making and constraints to conservation action is needed. For this study, key informant interviews with farmers and agricultural landowners, and subsequent inductive data analysis, has revealed that values, social identities, and perceived behavioral control are particularly strong influences on conservation decision making in the Red River Basin of Minnesota.

Study data were gathered using qualitative approach. Researchers administered in-depth interviews with key informants, and used qualitative analysis procedures to capture prevalent themes, as well as divergent and convergent ideas related to the research focus. The overriding study goals were to assess drivers and constraints to conservation decision making and action among farmers and farm landowners in the study watersheds. Inductive data analysis framed the research questions of focus in this paper:

- 1) What core values and social identities are central to agricultural producers and their farm management decisions?
- 2) What role does perceived behavioral control play in the relationship between farmer core values, social identities, and conservation decision making and behavior?

This study contributes to the body of knowledge related to conservation behaviors and decision making generally and more specifically to an understanding of the constraints to conservation decisions occurring by agricultural producers, owners, and land managers. With this understanding, efforts to cultivate more pro-environmental behaviors may be more successful. The thesis is organized into four sections: a literature review, the study methodology, a results section, and a discussion. The results chapter is presented as a standalone manuscript intended for submission to publication to the *Journal of Agriculture and Human Values*.

## CHAPTER 2

### LITERATURE REVIEW

This literature review examines background and supporting scholarly work around conservation decision making and on significant themes and relationships between themes that emerged from inductive data analysis. The literature presented here provided a basis for interview question development and served to ground emergent and significant themes related to values, social identity, perceived behavioral control and conservation behavior.

#### *Theories of behavior and decision making*

A rational approach towards decision-making assumes that an individual's non-participation in environmental stewardship results from the individual's perception of the rewards of environmental stewardship as lower than the associated costs (Stern, Dietz, Black, 1986). Yet people still participate in pro-environmental behavior, suggesting that they can find participation in a conservation behavior satisfying, with no other tangible reward as long as there is sufficient internal satisfaction from participation. Building on the importance of personal satisfaction of participation in pro-environmental behavior, the role of personal values should not be under-estimated. The more a person cares about an issue the more predictable their behavior related to that issue will be (Eagly & Chaiken, 1993).

Research suggests that many farmers are motivated to participate in conservation initiatives, because they already believe it is the right thing to do. A positive affinity with nature can support pro-environmental behavior. A connection with nature can be cultivated through direct interactions with natural environments, as well as positive

discussions about nature. Research shows that efforts which were inclusive and multi-generational produced a particularly strong affinity with nature (Kals, Schumacher, & Montada, 1999). That said, the “right thing to do,” to a certain extent, is tied to opinions on what good stewardship of land is, and can be a source of tension (Ahnstrom, et al. 2008, Carr & Tait, 1990). For example, Burton (2012) notes that being a good farmer is associated with many farmers as having a “tidy” farm, whereas conservation oriented habitats are not always considered tidy. Additionally, he states that surveys of farmers and non-farmers shows a notable divide in preferred rural-landscape aesthetics, with the later opting for natural or semi-natural spaces and disliking industrialized agricultural areas.

#### *Role of values in decision making and behavior*

There is some variation among researchers as to the definition of values and the role values play in decision making and behavior. Bardi and Schwartz (2003) defined values simply as the conveyance of what is important to us. Other definitions include a behavioral perspective. For example, according to Rokeach (1973), a value is “an enduring belief that a specific mode of conduct or end-state of existence is personally or socially preferable” (p. 5). A behavioral component was also emphasized in Feather’s (1995) definition of values as a core set of general beliefs that motivate people to decide what should be done. Generally there is agreement that values have three primary characteristics: (1) values are placed on what an individual perceives as desirable, (2) values have an emotional component, and (3) values are associated with behaviors that reflect the value (Rokeach, 1973, pp. 5-7).

Newhouse (1990) attributes the formation of values primarily to life experiences, rather than intervention programs or specific educational efforts. However, the cause and

effect relationship between experience and value formation can be difficult to ascertain (Newhouse, 1990). For example, a farmer might protect wildlife habitat on her farmland because she has a strong stewardship ethic, or conversely has developed a strong stewardship ethic because of repeated exposure to wildlife on the farm. Once a value has been formed it is difficult to change. Individuals are much more resistant to influence on topics on which they have strongly formed values compared to topics on which they have weakly formed values (Eagly & Chaiken, 1993). Similarly, Eagly & Chaiken (1993) report subjects become increasingly committed to endeavors they associate as being linked with their personally held values, and they will become increasingly less likely to alter their position in circumstances where their values are threatened or challenged.

It is difficult to examine the role of values in behavior and decision making without also considering attitudes. Fishbein and Ajzen (2010) describe attitudes as the tendency of an individual to respond, either favorably or unfavorably, to an object. Some researchers differentiate between attitudes and values, citing values as the foundation from which attitudes are formed (Willock et al., 1999, Schultz & Zelezny, 1999, Schultz et al., 2005). Other researchers see values and attitudes as more similar; as different points on the same continuum. Eagly and Chaiken (1993) identify values as “attitudes toward relatively abstract goals or end states of human existence...” (p. 5). The authors continue to stress that while they do not necessarily distinguish between attitudes and values theoretically, they do find it important to distinguish between *abstract* values and *concrete* attitudes in certain instances.

Research has shown an individual farmer’s attitude towards a conservation practice is more predictive of participation in a conservation practice their knowledge, income level, and education level determines their likelihood of participating in a conservation behavior (Luzar & Diagne, 1999). A 2006 review of literature related to pro-

environmental behavior by Oreg and Katz-Gerro suggests attitudes are overwhelmingly determined to be a more important factor in the determination of behavior than individual characteristics such as demographics.

Many researchers focus on the relationship between behavior and attitudes more than the relationship between behavior and values. The link between attitudes and behavior is more direct than the link between values and behaviors (Schultz, Gouveia, Cameron, Tankha, Schmuck, & Franek, 2005). Additionally, while values serve as the foundation for attitudes, they seem to be more vulnerable to moderators (Schultz, et al., 2005). Values may be moderated by factors including specified attitude objects (Corraliza, 2000) and perceived behavioral control (Ajzen, 1991). Studies specifically on farmers' conservation behavior have found social cultural influences (Burton, 2004) and social norms (Atwell, 2009, Newhouse, 1990) are also moderating factors of values.

#### *Role of identity in decision making and behavior*

Researchers predominantly separate identity theory into two broad dimensions: the first focusing on the social aspects of identity, and the second focusing on the internal cognitive aspects of identity (Stryker & Burke, 2000). Social identity has been defined as the "degree to which people think of themselves and the group in similar terms and define themselves in terms of their group membership" (Tyler & Blader, 2003, pg. 356). The social structure and internal structure converge when influencing behavior, and the behavior, in turn, feeds back to influence the further formation of identity (Styker & Burke, 2000). The more an individual identifies as having a positive association with the environment, the more likely they are to engage in pro-environmental behaviors (Stets & Biga, 2003). Research by Hinds and Sparks (2008) suggests the more interaction an individual has with the natural environment, the more likely they are to have a strong



environmental identity. In their study of undergrad students in the UK, participants that grew up in a rural area had a significantly stronger connection to the natural environment compared to participants that grew up in an urban area.

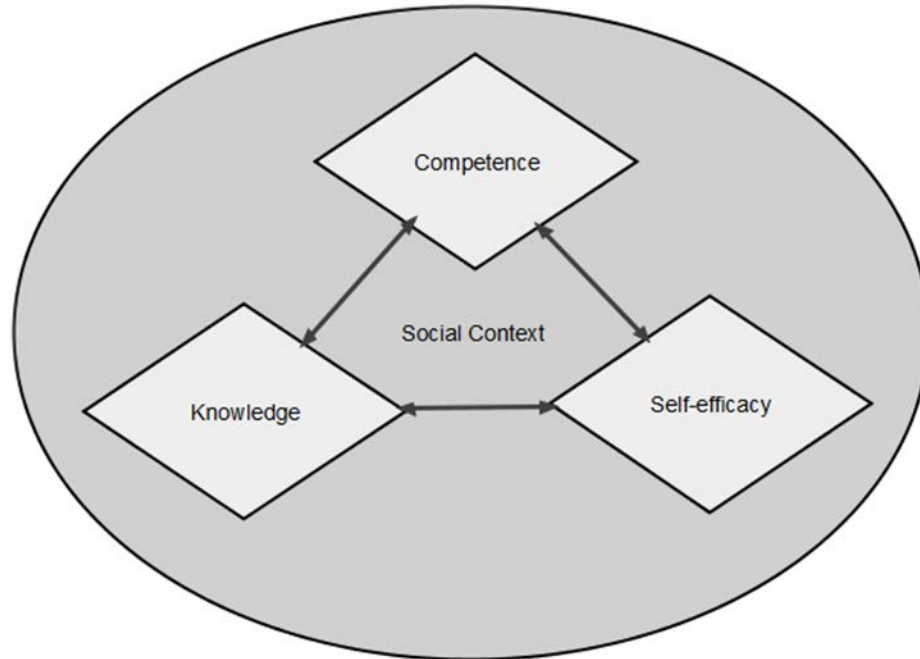
*Role of perceived behavioral control in decision making and behavior*

Several theoretical models prescribe importance to the role of control or ability to act upon intentions in decision making and behavior. Bandura (1990) suggests, "Among the mechanisms of agency, none is more central or pervasive than people's beliefs about their capabilities to exercise control over events that affect their lives. Self-beliefs of efficacy influence how people feel, think, and act." (p.128). Locus of control theories predict an individual will succeed in an endeavor to the extent they believe they are able to succeed, and not knowing the reason for a success or failure will undermine future motivation to act (Eccles & Wigfield, 2002). For example, farmers who believe a governmental regulation will not positively affect them, do not understand how the regulation was created, and/or do not feel regulators are considering their best interest will have a lower sense of perceived behavioral control.

Paulhus (1983) describes three primary spheres of control: personal efficacy, interpersonal control, and sociopolitical control. Personal efficacy is related to whether an individual perceives they are personally able to perform a task. Interpersonal control is related to whether an individual perceives they are able to influence people around them or alternatively the extent to which the individual perceives they are able to control the influence of others on them. Sociopolitical control is related to whether an individual perceives they are able to influence the social and political events around them or alternatively the extent to which the individual perceives they are able to control the influence of the social and political context on them. All three factors are important to

consider. For example, if one were interested in strategies to increase perceived control, it would not be enough to simply educate an individual as to what they could do personally given the social context of interpersonal and sociopolitical control. The Paulhus framework has been revisited since it was originally published, and while there have been shifts in the instrument scales, the basic three spheres of the framework remain supported in the literature (Paulhus & Van Selst, 1990, Spittal, Siegert, McClure, & Walkey, 2002).

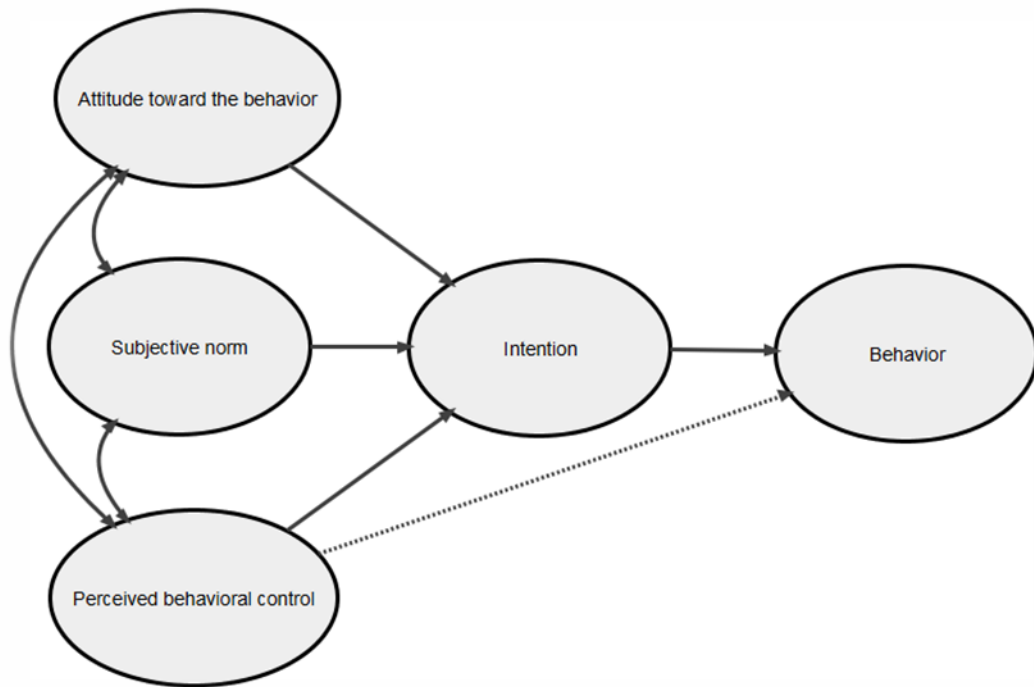
Cattaneo and Chapman's (2010) work on empowerment, specifically the development of an empowerment process model, may provide insight for considerations related to identity and PBC. The authors assert empowerment "encompasses a sense of personal control" (p. 646) and it is "an iterative process in which a person sets a personally meaningful goal, takes action towards that goal, and observes and reflects on the impact of that action" (p. 647). Their model for increasing empowerment rests on a foundational relationship between self-efficacy, knowledge, and competence within a social context (Figure 1).



**Figure 1. Adapted from the Empowerment Process Model (Cattaneo & Chapman, 2010).**

*Relationship between values, identity, and perceived behavioral control*

Fishbein and Ajzen's (1991) theory of planned behavior (TPB) identifies attitudes, social norms, and perceived behavioral control (PBC) as factors influencing behavior via intention (Figure 2). The TPB stresses the importance of PBC; noting it may function as a more direct influence on behavior than other factors. In short, it may not matter how someone wants to behave (i.e., attitude), or what they think others want them to do (i.e., subjective norm), if they don't feel like they have the ability to act.



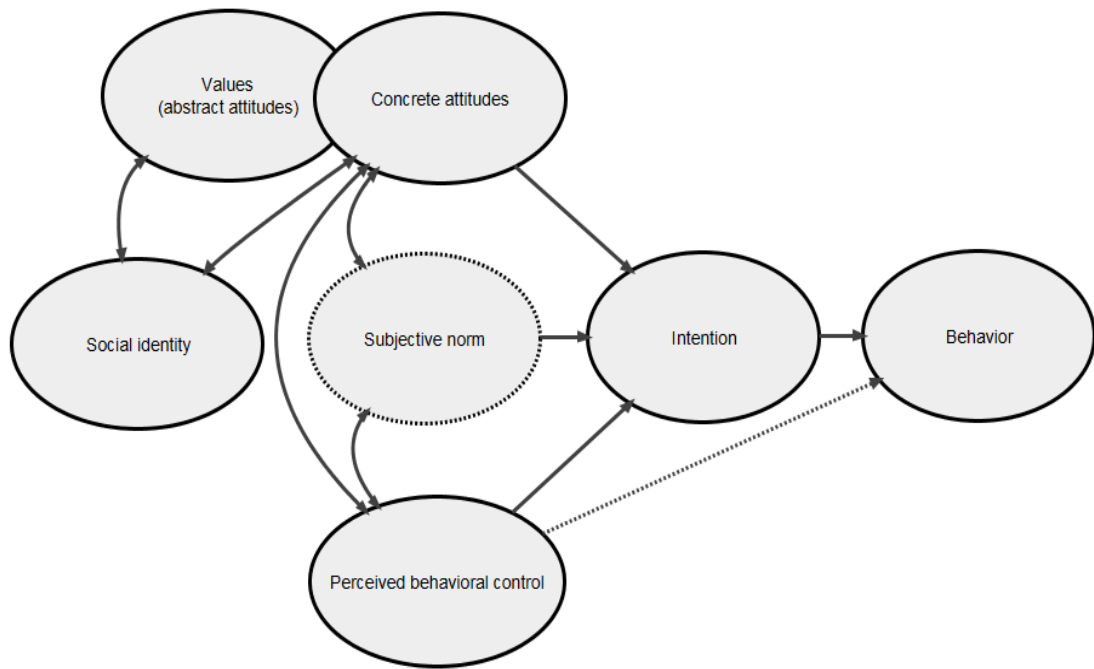
**Figure 2: Theory of Planned Behavior adapted from Ajzen, 1991**

The TPB is well supported as a theoretical framework; however, there has been rising interest in developing models to include other aspects that influence behavior and decision making (Fielding, McDonald, & Louis, 2008, & Eccles & Wigfield, 2002). For example, identity has been found to shape values, attitudes, and by extension, behavior (Tyler & Blader, 2003). Further, Stryker and Burke (2000) note identities are important contributors to the formation of values, and as an identity strengthens, so will the related value. These authors also posit in situations where an individual is uncertain regarding their ability to perform a task, they will draw upon both their social and cognitive identities as a reference in determining their potential success. In other words, in circumstances when an individual cannot sufficiently assess their perceived behavioral control, they will

reference their identity to decide if they are the type of person who should be able to perform the task. Identity, though, is not included in the Fishbein and Ajzen TPB model.

Values are not included in the TPB model, though values and attitudes are closely related, as values are considered abstract or core attitudes that help form more concrete or applied attitudes. Eccles and Wigfield (2002) show in their expectancy-value model that an individual will weigh both the relative value of an action and the perceived likelihood of success when deciding whether to act or not. Some research suggests PBC is a reliable predictor of pro-environmental behavior, but an individual must hold a positively associated value with the behavior in order to activate the action (Cleveland, Kalamas, & Laroche, 2005). Eagly and Chaiken (1993) describes that individuals may act upon an intention if they perceive control over the behavior under the TPB model. A more accurate representation might be that an individual will consider their control if they are otherwise motivated to act.

Through an iterative examination of existing literature and preliminary data analysis, a driving conceptual framework was developed that builds on the TPB and provides a thematic structure for further analysis. Specifically, values are included as underlying and foundational to attitudes, and identity is included as a contributor to the formation of attitudes and values. Subjective norms did not emerge as a significant driver or constraint to decision making and behavior in this study (Figure 3). The figure is not intended as a complete representation of the factors influencing behavior, but rather as a simplified blending of a more traditional TPB model and the aspects which emerged most strongly during analysis for this project.



**Figure 3 Study conceptual framework (adapted from Ajzen, 1991)**

Researchers have identified factors influential to farmer decision making, however, there is little research exploring the relationship between these factors. Conservation oriented social identity and values, via attitudes, can translate to conservation oriented behaviors, but are vulnerable to moderators such as perceived behavioral control. Evidence from this study suggests perceived control can be a significant barrier to farmers and in instances of low perceived control they may make decisions contrary to their values and social identities. A better understanding of these relationships could support the effective implementation of conservation programs and policies in an agricultural context.

## CHAPTER 3

### STUDY METHODOLOGY

#### Introduction

Data supporting this thesis were gathered as part of a broader multi-method social science assessment of conservation practices in the Red River Basin of Minnesota. The larger project was conducted in partnership with the University of Minnesota's Northwest Regional Sustainable Development Partnership and the Minnesota Department of Natural Resource. The project primarily sought to gain a better understanding of the drivers and constraints to adoption of conservation practices by agricultural producers and landowners in the Red River Basin of Minnesota. Interviews, reported on here, focus groups and a landowner survey were conducted. The project team also aimed to identify strategies for enhancing conservation action adoption. The results of the project have been made publically available (Pradhananga, Perry, and Davenport, 2014).

While many quantitative studies related to farmer behavior and decision making exist, there are fewer qualitative studies on the topic. Researchers and project partners deemed qualitative methods most appropriate for this study as researchers were interested in gleaning the type of deep data that can be acquired from interviews, rather than the more generalizable, but less in-depth, information that is typical of many quantitative approaches. Data for the study were collected using a multi-method qualitative approach. Researchers administered in-depth interview with key informants, and used qualitative analysis procedures to capture prevalent themes, as well as divergent and convergent ideas related to the research focus. Inductive data analysis framed the research questions of focus in this paper:

- 1) What core values and social identities are central to farmers and their farm management decisions?
- 2) What role does perceived behavioral control play in the relationship between farmer core values, social identities, and conservation decision making and behavior?

This chapter provides a detailed reporting on study design, instrument development, geographic location for the study, participants recruitment, and data analysis and management.

## Study Watersheds

### Red River Basin

This study was conducted in the Red River Basin, Minnesota. The Red River flows north in a wide, flat valley through Minnesota, South and North Dakota and into Lake Winnipeg in Manitoba, Canada (Appendix A). Two specific study watersheds were selected by project partners and the Project Advisory Team (PAT), a group of stakeholders, such as representative from soil and water conservation districts, watershed districts, and the natural resource conservation service, in the study area that provided input on study design and implementation and received updates on the project. The Mustinka River watershed and the South Branch of the Wild Rice watersheds (Appendix C) were selected by project partners and the PAT as representative of varying agricultural, geographic, and hydrologic conditions in the basin.

### Mustinka River Watershed

Mustinka River watershed drains 562,112 acres of land primarily used for agricultural purposes (86%), nearly all row cropping (Minnesota Pollution Control Agency,



2012). A 2013 report by the Minnesota Pollution Control Agency (MPCA) list the primary crops in the watershed as corn, soybeans, sugar beets, and small grains, and notes that while 97% of the area is privately owned, only 5% of land in the district is designated for residential land use (Dollinger, et al. 2013). Communities in the Mustinka watershed include: Elbow Lake, Graceville, Norcross, and Wheaton. Flooding and aquatic environment impairments are issues of primary concern due to a relatively flat topography, broad floodplains, and extensive landscape modifications to accommodate row cropping, such as ditching and stream channelization (Dollinger, et al. 2013). The same MPCA report documents extensive ditching and draining efforts that have occurred since agricultural activities began in the area to address the impacts on crop production of water retention on the land. These efforts have accelerated in recent years with estimates of well over 3000 miles of drain tile permitted since 2009, and resulting in significant alterations to the natural hydrological systems (Dollinger, et al. 2013).

#### Wild Rice Watershed

At approximately 2,080 square miles, the Wild Rice watershed is the third largest in the Red River Basin (Red River Watershed Management Board). Communities in the Wild Rice watershed include: Ada, Ulen, Twin Valley, and Mahomen. Portions of the White Earth Nation are also included in the watershed. Agricultural is the primary land use with over 60% of the acres in the area in agricultural production. The main resource concerns in the watershed are “erosion, nutrient management, wetland management, surface water quality, flood damage reduction, and wildlife habitat” (Minnesota Pollution Control Agency, 2011).

#### Instrument Development

An interview guide (Appendix G) was developed in collaboration with project managers and members of the Project Advisory Team (PAT) intended to gain to a better understanding of agricultural producer's motivations around conservation decision making and their understanding of conservation issues. The questions were modeled from previous similar research of the principal investigator, Mae Davenport, and adapted through an iterative review process with the PAT to assure questions were applicable for the local circumstances and the project objectives. During the interview the interviewer used a checklist of potential conservation practices (Appendix I) to guide the questions related specifically to the participants' knowledge and perceptions of these items.

#### Participant Recruitment

Local natural resource professionals in each of the two study watersheds (Appendix D) were contacted in order to develop an initial set of potential interviewees. Researchers initiated a snowball sampling process by collecting the list of potential interviewees from agency personnel and then asking participants for recommendations for additional individuals to interview. When recruiting participants, researchers aimed to reach a diverse group of farmers and agricultural landowners, including those farming different sized properties, with varied approaches and opinions towards conservation, and in a range of life-stages.

For the interview portion of the study individuals on the list were contacted using a standard script (Appendix E) to gauge their interest in participating in the study, and times were set for interviews with willing participants. A total of 64 individuals were contacted between the two study sub-watersheds to recruit the final participant group for 24 interview sessions. Potential interviewees were contacted by phone between one and three times. Phone messages were left either on machines or with a person depending. Participants would be contacted until there was a verbal refusal to participate or two

unreturned phone messages. In some cases, an additional call was made if the potential interviewee had been unsure about timing or availability. There were a total of 12 verbal refusals, the other 28 non-participants contacted either didn't answer the phone or didn't return messages.

The initial scope of the study called for 10 interviews in each sub-watershed, or a total of 20 interviews. The results of the snowball study methodology had resulted in a list of potential interviewees that were all male, and as a result, the first 10 interviews completed were with male interviewees. While gender had not been considered in the initial recruitment strategy, study researchers felt that it was important to make sure that female voices were included in the data to better represent a variety of perspectives on the issues. The study was modified to include at least two female participants in each set of sub-watershed interviewees. There had already been a complete set of 10 interviews done in one watershed so 2 additional interviews were added, plus 12 in the second watershed.

### Participant Profile

The 25 interview participants were asked a series of basic socio-demographic questions, as well as questions about their farms management and operations, and adoption of what have been deemed by scientists and resource professionals as agricultural best management practices (BMP). Interview participants represent diverse socio-demographic characteristics with varying farm sizes, ownership arrangements, level of BMP adoption, and income levels. Interview participants' age ranged from 28 to 80. A majority of the interviewees were males. However 2 female participants were interviewed in each sub-watershed. Most of the participants had lived in the community and had worked as a farmer for large portions, if not all, of their lives (Table 1). Additionally, most of the participants had a combination of owned and rented land that

they farmed and most earned more than 50% of their household income from the farming operation (Table 2). Farm operation sizes ranged from just over 200 acres to 6500 acres (Table 3). Conservation tillage and use of cover crops were the most frequently adopted BMPs, while practices more closely related to livestock ag waste management and rotational grazing, and terracing were least frequently adopted (Table 4).

**Table 1. Interview Participant Profile**

Socio-Demographic Characteristics		Mustinka River Watershed		Wild Rice River Watershed	
		N	Percent	N	Percent
Gender	Male	10	83	11	85
	Female	2	17	2	15
Age	Median	60	60	60	60
	Minimum	33	28	33	28
	Maximum	80	71	80	71
Years lived in community	Median	45	-	53	-
	Minimum	11	-	6	-
	Maximum	88	-	70	-
Years farming	Median	27	-	40	-
	Minimum	4	-	6	-
	Maximum	62	-	56	-
Formal education	Did not finish high school	0	0	0	0
	Completed high school	4	33	3	23
	Some college but no degree	2	17	6	46
	Associate or vocational degree	0	0	2	15
	College bachelor's degree	5	42	1	8
	Some college graduate work	0	0	0	0
	Completed graduate degree (MS or PhD)	1	8	1	8
Household income	Under \$34,999	0	0	0	0
	\$35,000-\$49,999	1	8	2	15
	\$50,000-\$74,999	3	25	1	7
	\$75,000- \$99,999	2	17	0	0
	\$100,000-\$149,999	3	25	5	39
	\$150,000 or more	3	25	5	39

**Table 2. Interview participant property characteristics**

Property Characteristics		Mustinka River watershed		Wild Rice River watershed	
		N	Percent	N	Percent
Percent income dependent on farming	0%	0	0	1	8
	1-25%	0	0	0	0
	26-50%	2	17	1	8
	More than 50%	10	83	11	84
Ownership arrangement	I own and manage my own land	0	0	2	15
	I rent my land <u>to</u> another party	0	0	3	23
	I rent my land <u>from</u> another party	0	0	1	8
	I own/manage and rent from another party	8	67	3	23
	I own/manage and rent to another party	3	25	4	31
	Other	1	8	0	0
Years farm has been in the family	Median	74	-	61	-
	Minimum	11	-	19	-
	Maximum	132	-	120	-
Distance farm is from home (miles)	Median	5	-	0	-
	Minimum	0	-	0	-
	Maximum	15	-	30	-

**Table 3. Interview participant farm size**

Property size	Mustinka River watershed			Wild Rice River watershed		
	N	Percent	Mean	N	Percent	Mean
Under 500 acres	8	67		4	31	
501-1000 acres	3	25	1,716	0	0	2,246
1001 or more acres	1	8		9	69	

**Table 4. Interview participant reported adoption of best management practices**

Best management Practice	Mustinka River watershed (N)	Wild Rice watershed (N)
Conservation cover	10	6
Conservation tillage	12	10
Buffer/filter strips	9	9
Terraces	1	0
Side water inlets	3	3
Water/sediment control basins	2	4
Drainage water management	3	3
Wetlands	4	5
Ag waste management	1	1
Rotational grazing	1	3
<b>Total</b>	<b>47</b>	<b>44</b>

#### Interview administration

Twenty-five semi-structured interviews were administered with individuals, 12 interview sessions in each watershed, with one session in the Wild Rice watershed having two participants. 10 interviews occurred in December of 2012 with the remaining in March and April of 2013. Participants were selected through a snowball sampling approach (Weiss, 1995) beginning with a list of potential participants from local resource professionals and building a progressively larger list through referrals from those individuals. This method was selected for the study to best find both male and female agricultural producers and/or land owners who represented a variety of ages with different farm sizes, adoption rates of BMPs, and attitudes towards conservation practices. Most of the interviews occurred in the individuals' homes, although some opted to meet at public establishments (bowling alley, senior center, or local coffee shop). Participants were offered \$50.00 as an incentive to participate and reimbursement for their time. Each individual signed a consent form prior to the start of the interview (Appendix F), and the interviewer emphasized that participation was voluntary and that

every reasonable effort would be made to make sure confidentiality was maintained. The interviewer also answered any questions the interviewee had prior to beginning the interview. After working through the questions in the guide, participants were asked to complete a participant background information sheet (Appendix H). This information was used to help understand the participating population more fully and will not be publically linked with the interview responses.

### Data Management and Analysis

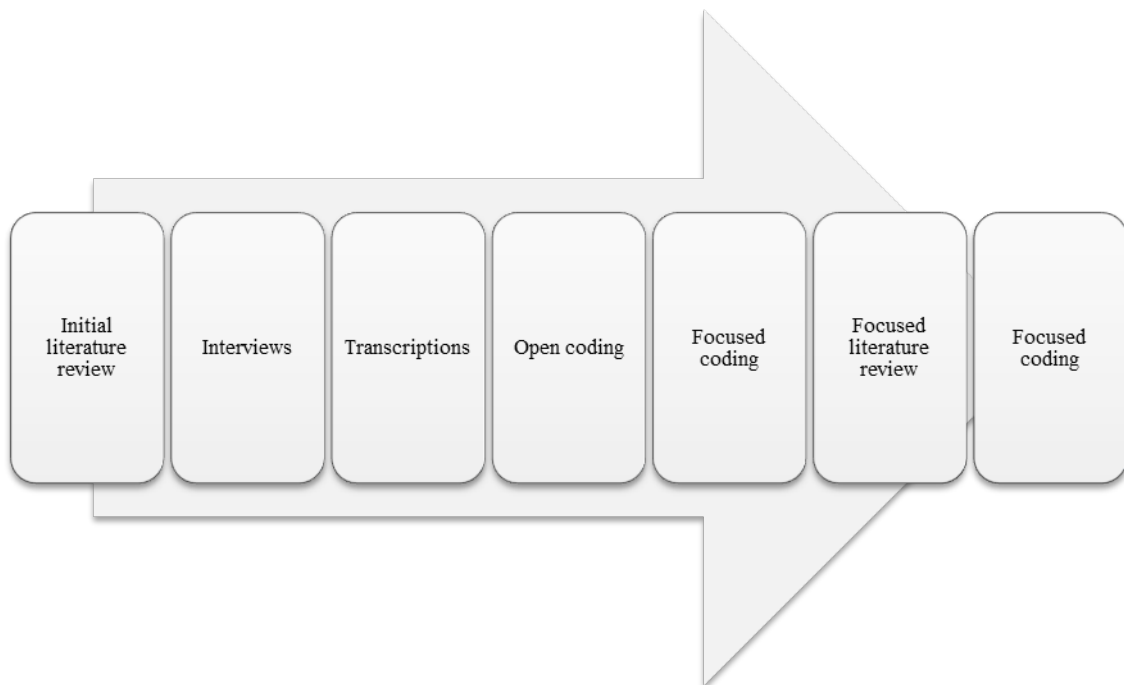
Qualitative data were analyzed both through focused coding aimed at addressing the project research questions as well as through a grounded theory approach. Analysis was performed using Nvivo software version 10 (NVivo, 2012) to manage the collection and analysis of the data. The coding schema development process included occasional checks for consistency and applicability from a team of researchers familiar with the study. Researchers used an adapted grounded theory approach to the coding and analysis of the data collected.

QRS International's Nvivo 10 software was used to manage the collection and analysis of the data. My coding schema development process will include occasional checks for consistency and applicability from other researchers familiar with the study. As in most open coding processes, analysis for this study moved from codes, to concepts, to categories, with every interview session fully transcribed and each line of the transcriptions analyzed. No identifying information was associated with quotes or materials made public from the interviews portions of the study. As suggested for qualitative analysis methods, initial emphasis was to employ an open analysis and then build more interpretive concept and categories (Strauss & Corbin, 1990). Through the open coding process a number of significant concepts and categories emerged that warranted further investigation by researchers. The data supporting this research were

gathered in part to address research questions related to drivers and constraints to the adoption of conservation practices by agricultural producers and landowners in the Red River Basin of Minnesota. Values, perceived control, and the impact of the federal farm bill program on conservation decision making were identified as some of these drivers and constraints. To refine and strengthen the analysis process, the open coding process was followed by revisiting the data and performing a focused coding with the themes of particular interest. All interviews transcriptions were recoded within the more narrow categories of

- The influence of values and identity of agricultural producers and land owners on conservation decision making
- The influence of perceived control of agricultural producers and land owners on conservation decision making

Researchers further coded primary themes into sub-themes and sub-sub-themes and theme tables were created to capture the information (Figure 4).



**Figure 4. Data analysis process**



## Study limitations

The goal of the study was not to statistically represent the opinions of the entire study watershed population or the perspectives of all the agricultural producers or landowners within the study communities. Thus, the perspectives of all residents or decision makers have not been captured. While not every value and belief system is represented in this study, a wide range and diverse set of opinions have been captured. Study participants have different backgrounds, experiences, and connections to community, farming practices, and water and were identified as being knowledgeable about community and/or having a diverse perspective on the use of water conservation best management practices on the farm. Importantly, this study documented the perspectives of members of traditionally underrepresented groups of stakeholders in water resource management—racial and ethnic minority groups. Again, researchers only spoke to a few experts within a few of these groups. While study findings may not be generalizable to all agricultural watershed populations, study findings provide important insight about community members and community engagement in similar sociocultural contexts and biophysical settings.

As with any study method there are certain limitations to the approach taken in this research. These include the potential for bias, the limitations and effects of snowball sampling, inconsistencies between interviewers and time of year for interviews, and the overall generalizability of the study. To a certain extent the best way to mitigate the effects of these limitations is to be mindful of them and to practice neutrality and honesty as well as one is able. The goals of the study, however, should also be remembered in order to best weigh the impact of the limitations.

One potential limitation is bias, which has the opportunity to occur at every step of the process. As Weiss (1995) describes, a researcher might tend to select people to interview they are more comfortable with, or give more positive responses to answers during interviews that they are more agreeable to, or focus on results that confirm their hypothesis during analysis. Knowing myself and my personal biases and tendencies will help lessen the effects of this. This limitation will be mitigated to a certain extent through the semi-structured nature of the interviews with a set of standardized questions adds. Further, interviewers and coders participating in the study, including myself, have been trained in qualitative research techniques, adding standardization to the methods.

In best circumstances it is difficult to control for outside influences in an interview setting. In the case of this study, the initial set of interviews were conducted by one interviewer and a second set a few months later by a different interviewer. The different influences between the interviews could be seen as a limitation, however, given that the data will be analyzed as one complete set and not as a compare/contrast between the two study areas, that the different influences might have added a complexity and richness to the data that might have been lacking had they been more standardized. For example, the interviewees (primarily male) might have communicated different themes to the initial male interviewer than they did to me as a female. The initial set of interviews occurred during end of year tax season versus the second set during early planting and flood season – one might speculate how these differences could lend a more complete picture given the shading of the time.

Participation in the qualitative portion of the study was limited to those who were referred to us and who were willing and able to take the time to do the interview. Snowball sampling will always underrepresent individuals with limited social networks and connections (Weiss, 1995) and individuals with strong positive or negative feelings

towards conservation issues may have been more likely to agree to participate. The sample used in this study cannot be considered a representative sample, although efforts were made to include a diversity of participants; both male and female participants of a variety of ages, incomes, farm types, and perspectives on conservation. Additionally, the study areas are small close knit communities. All participants partake voluntarily and their participation is kept completely confidential by the researchers, however the perception of friends, neighbors, and family being aware of participation could possibly affect results. This limitation may be mitigated through intentional assurances and actualization of confidentiality.

Although not necessarily a limitation of this research it is worth stressing that there is limited generalizability given the relatively small number of participants, the geographic scope, and the focus on individuals rather than communities. This is common amongst studies of this sort, most focus on the individual (Vinning & Ebreo, 2002) and is appropriate as the intent is not to draw generalizable conclusions, but to gather deep information sometimes inaccessible from other techniques, such as surveys, which can further understanding and support additional study.

## CHAPTER 4

### STUCK: FARMER CONSERVATION DECISION MAKING AND PERCEIVED BEHAVIORAL CONTROL

#### Abstract

This study explores the relationship between values, identity, and perceived behavioral control and their influence on agricultural conservation decision making. Twenty-four qualitative interviews were conducted with farmers and agricultural landowners in two Minnesota sub-watersheds of the Red River Basin. Study findings reveal participants hold values and identities consistent with natural resource conservation. However, they also perceive an inability to act in accordance with their values and identities. This research builds on other farmer behavior studies by investigating perceived control as a moderator of conservation behavior. A better understanding of farmer decision making will enable land managers, resource professionals, and policy makers to enhance conservation initiatives and interventions by addressing constraints to conservation action. Programs and policies more closely aligned with farmer values and identities and providing a greater sense of control, will be better received by farmers and agricultural producers.

Keywords: Conservation behavior • Values • Perceived behavioral control • Agriculture • Identity

#### Introduction

The balance between the production of agricultural products, the protection of natural resources, and implications for water quality and quantity are challenges facing many policy makers, resource managers, and agricultural producers. These are particularly wicked problems in Minnesota where water and agriculture are both

fundamental to the state's heritage and modern day identity. Minnesota is one of the leading agricultural economies in the nation, ranked fifth in total value of agricultural products sold (USDA, 2014). There are over 109,000 farm operators in Minnesota (USDA, 2014), as well as the headquarters of many national and international agribusiness corporations (Runge, 2006). The number of farms has dropped in recent years, however the average farm size has risen, as has the value of products sold and the amount of government payments. The average Minnesota farm has seen a 75% increase in the value of products sold and a 14% increase in payments received from the government since 2007 (USDA, 2014).

Water is also important in Minnesota. Much of the State's identity is built around water, "The Land of 10,000 Lakes", with recreation, tourism, commerce, transportation, and development all dependent on water resources. Estimating the economic impact of changes in water quality is complicated (Wiebe & Gollehon, 2006); however it can be assumed reduced water quality has negative consequences for state and local economies and quality of life for Minnesotans. Since the passage of the Clean Water Act in 1972, there have been improvements in water quality throughout the United States in regard to point source pollutants. However, non-point source pollution, primarily from urban and agricultural sources, remains a significant contributor of pollution to water resources. A 2006 report by the United States Department of Agricultural Economic Research Service cites agricultural land uses as the leading source of impairments for lakes and rivers the United States, with concerns including sedimentation, excess nutrient and pesticide loading, pathogen transmission, and salinization. Central and southern Minnesota are the headwaters of the Mississippi River Basin from which 15% of nitrogen fertilizer and 3% of pesticides applied to farmland in the end up in the Gulf of Mexico

(Wiebe & Gollehon, 2006). Northwestern Minnesota drains to Lake Winnipeg which was declared the world's most threatened lake in 2013 by Global Nature Fund.

The Red River Basin of the north is a prime example of a region facing the many challenges of effectively managing both water and agricultural resources. The waters of the Red River Basin flow east from Saskatchewan, Canada through southern Manitoba and north from South Dakota, through Minnesota and North Dakota, eventually reaching the southern end of Lake Winnipeg. The Basin is flat, wide, and slow draining under natural conditions. It is also highly susceptible to flooding, with southerly spring melt accumulating behind frozen northern waters during seasonal snowmelt (Red River Basin Commission (RRBC), 2005). The basin is characterized by fine silt and clay soils, and as such is vulnerable to sedimentation from disturbed soils (Minnesota PCA, 2006). Nutrient pollution levels in the basin are largely dependent on adjacent land cover; however the U.S. portion of the river is estimated to contribute 30% of total nitrogen and 43% of total phosphorous occurring in Lake Winnipeg (Minnesota PCA, 2006). Agricultural uses dominate the local economy, but many of the environmental concerns of the Basin are attributed to agricultural land uses (RRBC, 2005).

This study uses a social science approach to explore conservation. Specifically, the study examines the behaviors and decision making of farmers in two sub-watersheds of the Red River Basin in Minnesota. In order to meet the hydrologic, ecological, and climatic challenges created by human activities, it is important to not only know what is occurring on the landscape but also how people make decisions with important consequences. A single farm may be hundreds of acres, and between rented and owned land a single farmer may have direct influence on thousands of acres. For example, in the Mustinka River Watershed, 793 individuals farm over 450,000 acres: 97 of those individuals farm more than 1,000 acres each (NRCS, 2014).

Though there has been extensive biophysical research on the environmental impacts of agriculture, this has not been sufficient to fully address the challenges at hand. A better understanding of human decision-making and constraints to conservation action is needed. For this study, key informant interviews with farmers and agricultural landowners, and subsequent inductive data analysis, has revealed values, social identities, and perceived behavioral control are particularly strong influences on conservation decision making in the Red River Basin of Minnesota.

### *Role of values in decision making and behavior*

There is some variation among researchers as to the definition of values and the role values play in decision making and behavior. Bardi and Schwartz (2003) defined values simply as the conveyance of what is important to us. Other definitions include a behavioral perspective. For example, according to Rokeach (1973), a value is “an enduring belief that a specific mode of conduct or end-state of existence is personally or socially preferable” (p. 5). A behavioral component was also emphasized in Feather’s (1992) definition of values as a core set of general beliefs that motivate people to decide what should be done. Generally there is agreement that values have three primary characteristics: (1) values are placed on what an individual perceives as desirable, (2) values have an emotional component, and (3) values are associated with behaviors that reflect the value (Rokeach, 1973, pp. 5-7).

Newhouse (1990) attributes the formation of values primarily to life experiences, rather than intervention programs or specific educational efforts. However, the cause and effect relationship between experience and value formation can be difficult to ascertain (Newhouse, 1990). For example, a farmer might protect wildlife habitat on her farmland because she has a strong stewardship ethic, or conversely has developed a strong

stewardship ethic because of repeated exposure to wildlife on the farm. Once a value has been formed it is difficult to change. Individuals are much more resistant to influence on topics on which they have strongly formed values compared to topics on which they have weakly formed values (Eagly & Chaiken, 1993). Similarly, Eagly & Chaiken (1993) report subjects become increasingly committed to endeavors they associate as being linked with their personally held values, and they will become increasingly less likely to alter their position in circumstances where their values are threatened or challenged.

It is difficult to examine the role of values in behavior and decision making without also considering attitudes. Fishbein and Ajzen (2010) describe attitudes as the tendency of an individual to respond, either favorably or unfavorably, to an object. Some researchers differentiate between attitudes and values, citing values as the foundation from which attitudes are formed (Willock et al., 1999, Schultz & Zelezny, 1999, Schultz et al., 2005). Other researchers see values and attitudes as more similar; as different points on the same continuum. Eagly and Chaiken (1993) identify values as “attitudes toward relatively abstract goals or end states of human existence...” (p. 5). The authors continue to stress while they do not necessarily distinguish between attitudes and values theoretically, they do find it important to distinguish between *abstract* values and *concrete* attitudes in certain instances.

Research has shown an individual farmer’s attitude towards a conservation practice is more predictive of participation in a conservation practice their knowledge, income level, and education level determines their likelihood of participating in a conservation behavior (Luzar & Diagne, 1999). A 2006 review of literature related to pro-environmental behavior by Oreg and Katz-Gerro suggests attitudes are overwhelmingly determined to be a more important factor in the determination of behavior than individual characteristics such as demographics.



Many researchers focus on the relationship between behavior and attitudes more than the relationship between behavior and values. The link between attitudes and behavior is more direct than the link between values and behaviors (Schultz, Gouveia, Cameron, Tankha, Schmuck, & Franek, 2005). Additionally, while values serve as the foundation for attitudes, they seem to be more vulnerable to moderators (Schultz, et al., 2005). Values may be moderated by factors including specified attitude objects (Corraliza, 2000) and perceived behavioral control (Ajzen, 1991). Studies specifically on farmers' conservation behavior have found social cultural influences (Burton, 2004) and social norms (Atwell, 2009, Newhouse, 1990) are also moderating factors of values.

#### *Role of identity in decision making and behavior*

Researchers predominantly separate identity theory into two broad dimensions: the first focusing on the social aspects of identity and the second focusing on the internal cognitive aspects of identity (Stryker & Burke, 2000). Social identity can have been defined as the "degree to which people think of themselves and the group in similar terms and define themselves in terms of their group membership (Tyler & Blader, 2003, pg. 356). The social structure and internal structure converge when influencing behavior, and the behavior, in turn, feeds back to influence the further formation of identity (Stryker & Burke, 2000). The more an individual identifies as having a positive association with the environment, the more likely they are to engage in pro-environmental behaviors (Stets & Biga, 2003). Research by Hinds and Sparks (2008) suggests the more interaction an individual has with the natural environment, the more likely they are to have a strong environmental identity. In their study of undergrad students in the UK, participants that grew up in a rural area had a significantly stronger environmental identity compared to participants that grew up in an urban.

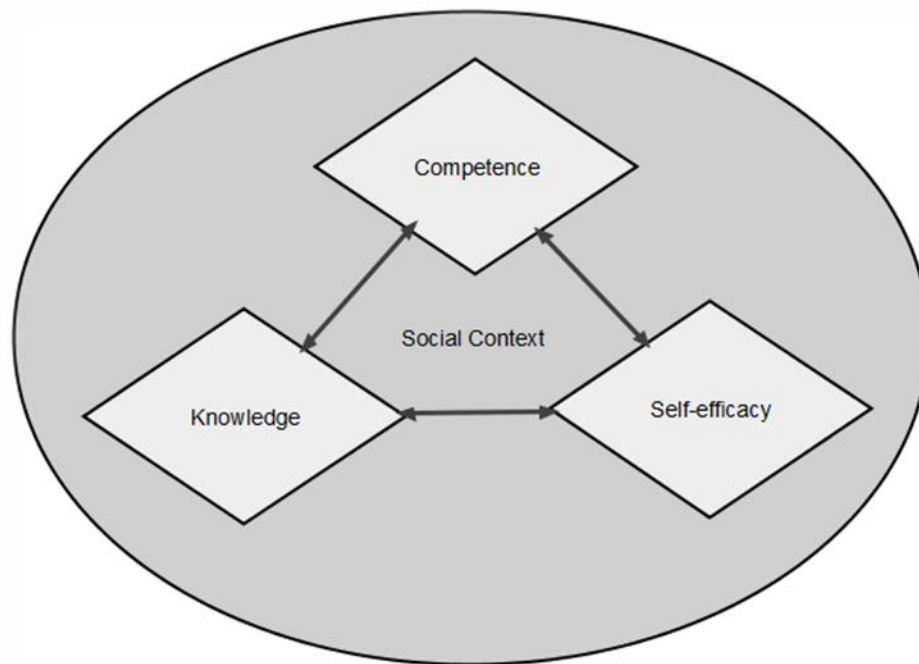
### *Role of perceived behavioral control in decision making and behavior*

Several theoretical models prescribe importance to the role of control or ability to act upon intentions in decision making and behavior. Bandura (1990) suggests, "Among the mechanisms of agency, none is more central or pervasive than people's beliefs about their capabilities to exercise control over events that affect their lives. Self-beliefs of efficacy influence how people feel, think, and act." (p.128). Locus of control theories predict an individual will succeed in an endeavor to the extent they believe they are able to succeed, and not knowing the reason for a success or failure will undermine future motivation to act (Eccles & Wigfield, 2002). For example, farmers who believe a governmental regulation will not positively effect them, do not understand how the regulation was created, and/or do not feel regulators are considering their best interest, will have a lower sense of perceived behavioral control.

Paulhus (1983) describes three primary spheres of control: personal efficacy, interpersonal control, and sociopolitical control. Personal efficacy is related to whether an individual perceives they are personally able to perform a task. Interpersonal control is related to whether an individual perceives they are able to influence people around them or alternatively the extent to which the individual perceives they are able to control the influence of others on them. Sociopolitical control is related to whether an individual perceives they are able to influence the social and political events around them or alternatively the extent to which the individual perceives they are able to control the influence of the social and political context on them. All three factors are important to consider. For example, if one were interested in strategies to increase perceived control, it would not be enough to simply educate an individual as to what they could do personally given the social context of interpersonal and sociopolitical control. The Paulhus framework has been revisited since it was originally published, and while there

have been shifts in the instrument scales, the basic three spheres of the framework remain supported in the literature (Paulhus & Van Selst, 1990, Spittal, Siegert, McClure, & Walkey, 2002).

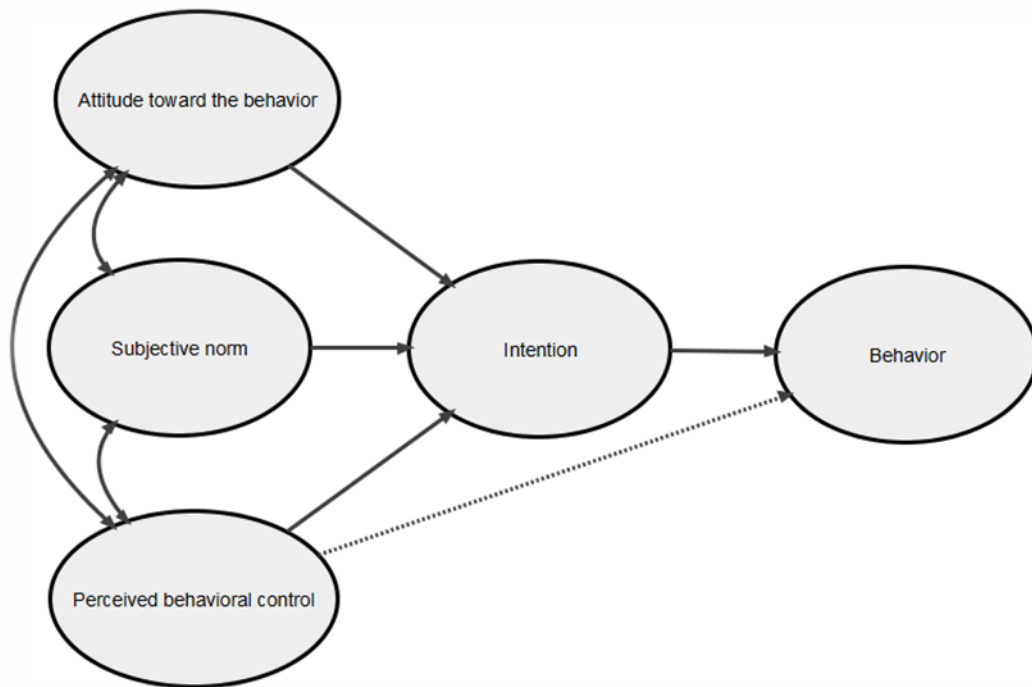
Cattaneo and Chapman's (2010) work on empowerment, specifically the development of an empowerment process model, may provide insight for considerations related to identity and PBC. The authors assert empowerment "encompasses a sense of personal control" (p. 646) and it is "an iterative process in which a person sets a personally meaningful goal, takes action towards that goal, and observes and reflects on the impact of that action" (p. 647). Their model for increasing empowerment rests on a foundational relationship between self-efficacy, knowledge, and competence within a social context (Figure 5).



**Figure 5. Adapted from the Empowerment Process Model (Cattaneo & Chapman, 2010).**

*Relationship between values, identity, and perceived behavioral control*

Fishbein and Ajzen's (1991) theory of planned behavior (TPB) identifies attitudes, social norms, and perceived behavioral control (PBC) as factors influencing behavior via intention (Figure 6). The TPB stresses the impotence of PBC; noting it may function as a more direct influence on behavior than other factors. In short, it may not matter how someone wants to behave (i.e., attitude), or what they think others want them to do (i.e., subjective norm), if they don't feel like they have the ability to act.



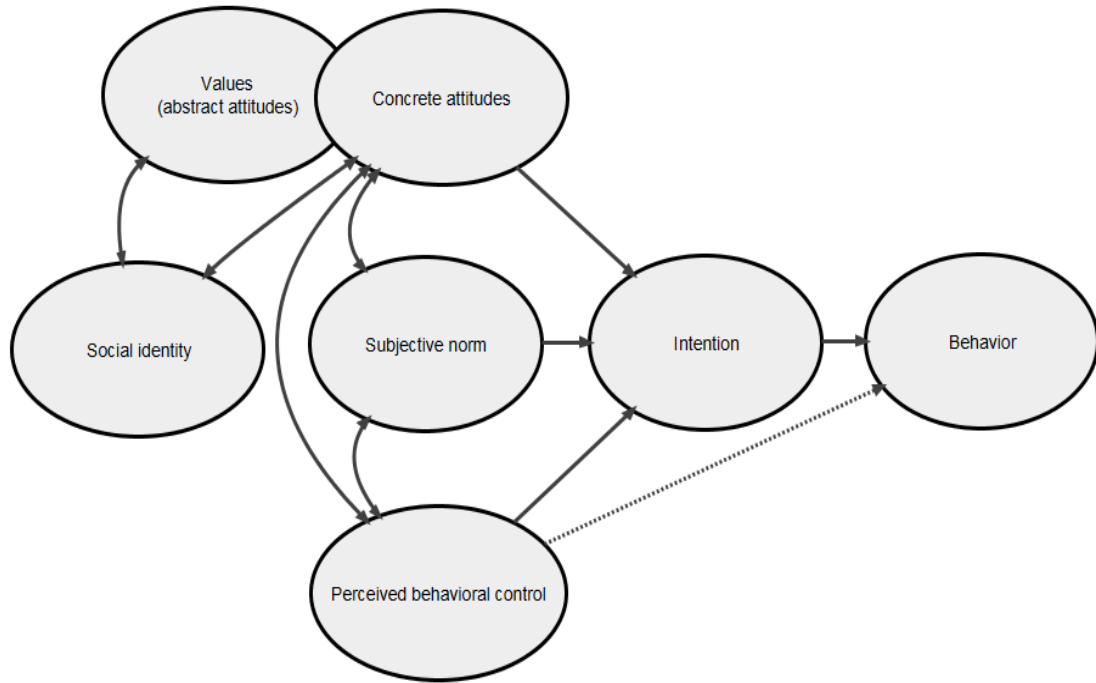
**Figure 6. Theory of Planned Behavior adapted from Ajzen, 1991**

The TPB is well supported as a theoretical framework however, there has been rising interest in developing models to include other aspects that influence behavior and decision making (Fielding, McDonald, & Louis, 2008, & Eccles & Wigfield, 2002). For example, identity has been found to shape values, attitudes, and by extension, behavior

(Tyler & Blader, 2003). Further, Stryker and Burke (2000) note identities are important contributors to the formation of values, and as an identity strengthens, so will the related value. These authors also posit in situations where an individual is uncertain regarding their ability to perform a task, they will draw upon both their social and cognitive identities as a reference in determining their potential success. In other words, in circumstances when an individual cannot sufficiently assess their perceived behavioral control, they will reference their identity to decide if they are the type of person who should be able to perform the task. Identity, though, is not included in the Fishbein and Ajzen TPB model.

Similarly, values are not included in the TPB model. As discussed above, values and attitudes are closely related as values are considered abstract or core attitudes help form more concrete or applied attitudes. Eccles and Wigfield state in their expectancy-value model that an individual will weigh both the relative value of an action and the perceived likelihood of success when deciding whether to act or not (Eccles & Wigfield, 2002). Some research suggests PBC is the only reliable predictor of pro-environmental behavior, but an individual must hold a positively associated value with the behavior in order to activate the action (Cleveland, Kalamas, & Laroche, 2005). Eagly and Chaiken (1993) describes that individuals may act upon an intention if they perceive control over the behavior under the TPB model. A more accurate representation would be people consider control if they are otherwise motivated to act.

For purposes of this study, researchers considered a modified, integrated model that builds on the TPB to include other important aspects that emerged in the study. Specifically, values are included as underlying and foundational to attitudes, and identity is included as a contributor to the formation of attitudes and values. Subjective norms did not emerge as significant in the data for this study and therefore have not been given further in-depth consideration (Figure 7).



**Figure 7. TPB inclusive of values and social identity**

### *Conclusion*

Agriculture is a vital component of our modern society; however it can have significant effects on natural resources. While there have been substantial efforts to address the impacts of agriculture on water resources, and many gains in this area, there are still concerns. Researchers have identified factors influential to farmer decision making, however, there is little research exploring the relationship between these factors. Conservation oriented social identity and values, via attitudes, can translate to conservation oriented behaviors, but are vulnerable to moderators such as perceived behavioral control. Evidence from this study suggests perceived control can be a significant barrier to farmers and in instances of low perceived control they may make decisions contrary to their values and social identities. A better understanding of these

relationships could support the effective implementation of conservation programs and policies in an agricultural context.

### **Materials and Methods**

Data were gathered using a multi-method qualitative approach. Researchers administered in-depth interviews with key informants, and used qualitative analysis procedures to capture prevalent themes, as well as divergent and convergent ideas related to the research focus. The overriding study goals were to assess drivers and constraints to conservation decision making and action among farmers and farm landowners in the study watersheds. Inductive data analysis framed the research questions of focus in this paper:

- 1) What core values and social identities are central to farmers and their farm management decisions?
- 2) What role does perceived behavioral control play in the relationship between farmer core values, social identities, and conservation decision making and behavior?

### *Study Area*

#### Red River Basin

This study was conducted in the Red River Basin, Minnesota. Two specific study watersheds were selected by project partners and the Project Advisory Team (PAT), a group of stakeholders in the study area who provided input on study design and implementation and received updates on the project. The Mustinka River watershed and

the South Branch of the Wild Rice watersheds were selected as representative of varying agricultural, geographic, and hydrologic conditions in the basin.

#### Mustinka River Watershed

The Mustinka River watershed drains 562,112 acres of land primarily used for agricultural purposes (86%), nearly all row cropping (Minnesota Pollution Control Agency, 2012). A 2013 report by the Minnesota Pollution Control Agency (MPCA) list the primary crops in the watershed as corn, soybeans, sugar beets, and small grains, and notes while 97% of the area is privately owned, only 5% of land in the district is designated for residential land use (Dollinger, et al. 2013). Communities in the Mustinka watershed include: Elbow Lake, Graceville, Norcross, and Wheaton. Flooding and aquatic environment impairments are issues of primary concern because of the relatively flat topography, broad floodplains, and extensive landscape modifications to accommodate row cropping, such as ditching and stream channelization (Dollinger, et al. 2013). The same MPCA report documents extensive ditching and draining efforts have occurred since agricultural activities began in the area to address the impacts on crop production of water retention on the land. These efforts have accelerated in recent years with estimates of well over 3000 miles of drain tile permitted since 2009, and resulting in significant alterations to the natural hydrological systems (Dollinger, et al. 2013).

#### Wild Rice Watershed

At approximately 2,080 square miles, the Wild Rice watershed is the third largest in the Red River Basin (Red River Watershed Management Board). Communities in the Wild Rice watershed include: Ada, Ulen, Twin Valley, and Mahomen. Portions of the White Earth Nation are also included in the watershed. Agricultural is the primary land use with over 60% of the acres in the area in agricultural production. The main resource



concerns in the watershed are “erosion, nutrient management, wetland management, surface water quality, flood damage reduction, and wildlife habitat” (Minnesota Pollution Control Agency, 2011).

### *Study design and sample profile*

An interview guide was developed to explore farmer values and assess drivers and constraints to conservation decision making. Participants also asked for specific beliefs, attitudes and behaviors associated with 10 agricultural conservation practices developed in consultation with the PAT. Participants were also asked to provide basic sociodemographic and landownership and management information.

Local natural resource professionals in each of the two study watersheds were consulted to develop an initial pool of prospective participants. Since one goal was maximum variation in the sample, participants were identified and recruited with varying farm sizes, conservation actions, and engagement in watershed decision making processes. Researchers then initiated a network referral process by asking participants to recommend other farmers with different backgrounds or perspectives. Participation in interviews was voluntary and participant identities remained confidential. Participants were offered \$50.00 as an incentive and reimbursement for their time.

A total of 64 individuals were contacted between the two study sub-watersheds to recruit the final participant group for 24 interview sessions with 25 total participants (one interviewee asked a friend join the session). Interview participants represent wide-ranging socio-demographic characteristics with varying farm sizes, ownership arrangements, and levels of conservation practice adoption. Participants' age ranged from 28 to 80. Two female agricultural producers were interviewed in each subwatershed. Most of the participants had lived in the community and had worked as a farmer for most,

if not all, of their lives. Most participants had a combination of owned and rented farmland and most earned more than 50% of their household income from the farming operation. Farm operation sizes ranged from just over 200 acres to 6500 acres. Conservation tillage and use of cover crops were the most frequently reported conservation practices. 22 of 24 participants reported using one or both of those practices.

#### *Data collection, management and analysis*

Twenty-five semi-structured interviews were conducted in December 2012 through April 2013. Interviews lasted from 45 minutes to two hours. Most interviews were conducted at the home or on-farm office of the interviewee, however some interviewees requested interviews be held at public locations such as coffee shops, restaurants, or bowling alleys. Qualitative data were analyzed first through open coding consistent with a grounded theory approach (Charmez, 2008) and then through focused coding aimed at addressing the emergent research questions. Coding and code organization was performed using QRS International's Nvivo 10 software. The coding schema development process included periodic checks for consistency and applicability across a team of researchers familiar with the study.

### **Results**

The preservation of the land and resources were viewed as important to interviewees, however, participants did not perceive control over their decision making and the ability to act in accordance with their values and identities in many cases. That said, there are notable exceptions which should be considered. These results are summarized and data supporting findings are presented.

#### *Farmer values*

In order to elicit discussion on values interviewees were asked to describe what their farm means to them, how they define conservation, and what where the most important decision making factors for them on the farm. Two primary value categories, each with multiple themes and descriptors, emerged in data analysis (Table 5). Prominent values including natural resource stewardship and independence appeared to be guiding principles in farm management.

**Table 5. Prominent Farmer Values**

<b>Value Orientations</b>	<b>Value Expressions</b>	<b>Descriptors</b>
<b>Natural Resource Stewardship</b>	Careful use and maintenance of farm-essential natural resources	Soil, land
		Water
		Air
	Taking extra initiative to conserve other natural resources	Wildlife Trees
<b>Independence</b>	Autonomy in decision making and action	Government control and regulation
	Responsibility for impacts	Urban/rural and upstream/downstream resource management
	Applying local knowledge	Integration into resource management

Natural resource stewardship values were expressed in terms related to soil preservation and water resource protection sustained use and yield on the farm. One interviewee expressed a common sentiment among participants: “If that topsoil runs away [a farmer’s] kids [are] not going to be able to grow a crop or make money growing a crop.” Many interviewees see the need to adopt practices which minimized soil erosion from both wind and water. They were significantly more likely to state they had adopted, or would consider adoption of, practices that minimized soil loss over practices with other primary conservation benefits. For example, when asked how they define conservation, a participant responded,

I would say conservation is just making sure the soil and the air and the water are maintained so they are sustainable...I think farmers are good stewards, because if we don't have the soil, we don't have the water, we don't have the things we need to farm, we are going to go out of business. Making sure that the resources are there for the long term is important to us.

Study participants also mentioned wishing to be able to incorporate a greater diversity of land uses for the conservation of non-essential, but desirable natural resources, such as tree-lines and habitat for wildlife. For example, one interviewee acknowledged, "In a way I'd like to see it not be quite so wide open with every little tree dozed out in the middle of the fields. I guess I'd like to see tree lines back on land again." Another participant stated, "I believe in a live and let live kind of thing. If there's a slough there, why not make it better for the wildlife and better for the land."

Independence was an important value to participants. When asked what they like about being a farmer, nearly all participants described attributes related to "independence" specifically, or some near variation on the theme including, "being my own boss," "not having someone else make decisions for me," and "freedom." For example, when asked what they liked most about farming, this participant responded, "Independence...both on the business side and probably on the leisure side too. You know it's nice to be able to call your own shots. You do a decent job; see your rewards or benefits. That's probably the biggest thing."

Many participants describe the importance of being responsible for their own actions and wanting to limit the impact to themselves from others. Upstream landowners expressed concern they might be assigned a disproportionate level of responsibility for downstream impacts. Similarly, downstream landowners felt burdened with the consequences of actions taken by upstream neighbors. Some participants saw potential risks from too much government involvement and what they perceived as urban

residents' lack of understanding of rural lifestyle and land management. Many participants were uneasy with decisions affecting rural or upstream land uses being made by urban or downstream stakeholders. For example, when asked about flooding in the Red River Basin, an interviewee explained, "[the water is] pushed down to Fargo, and that's all we hear about. I am guessing, most of their ideas are going to make our problems worse." Interviewees were skeptical people outside of their area could design policies and programs relevant to farming and rural issues. One participant lamented,

Our paycheck is in the field. If we want to have a crop and we want a paycheck, we have to get [the crop] in. Those are very tough things in agriculture that I don't think urban people understand at all. They don't understand the long hours, the dirt, the pressures.

Generally, the more local the governmental body is, the more trusted it was by participants. Some interviewees expressed little trust in resource agency personnel at the state or federal level. One interviewee observed, "all the government agencies are sitting [at the meeting] getting a paycheck and most of them have never been out on the land." Another interviewee admitted, "I am obviously concerned that the government officials will come in and tell us what to do... the farmers have little or no control."

### *Social identities*

Interview questions related to decision making on the farm generally, and decision making related to conservation specifically, elicited responses related to farmer social identity. Three social identities, each with multiple expression, emerged from the data. Primary identities were family identity, community identity, and business/economic identity (Table 6).

Family identity was conveyed through descriptions and memories of family farming legacies, current family ties, and considerations for future generations. One interviewee reflected, “This particular farm and most the acreage involved has been in our family since 1880. So I’ve got a responsibility, I would call it, to take care of it, keep it going, pass it down.” Farmers’ concerns for future generations on their farms were related to family members and non-family farming partners.

**Table 6. Prominent Farmer Social Identities**

<b>Social Identity</b>	<b>Identity Expressions</b>	<b>Descriptors</b>
Family Identity	Maintaining family legacy	Veneration of past generations Responsibility to future generations
	Existing family ties	Desire to provide high quality of life for present generation of children and/or grandchildren
Community Identity	Esteem for smaller family farms	Ability to know the land being farmed and desire for more farmers farming
	Social connectedness through thriving community structure	Vibrant local downtowns, cooperation with neighbors,
	Pride and appreciation for the work of farmers	Upholding the reputation of farmers as providers for those who don’t farm and as having a connection to the land
Business/economic identity	Striving to manage risk to farm operation	Rotation choices based on crops protected under Federal Crop Insurance Program
		Consideration of market forces in decision making
	Information sharing between farmers	Economic prosperity as a sign of good farm management practices

Community identity included a reverence or preference for certain agricultural or rural community features and characteristics such as landscapes dominated by smaller scale, family farms, vibrant and cohesive social structures, and a pride and appreciation for the farming community. Participants valued rural community lifestyles: “I like being close to my heritage and family roots. I like the small town rural environment and being

close to the land.” Interviewees also expressed a sense of responsibility to consider other community members when making decisions:

We have to be concerned about our own land because of our own desire to make our land better and more utilizable, but when our actions directly affect the person next to us or down the road in a negative way, we have to be very careful of that. Our biggest concern has to be not just our own immediate land, but also theirs too. You know we can't say 'well this is the best thing for my land, and to hell with the rest of you.

The aesthetics of the open landscape, access to natural areas, and the perceived benefits to families, such as smaller schools and close knit communities, were all described as important community amenities. Several participants noted a strong sense of community: “There is a real sense of community when you get into these small rural ag towns... people tend to look out for each other.” Many farmers discussed farming because they enjoy the work of farming—being outside and close to nature: “I especially love being out in the field. Just being out there and working and watching nature while you're doing it.”

The business or economic identities expressed were primarily tied to managing risk of the operation. Many participants expressed a desire to limit risk for their farm business as a primary decision making factor. Risk was frequently described in terms of financial gains, and interviewees expressed concerns the decisions they make would put their business or families at risk. Success was often characterized as having bills paid and a little extra left for other things. At the same time, money and financial gains were important to decision making, because profits give individuals and their families access other important values. For example, one interviewee summarized the issue when asked about their most important considerations on the farm: “I think economics. We like the lifestyle, but without the economics, you don't farm. So, you don't have the lifestyle you want. Economics is obviously the first priority. If you are not profitable, you aren't able to continue.”

Business identity was also expressed through passive and active information sharing about farm operation viability. Farmers' actions are observed by others and they, in turn, are watching what happens in the community. For example, one interviewee noted, "Farmers always pull up in each other's farms and visit to see what's going on. Usually you can see what other people are doing." Another participant reflected, "Coffee shop talk doesn't do a whole lot for me relative to making decisions of how we are going to manage our own business, but getting feedback and input from folks who have adopted those practices, and weighing that in our own decisions, well, we're not too close minded for that."

#### *Low Perceived Control*

Behavioral control emerged as an important component of farmer decision making; however, interviewees frequently lamented limited power or control in decision making on the farm. Participants expressed distress and in some instances helplessness over their inability to act in accordance with the values and identities discussed in the previous sections. For example, one interviewee explained, "my basic [goal is] to be a steward of the land, but like I say, when politics won't let you do that, I feel you're kind of trapped in the deal sometimes." The tension between values and perceived control was also characterized as an issue of inadequate financial resources to commit to conservation practices:

The Lord only is lending us this land for us to take care of it. We're just stewards and I hope we leave it in better condition for the next generation. We're not doing some of the farm programs because we are not paid what [we need]. You cannot have summer fallow to rest the land, or plant alfalfa or some other cover crop to nurture back the land. We did this quite often before, but you can't do it anymore, because you can't make it financially. You are using every acre of land to its fullest.



Frequently, low perceived control was non-specific to any one behavior or outcome. For example, when asked what they would change about farming today, if they could change anything, many participants perceived a lack of ability to change many of the things most important to them. Common responses included, “I don’t know if there is any way to fix it...,” “I don’t know. I kind of hate to see it going this way ... but what can you do about it? ,” and “I don’t really know what you could change...” Five primary themes, some with sub-themes, emerged from the data (Table 7).

**Table 7. Perceived control themes**

Theme	Sub-theme	Descriptor	Generally high PBC	Generally low PBC
Economics	Concern over debt management	Farmer are unsure as to their ability to manage debt long term		X
	Conservation implementation and maintenance costs	Conservation is not considered in budgeting and seen as an expensive extra		X
	Specialized farm equipment costs	Farm equipment is increasingly expensive and specialized limiting the ability to diversify rotations		X
	Increasing farm sizes	Farmers feel the need to farm additional land to be economically viable		X
	Input costs	Seed, chemical, and labor costs are increasingly expensive, offsetting gains in yield		X
	Land Prices	Land prices continue to rise and are seen as prohibitive to new farmers		X
	Rent Prices	Rent prices continue to rise in spite of input costs also rising		X
	Variable Markets	Markets are unpredictable, reliant on international forces, and make decision making more difficult		X
Risk Management	Crop Insurance	Crop insurance is increasingly relied upon to manage risk but limits decision making of farmers		X
	Resilience to weather	Weather is increasingly unpredictable challenging farmers to adapt		X
	1. Rotation choices	2. Ration choices are limited by economics,		X

		markets, and federal farm policy		
Outside influence	Government and regulation	Governments regulations do not reflect farmers values and farmers do not have a proportionate say in decision making		X
	a. Urban-rural conflict	b. Urban residents don't understand rural lifestyle and have unreasonable expectations		X
Community Change	3. Larger farm sizes	4. Farmers farming more acres have less of a connection to the land		X
	5. Reduced viability of community	6. Fewer farm families leads to fewer children in schools, economically depressed main streets, and fewer opportunities to interact with neighbors		X
Soil Conservation	7. Adoption of practices to limit soil erosion	8. Conservation tillage, buffer strips, winter silage all seen as positive and generally adopted	X	
Technological advances	9. Adoption and implementation of new technology	10. Use of GPS, precision farming, and GMO crops to advance desired outcomes on the farm is viewed positively but sometimes difficult to implement	X	X
Chemical use	11. Adoption of more sophisticated approaches to chemical application	12. Knowledge about better practices to limit chemical use, but remaining concerns over type and amount of chemical used	X	X

The perception of farmers to need to continually expand the amount of land they farm to be economically viable was prevalent: “You got to go bigger to do it cheaper and make more money at it, but when is it ever going to stop? It is a huge problem I think.” Interviewees described the trend towards increased farm size, and the resulting reduction in the number of farmers farming, as having negative impacts on their communities. One participant observed, “The fact that the size of the farm is getting bigger and bigger, it’s

the demise of rural life, really.” After mentioning concerns about increasing farm size, another interviewee continued, saying, “There are fewer people, towns have shrunk in size, rural communities are down population wise, and schools are smaller and consolidating, as the farms have gotten larger.”

Interviewees saw the expense of specialized equipment to support larger operations with more limited rotations as a challenge to viability. Once they had invested in a large piece of machinery specific to one or two crops, there was an increased risk in adding additional crops or livestock. One interviewee described the challenge: “our grandson was looking at a new corn planter and soybean planter, it was \$250,000 used. About 12, 15 years ago we bought a planter and we paid like \$12,000, \$13,000 for it, and now a new one is over \$250,000 ... [the equipment prices are] out of kilter totally.”

Interviewees closely associated limited options in rotation with the structure of the federal Farm Bill. According to participants, the Farm Bill's crop insurance program insures only a small number of crops, and incentivizes farmers to plant the crops with the least risk. Many participants perceived the least risk and the most financial gain comes from acquiring the greatest yield possible through a corn and soybean rotation cycle: “The farm program doesn't really allow for crop rotation, which is pretty standard for the soil health, water quality things we want to be doing. But, the farm program leads [farmers] to just corn and soybeans.” Still, crop insurance was seen as a critical component of risk management:

When I started farming, if you had a bad crop it took three years to regain what you had lost. Now I am sure you are at ten years, if not fifteen. You do need more risk management. We spend more money on crop insurance. Years ago we never bought any crop insurance.

Interviewees expressed concern over changing weather patterns and their inability to predict or properly respond. Weather, above other themes, was perceived as an object which the interviewees did not have control over or the ability to predict or respond to effectively. One interviewee reflected, "The pressure is always on you to work with the weather. Try to stay one step ahead of the weather. You pretty much depend upon nature." Another participant mentioned,

Weather is playing a big role. I mean if we have a drought next year, are we going to be able to make our payments? We don't know. The weather is a big challenge ... the weather is always so unpredictably, it's probably the biggest challenge. We just don't know what is going to happen!

#### *Perceived Control*

Contrary to the object described above, interviewees did perceive they had sufficient power and control over decision making related to soil conservation. When this issue factored into decision making, participants perceived they were able to make decisions that aligned with their values and/or identities. Erosion control measures had been widely adopted by interviewees and many spoke positively about the outcomes of their management decisions:

I look back at where we were twenty years ago. The soil erosion was terrible. Winter time out here, the snow in the ditches would have been half dirt. Thank goodness pretty much everyone has parked the plows. I think everybody is doing more of a conservative tillage approach. I know we have really changed.

One interviewee observed the community was able to change practices with the right combination of knowledge, modernized equipment, and perceived need:

When I was very young, everything was moldboard plowed. In the winter it wouldn't look white. The ditches would be filled with it. When it would blow, it would be a grey snowstorm. In the spring when it would melt, the ditches would fill up with silt, it would just run right off. People started, I would say in the mid-70's, well, started it, maybe not heavy, but you could see that it

didn't wash. So in farming time, in no time, they completely got away from the moldboard plow and that made a huge difference. I couldn't take you to a piece of land that's moldboard plowed today. I couldn't, and I know the county pretty well.

Farmers had access to technology that made adoption of other practices possible, and saw conservation of the soil was positive for their business and for the environment. Perhaps most important was what interviewees did not say about soil conservation practices. Specifically, no one mentioned any policies or programs that would serve as a barrier to adopt more conservation oriented practices or would incentivize alternative practices.

#### *High and Low Perceived Behavioral Control*

Two themes, chemical use and technological advances, were neither described by participants primarily as objects over which they perceived control in their decision making nor primarily as objects over which they did not have perceived control. These themes were characterized as both high and low control depending on particular circumstances. Some farmers interviewed mentioned achieving success in limiting chemicals, but feeling unable to further limit the practice. For example, the sentiment of many participants was summarized well by this interviewee,

I worry about the nitrates going into our water... I would say 10, 15 years ago, you'd see the fertilizer rates going on the land a lot higher. There are still guys that put too much on. Through education, farmers are starting to find out that the nitrogen they were putting on was much more than they needed.

Another participant described the issue in this way, "Ag production these days can't get along without [chemical application]. So I don't know what, something you just try and do as carefully as possible and watch the runoff issues". Another, a farmer mentioned,

“When it comes to insecticides, nobody likes to spray insecticides. When you talk about water quality stuff, you don’t want nothing getting in the water like that.”

Similarly interviewees perceived a mixed sense of control over technological advances such as precision farming practices and advancements in weed management.

One participant described it this way,

I mean the GPS, how does that work for us? It works a whole bunch! It’s better for the environment, my tractors are out in the field cultivating or chisel plowing they’re going the exact width. I’m not wasting fuel or man power, so consequently that’s better for me. When I apply chemical, we apply so that sprayers shut off as it goes down the road, our planters shut off so we are using better technology to help us become better stewards of the land.

Conversely, not all participants felt comfortable with technology, as demonstrated by this participant,

I think at our age it’s about the technology side that is challenging, because we just are at that age where technology doesn’t come as easily for us as it does for my kids. The technology is a challenge for us just because of our age. There is a lot of technology with precision farming, with the GPS, and steering systems. We do that stuff, but we are maybe a little behind the curve. It’s a little bit more of a challenge for us to adapt to the new technology.

This interviewee also expressed the challenges of keeping up with changes both with technological and chemical use,

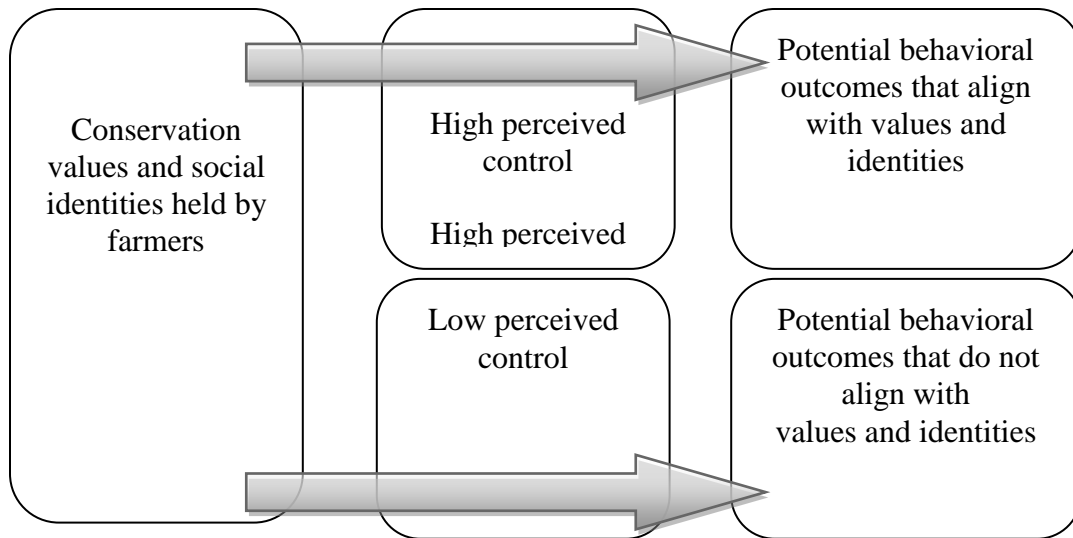
I always figured when Roundup Ready soybeans came, we had the world by the tail. It made it pretty easy, you know just one chemical, spray it all... But [weeds are] getting resistance to that and ... they have new chemicals coming out to combat that. It’s something you have to stay on top of all the time.

## **Discussion**

### *Values and social identities as drivers of conservation behavior*

Analysis of the interview data suggests that if behavioral outcomes were solely a function of the values and identities held by farmers would tend to be conservation oriented. As demonstrated in the literature, the stronger a value is, the greater likelihood is of acting in alignment with that value (Eagly & Chaiken, 1993). Clearly, natural resource stewardship values would be closely associated with conservation behaviors and decision making. A value orientation toward independence was expressed in relation to the use of local knowledge of the land and the environment. A business identity could lead towards behaviors including maximizing care for the soil and managing water resources for long term farm viability. Similarly, developing family ties and vibrant community systems include maintaining the health of the land for the current and future generations. Interviewees discussed the aesthetic appeal of open areas and the small farm lifestyle in which farmers had close ties to the land. The values and identities expressed by interviewees in this study are not unique. Other researchers have reported similar findings in other qualitative farmer behavior research (Atwell, Schulte, & Westphal, 2009, & Reimer, Thompson, & Prokopy, 2012)

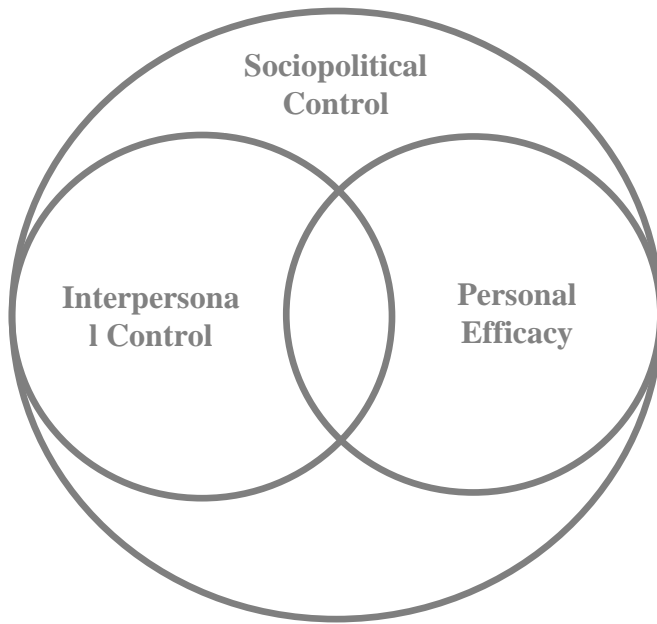
Decision making on the farm is a function of more than just an expression of core values and social identities. Farmers and farm landowners must perceive they have the ability to act in order to achieve outcomes that align with their values and identities. This study suggests in circumstances that individuals hold conservation oriented values or identities *and* have perceived control there is a potential for behavioral outcomes that align with their values and social identities more strongly support conservation outcomes. Conversely, circumstances in which individuals hold conservation oriented values or identities but have low perceived control are less supportive of conservation outcomes (Figure 8).



**Figure 8. Relationship between behavior outcomes and values/identities dependent on PBC**

When applying Paulhus' (1983) three primary spheres of control, personal efficacy, interpersonal control, and sociopolitical control, a clear distinction does not appear between the three concepts. All seem to rest in the sociopolitical context, while there is some overlap between personal efficacy and interpersonal control (Figure 9).





**Figure 9. Spheres of Control**

For example, while an individual is responsible for their own debt management, components of debt management, such as access to preferred interest rates or demand for commodities, will be influenced by forces on an international scale. Respondents in this study generally did not perceive control over personal debt management (Table 8). Similarly, community change is largely the result of the cumulative decision making of others affecting the individual, but the changes are driven by forces well beyond the community. Community change also was generally perceived to be beyond the control of the participants (Table 8).

**Table 8. Perceived behavioral control (PBC) themes and control classifications**

Themes	Sociopolitical Control	Interpersonal Control	Personal Efficacy	General high PBC	General low PBC
Economics	X				X
Concern over debt management	X		X		X

Conservation implementation and maintenance costs	X		X		X
Specialized farm equipment costs	X	X			X
Increasing farm sizes	X	X	X		X
Input costs	X	X			X
Land Prices	X	X			X
Rent Prices	X	X			X
Variable Markets	X	X			X
Risk Management	X		X		X
Crop Insurance	X				X
Resilience to weather	X	X	X		X
Rotation choices	X	X	X		X
Outside influence	X	X			X
Government and regulation	X	X	X		X
Community Change	X	X			X
Larger farm sizes	X	X			X
Soil Conservation	X	X	X	X	
Technological advances	X		X	X	X
Chemical use	X	X	X	X	X

*Management implications*

Resource managers at all levels of government and in the nonprofit sector face a difficult task as they navigate the complexities of human and social dimensions while attempting to implement best available practices to achieve desired conservation

outcomes. The findings from this study suggest many farmers and farm landowners hold natural resource stewardship values and conservation oriented social identities, but feel unable to make decisions which fully align with those values because of outside self-efficacy, inter-personal control and socio-political control constraints. By better designing policies and programs to increase perceived behavioral control, the ability of farmers to act in accordance with their values could increase, resulting in more effective programming.

The translation of these findings may develop in many different ways. At a foundational level, agency personnel should prioritize both formal and informal relationship building with local constituents in order to more accurately assess values and perceived constraints to conservation. Values are deeply held and difficult to shift once they have been developed. Fortunately for those hoping to achieve pro-conservation outcomes, evidence suggests many farmers hold stewardship of the land as a core value. Government, non-profit, and academic sectors should cooperate to support community viability and interconnectedness in order to reinforce social ties and an individual's sense of responsibility to others.

Empowerment and perceived control increase as self-efficacy, knowledge, and competence increase (Cattaneo & Chapman, 2010). With a core value of independence, farmers are well positioned to respond to initiatives that maximize the expression of their local knowledge and competence. Managers should consider designing programs that allow for flexibility in implementation, limit risk to the farm operation, and provide skills and equipment necessary for implementation. Farm programs that limit risk for a wider variety of rotation options could increase perceived control and could mitigate the environmental challenges of mono-cropping or near mono-cropping. Designers and implementers of economic incentives and regulations should limit barriers and conflict

between values and behavior. State and federal representatives should work through more local units of government to build relationships and increase legitimacy of place-based knowledge. Policymakers must take caution to not implement programs which inadvertently disincentivize conservation. For example, expansion of crops protected under the federal crop insurance program might encourage a larger rotation of crops. Programs should either be designed to minimize conflicts between pro-conservation values and economic viability, or farmers should be empowered to recognize where their decisions can be both economically profitable and environmentally beneficial.

Soil conservation practices can serve as a good example of the positive conservation outcomes can be achieved when farmers perceive the ability to act in accordance with existing natural resource stewardship values. Interviewees expressed pride in the changes they made and the results had been achieved on the landscape. Soil conservation actions were perceived as a form of natural resources stewardship that didn't require dependence on others. Participants had sufficient knowledge about the problem, as well as access to the equipment to help them address the issue. There were no significant policies or programs that incentivized alternative management. As illustrated in the empowerment process model, they were able to build from knowledge, self-efficacy, and competence to create positive outcomes. The gains in soil conservation practices should be used as a model for other conservation initiatives.

#### *Future research*

Future research should examine the role of perceived behavioral control on climate impacts and resiliency. Supporting the development of practices to help farmers adapt to climatic change would also align well both with core stewardship values as well as perceived control given increasingly unpredictable weather. Researchers and land

managers would benefit from additional research on farmers' knowledge and perceived ability to respond to increased variation and extremes in weather.

Evidence emerged in this study that landowners in different parts of the watershed do not share an understanding about who is, or who should, be responsible for the negative impacts of land use decisions. Downstream landowners were apt to feel upstream landowners should take more responsibility for their impacts, while upstream landowners tended to indicate once water or pollution leaves their land that it isn't their responsibility any longer. A better understanding of upstream and downstream landowner behavior, as well as behavior across the varying political landscapes could be useful to managers attempting to make decisions at the Basin scale.

### *Conclusion*

This research suggests farmers may feel stuck in a system that does not allow them the ability to make decisions that would otherwise have the greatest benefit to their personal economy and to the natural systems on which their livelihoods depends. Values, identity, and perceived behavioral control should be key considerations of policy makers and land managers hoping to make significant environmental gains. In order to achieve the necessary balance between production of food products and a healthy, functioning, environment, systems must be put in place that both afford farmers sufficient security, as well as facilitate their ability to engage in conservation behavior. Farmers will be more likely to make conservation oriented decisions if they feel like they have the ability to make those decisions.

## CHAPTER 5

### DISCUSSION

This study began, as many studies do, as a small piece of a larger, more wide-ranging effort. Funders and original project personnel were interested in exploring the drivers and constraints to conservation practice implementation by farmers and agricultural landowners in the Red River Basin of Minnesota. The parent project included both a quantitative portion, with over 1,000 surveys sent to landowners in three watersheds, and a qualitative portion, with nearly 40 participants in interviews and focus groups across two watersheds. Many significant themes emerged both first through an initial grounded theory, open coding process, as well as through a later more focused coding process. For purposes of this thesis I decided to use solely the data from the interviews. It is a deep and rich data set that yielded sufficient information for consideration.

During the open coding process of the data analysis, themes emerged that suggested farmers and agricultural landowners hold many values and identities that are generally conservation oriented. However, the interviewees also had a sense of feeling stuck or trapped in a system that did not allow them to act in accordance with their values in some cases. The relationship between values, identity, and perceived control in regard to conservation decision making became the basis of this thesis. Specifically, this thesis addresses the following two questions:

- 1) What core values and social identities are central to farmers and their farm management decisions?
- 2) What role does perceived behavioral control play in the relationship between farmer core values, social identities, and conservation decision making and behavior?

This discussion chapter is intended to bring together the key points from previous chapters and provide readers with an overall understanding of the study and potential implications. The chapter includes a summary of management implications, further reflection on the types of behavioral outcomes that might be possible under high and low perceived control conditions relevant to the values and social identities that were identified, and suggestions for future research.

### *Management implications*

Resource managers at all levels of government and in the nonprofit sector face a difficult task as they navigate the complexities of human and social dimensions while attempting to implement best available practices to achieve desired conservation outcomes. The findings from this study suggest many farmers and farm landowners hold natural resource stewardship values and conservation oriented social identities, but feel unable to make decisions which fully align with those values because of outside self-efficacy, inter-personal control and socio-political control constraints. By better designing policies and programs to increase perceived behavioral control, the ability of farmers to act in accordance with their values could increase, resulting in more effective programming.

At a foundational level, agency personnel should prioritize both formal and informal relationship building with local constituents in order to more accurately assess values and perceived constraints to conservation. Values are deeply held and difficult to shift once they have been developed. Government, non-profit, and academic sectors should cooperate to support community viability and interconnectedness in order to reinforce social ties and an individual's sense of responsibility to others. Managers should consider designing programs that allow for flexibility in implementation, limit risk to the

farm operation, and provided skills and equipment necessary for implementation.

Designers and implementers of economic incentives and regulations should limit barriers and conflict between values and behavior. State and federal representatives should work through more local units of government to build relationships and increase legitimacy of place-based knowledge. Policymakers must take caution to not implement programs which inadvertently disincentivize conservation. Programs should either be designed to minimize conflicts between pro-conservation values and economic viability, or farmers should be empowered to recognize where their decisions can be both economically profitable and environmentally beneficial.

*Reflection on Potential Behavioral Outcomes*

Readers may find it appealing to consider potential behavioral outcomes resulting from the values and identities which were discussed in this study. Specifically, resource managers tasked with prioritizing investments may find it useful to consider possible outcomes. Findings from this study as well as a review of existing literature suggest that under circumstances of high perceived control, individuals may be more likely to make decisions that align with their values. In the case of the interviewee participants for this study, it appears many of their values and identities could be conservation oriented. Using participant interviews, observations in the field, and experience working in a rural context, potential outcomes under high and low perceived behavioral control were document (Table 9).

**Table 9. Potential behavioral outcomes related to farmer values**

Prominent Farmer Values	Value Expressions	Descriptors	Potential Outcome With High PBC	Potential Outcome With Low PBC
Natural Resource Stewardship			Pro- conservation oriented behaviors and decision making	Loss of natural resource amenities
	Careful use	Soil (Land)	Preservation or	Increased



	and maintenance of farm-essential natural resources	Water Air	enhancement of essential resources allowing for sustained use of the land for farming practices and human survival	vulnerability, reduced output from the land, and/or the need for additional inputs as natural resource quality is reduced
	Taking extra initiative to conserve other natural resources	Tree lines Wildlife	Protection of land and resources for non-essential but desirable resources	Loss of traditional but non-essential resources and features that helped define the landscape
Independence			Farmers feel able to exercise their ability to make independent decisions	Farmers feel unable to make independent decisions
	Responsibility for impacts	Urban/rural and upstream/downstream resource management	Farmers feel able to be responsible for their actions and feel others are acting appropriately responsibly	Farmers feel unable to be responsible for their own actions and/or feel others are not taking their fair-share of responsibility
	Autonomy in decision making and action	Government control and regulation	Government regulations are predictable, consistent, and align with reasonable and applicable farming practices	Government regulations are inconsistent, unclear, and/or are in conflict with preferred farming practices
	Applying local knowledge	Integration into resource management	Local knowledge and expertise is part of the decision making process and represented in management implementation	Local knowledge is surpassed by outside influence and local actors feel unrepresented and disengaged in management and decision making

**Table 10. Potential behavioral outcomes related to social identities**

<b>Social Identity</b>	<b>Identity Expressions</b>	<b>Descriptors</b>	<b>Potential Outcome With High PBC</b>	<b>Potential Outcome With Low PBC</b>
Family Identity			Farmers make decisions with past and future generations in mind	Farmers make decision without regard for past or future generations
	Maintaining family legacy	Veneration of past generations; Responsibility to future generations	Farmers feel an obligation to build on what was passed to them from past generations	Farmers feel disconnected with those that came before and are unconcerned with maintaining the resource
	Existing family	Desire to	Farmers feel an	Farmers feel

	ties	provide high quality of life for present generation of children and/or grandchildren	obligation to protect resources for those that will farm after them	unobligated to maintain resource beyond the time period they will personally use them
Community Identity			Many farmers farming traditional operations lead to strong communities and a responsibility towards maintaining the natural resources	Fewer farmers farming large scale operations lead towards increased competitiveness and decreased social responsibility
	Esteem for smaller family farms	Ability to know the land being farmed and desire for more farmers farming	Farms are small enough for farmers to know the land the work and maintain a diversified farm operation	Farms grow too large to maintain connection to the land and large scale efficiency is gained through limited operational practices
	Social connectedness through thriving community structure	Vibrant local downtowns, cooperation with neighbors,	Schools, main-streets and neighbor relationships are strong and vibrant	Increased competitiveness, among fewer actors with declining social systems
	Pride and appreciation for the work of farmers	Upholding the reputation of farmers as providers for those who don't farm and as having a connection to the land	Farmers enjoy the work of farming and are proud to be farmers	Farmers feel conflicted in their decision making and are concerned with long-term profitability and sustainability
Business/economic identity			Farmers are perceived as profitable and sustainable business operators	Farmers are perceived as "greedy" and solely profit driven.
	Striving to manage risk to farm operation	Rotation choices based on crops protected under Federal Crop Insurance Program; Consideration of market forces in decision making	Risk is managed by making choices that maximize long term financial gains and use of the natural resources	Risk is managed for short term viability with long term exhaustion of natural resources
	Information sharing between	Economic prosperity as a sign of good	Farmers passively and actively share information about BMPs	Farmers are reluctant to share information or are not willing to

	farmers	farm management practices	leading to increased adoption of conservation practices	learn from others leading to lack of innovation and adoption of new practices
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*Future research*

A theme that emerged that was not explored fully for this thesis was that research participants identified the system created under the structure of the Federal Farm Bill Insurance program as a constraint to conservation behavior. Interviewees saw the structure of the Farm Bill as important to limiting risk on the farm, but restrictive to crop rotation decisions. While there are benefits to farmers and communities from the Federal Farm Bill, aims of the policy may be more effectively implemented with a deeper exploration of farmers' values and decision making. Further research into the structure and possible options for modifications to the Farm Bill should be explored.

Future research should examine the role of perceived behavioral control on climate impacts and resiliency. Supporting the development of practices to help farmers adapt to climatic change would also align well both with core stewardship values as well as perceived control given increasingly unpredictable weather. Researchers and land managers would benefit from additional research on farmers' knowledge and perceived ability to respond to increased variation and extremes in weather.

Evidence emerged in this study that landowners in different parts of the watershed do not share an understanding about who is, or who should, be responsible for the negative impacts of land use decisions. Downstream landowners were apt to feel upstream landowners should take more responsibility for their impacts, while upstream landowners tended to indicate once water or pollution leaves their land than it isn't their responsibility any longer. A better understanding of upstream and downstream landowner

behavior, as well as behavior across the varying political landscapes could be useful to managers attempting to make decisions at the Basin scale.

### *Conclusion*

Given current theory on behavior and decision making combined with the findings from this research as well as from the other studies presented, this study suggests the lack of power and control farmers feel towards decision making on their land are highly significant considerations for the success of conservation initiatives on rural agricultural lands. That said, farmers hold many values and identities which could contribute to positive conservation outcomes if they felt the ability to act upon those values. In order to achieve the necessary balance between production of food products and a healthy, functioning, environment, systems must be put in place that both afford farmers sufficient security, as well as facilitate their ability to engage in pro-environmental behavior. Farmers will be more likely to make pro-environmental decisions if they feel like they have the ability to make those decisions. It is unreasonable to ask farmers to make decisions which could compromise their near-term ability to continue farming, such as decisions which are disproportionately financially risky. That said, in the long term, environmental degradation will have negative effects on farmers' viability.

This research suggests farmers may feel stuck in a system that does not allow them the ability to make decisions that would otherwise have the greatest benefit to their personal economy and to the natural systems on which their livelihoods depends. Values, identity, and perceived behavioral control should be key considerations of policy makers and land managers hoping to make significant environmental gains. In order to achieve the necessary balance between production of food products and a healthy, functioning, environment, systems must be put in place that both afford farmers sufficient security, as well as facilitate their ability to engage in conservation behavior. Farmers will be more

likely to make conservation oriented decisions if they feel like they have the ability to make those decisions.

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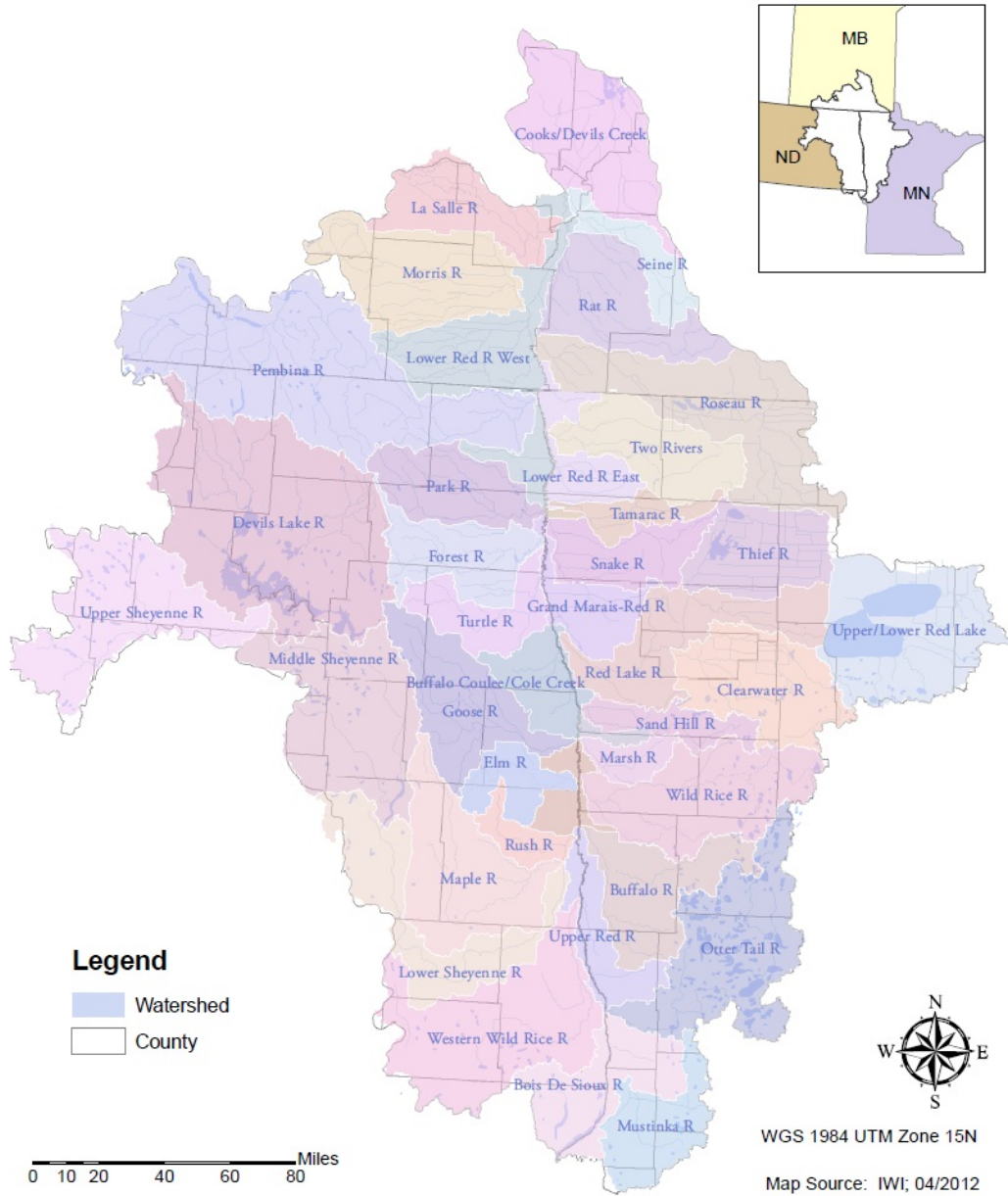
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## APPENDICES

## **APPENDIX A: RED RIVER BASIN**

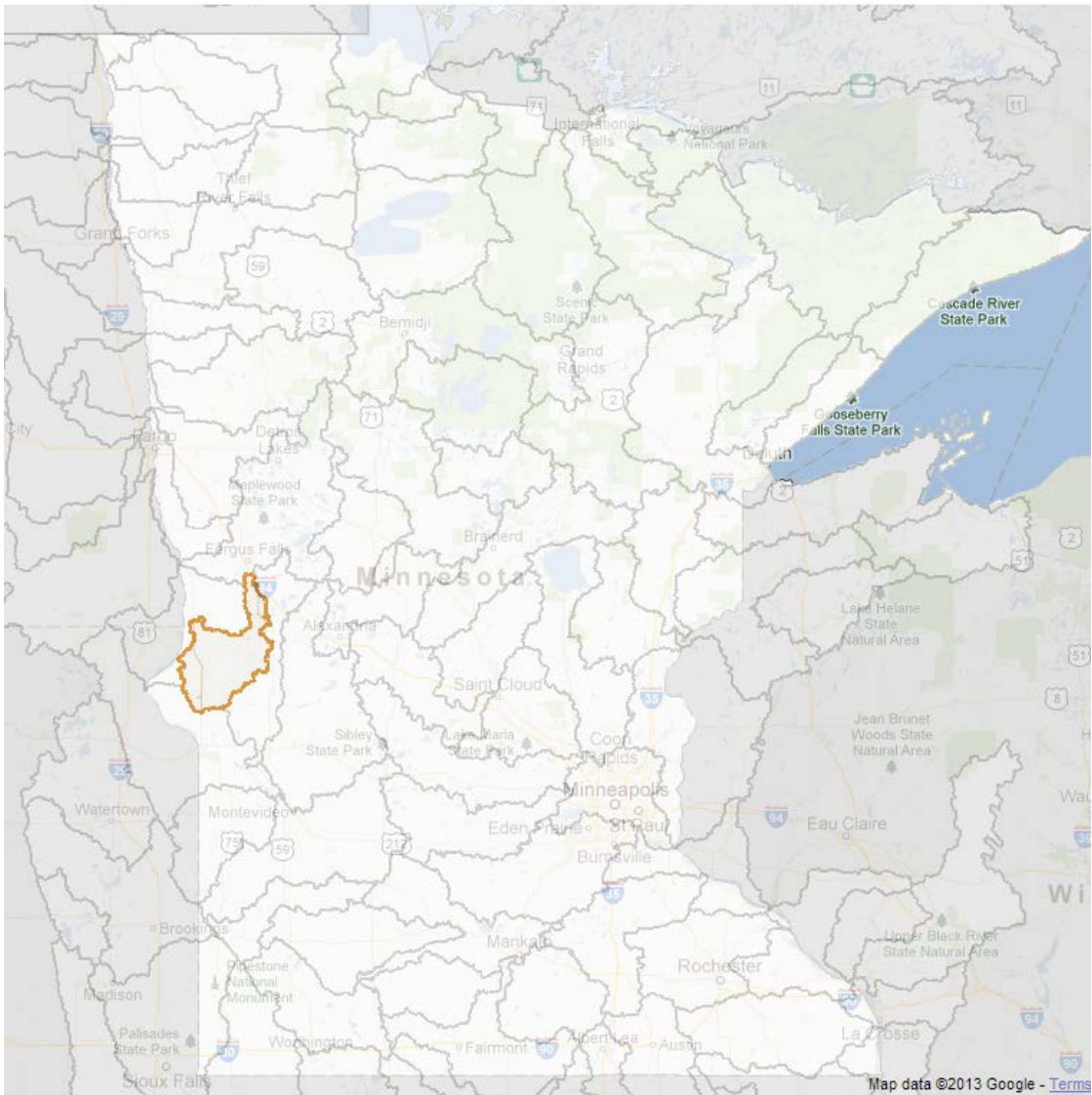
# Red River Basin



(International Water Institute, 2012)

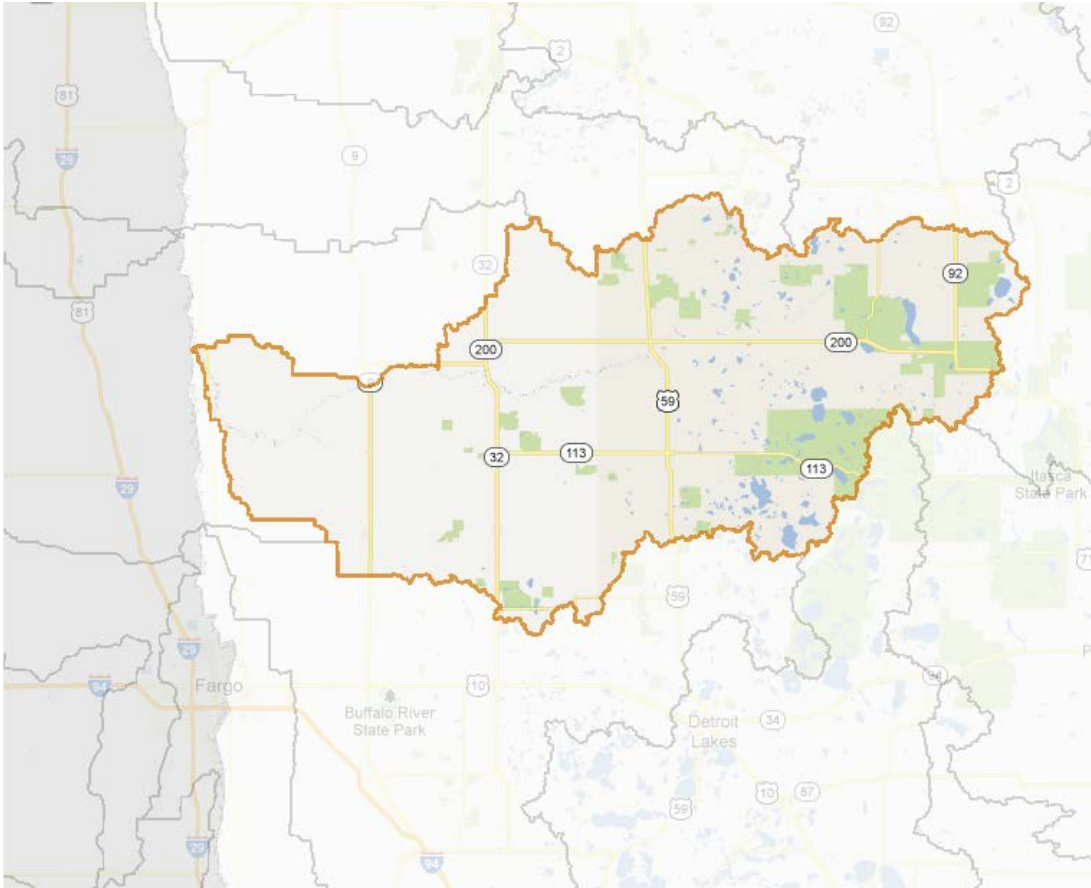


**APPENDIX B: MUSTINKA RIVER WATERSHED MAP**



Mustinka River watershed (Minnesota Pollution Control Agency, 2012)

**APPENDIX C: WILD RICE RIVER WATERSHED (SOUTH BRANCH) MAP**



Wild Rice Watershed District (Minnesota Pollution Control Agency, 2011)

## APPENDIX D: NETWORKING SCRIPT

## **Red River Basin Agricultural Conservation Practices Study, Script for Network Contact**

“Hello, my name is \_\_\_\_\_. I am a graduate student working on a research project with the Northwest Regional Sustainable Development Partnership and the University of Minnesota in consultation with local representatives from BWSR and NRCS. We are conducting a study of agricultural conservation practices in the Red River Basin from the perspectives of local farmers. Over the next several weeks, we will be interviewing farmers in the Mustinka watershed about their farms and what influences their decisions about conservation practices. We plan on contacting farmers with varying backgrounds and different attitudes toward conservation practices. We will also be interviewing farmers in the South Branch of the Wild Rice River. The reason I’m calling you is that first, we wanted to let you know about our study and to find out what questions you might have. Second, we would like your input. I was wondering if you could recommend any farmers in the Mustinka watershed who might be willing to share their perspectives with us on agricultural conservation practices. As I mentioned, we are looking for folks with a range of opinions.”

**If yes:** “Terrific. Thanks so much.”

- a. Write down contact information of farmers. Can we mention that you recommended them?
- b. “Do you know of any more contacts that might be able to recommend additional farmers for interviews?”

**If no:** “Ok, do you know of anyone who might be able to recommend farmers for interviews? (Write down contact information) Thank you for your time. Good bye.”

**If they seem unsure:** “We have designed the project in collaboration with local representatives from BWSR, NRCS, MN Department of Agriculture, and MN DNR and we have their support. Farmer participation is voluntary and confidential. We want to document how farmers feel about conservation practices so that we can support future development of programs that make sense to farmers and benefit water resource management in the Red River Basin.”

**If they want to know how the information will be used:** “A final technical report will be written that documents the study process, presents the interview results, and provides recommendations for water resource professionals. If you are interested in the report, we can make sure we get you a copy. We will also be presenting our interview findings in a series of focus groups with resource professionals in the area. Would you be interested in participating in something like this in the future?”

**If they want to know who is supervising the research:** “Mae Davenport is the supervisor for this study. She is an associate 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 approved by the IRB/Human Subjects Committee.

**APPENDIX E: INITIAL CONTACT SCRIPT**



## Red River Basin Agricultural Conservation Assessment

### Script for Initial Contact

“Hello, my name is \_\_\_\_\_. I am a graduate student conducting research on watershed management for Mae Davenport, Assistant Professor in the Department of Forest Resources at the University of Minnesota. This study involves farmers in the [Mustinka, Wild Rice, Middle-Snake-Tamarac] Watershed. This research will provide decision-making support specific to farmers and their fields that aids in promoting agricultural conservation practices in an effective and economical way. I have been interviewing farmers to gather their insights about their operations regarding conservation and was hoping you would be able to assist me by participating in the study and sharing your perspectives with me. We are offering an optional \$XX gift for your participation. The interview takes about one hour. 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?”

- c. **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)\_\_\_.”
- d. **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 the final report. 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 community members to try to get diverse perspectives and a range of experiences. I’ve been conducting background research and see that you are a [position in organization] **OR** [Name of person] recommended I contact you. 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 understand the opportunities and constraints to improving watershed management in the community. We’ll be putting together a final report that identifies those opportunities and constraints to share with

community leaders, educators and water 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 understanding the critical capacities communities need to sustainably manage their watersheds. We’re collecting social data to assess the needs and opportunities in your community and identify strategies that could be used to sustainably management the watershed. This will lead to an improved understanding of the drivers and constraints to sustainable watershed planning and management at the landowner, community and watershed levels.”

**If they want to know who is supervising the research:** “Mae Davenport is the supervisor for this study. She is an assistant 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 approved by the IRB/Human Subjects Committee.

**APPENDIX F: CONSENT FORM**

## **RRB Agricultural Conservation Practice Study Consent Form**

You are invited to participate in a study of agricultural conservation practices in the Red River Basin from the perspectives of local farmers. You were selected as a possible participant for an interview because you are a farmer in the Mustinka River or Wild Rice River watersheds. 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: Mae Davenport, Assistant Professor at Department of Forest Resources, University of Minnesota.

### **Background Information**

The purpose of this study is to better understand what influences farmers' decisions about conservation practices.

### **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 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:**

A gift or cash, valued at \$50, 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. Only those directly involved with the project will have access to the audio recording or 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: Mae Davenport. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact her at address: 115 Green Hall 1530 Cleveland Ave. North, St. Paul, MN 55108-6112, phone: 612-624-2721, email: mdaven@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 G: STUDY INTERVIEW GUIDE**

Interview guide, University of Minnesota

**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. How would you describe your farm to a friend?
2. What do you like about being a farmer?
3. What worries or concerns you the most about farming today?
4. If you could change anything about farming today, what would you change?

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

5. First, could you please describe for me the ownership and management arrangement of your farm? a. Do you rent farmland through a crop-share lease or cash rental?
6. What are the most important considerations for you when making decisions about your farm?
  7. Do you consult with others when making those decisions? a. If so, who do you talk to?
  8. How do you evaluate the success of your farm operation? a. What kinds of outcomes are you looking for in judging success?
9. What issues challenge or limit you in making your farm operation a greater success?
10. Have you changed the way you farm in the past 5 years in attempt to make your farm more successful?

**As you may know, there is increasing concern about flooding and water quality in the Red River Basin. In turn, resource professionals are promoting conservation practices throughout the basin to address these problems. Farmers, in particular, have been encouraged to consider agricultural conservation practices to reduce the impacts farming has on water resources. I have a few questions for you about water resources in the area.**

11. Are you concerned about water resource problems in the Red River Basin? Please explain.
12. Are you concerned about water resource problems in the Mustinka River watershed? Please explain.
  - a. [If yes] What consequences of water resource problems concern you the most?

13. Are you concerned about water-related impacts to your farm, such as erosion?

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

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

15. **First, a broad question: What does the term “conservation” mean to you?** a. What do you see as your role in conservation?

**16. Do you use practices on your farm that reduce the impacts your farm has on water resources? Please describe those practices for me. [Write down/check off practices on checklist, then for each practice ask the following]** a. How long have you used this practice on your farm?

b. What first motivated you to use this practice?

c. What do you like about this practice?

d. What don't you like about this practice?

e. Is this practice doing what it was intended to do? Please explain.

f. On a scale of 1-5, one being “not at all likely” and five being “extremely likely” how likely are you to maintain this practice in the future? Please explain.

17. Do you budget for implementing conservation practices each year?

**18. I have a list of conservation practices that resource professionals have recommended to farmers in this area. You've described some of these practices already. I'd like to get your perspectives on the other practices on this list. [Ask for all remaining practices in checklist, those not described in 15]** a. Before we focus on that list, are there other practices you have been considering? *[if so, ask questions b-e for each, if not go through list and ask b-e for each]*

b. What have you heard about this practice?

c. What has influenced your decision not to use this practice?

d. On a scale of 1-5, one being “not at all likely” and five being “extremely likely” how likely are you to adopt this practice in the future? Please explain.

e. Would you adopt this practice if things were different? Please explain.

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



**20. 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 you knew had adopted the practices?**

**e. You could talk to other farmers about how to make the practices work on your farm?**

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

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

**Finally, I have a few more general questions for you about water resource conservation in the RRB.**

**23. In five years do you think you will have conservation practices on your land? Please explain.**

**24. What do you think are the 3 biggest obstacles in the way of healthy water resources in the Red River Basin?**

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

**APPENDIX H: BACKGROUND INFORMATION SHEET**

ID# \_\_\_\_\_

*Please do not put your name on this worksheet.*

To better document the types and range of farmers we talk to, we are asking participants to complete a short background information worksheet. This information will only be presented as a summary of study participant characteristics. All efforts will be made to maintain confidentiality and any information provided that may reveal your identity will be excluded from published documents. Your name will not be associated with the data collected and will not be referenced in any future publications.

1. How many years have you lived in your community? \_\_\_\_\_.
2. How many years have you been farming? \_\_\_\_\_.
3. Approximately, how long has your farm been in your family? \_\_\_\_\_.
4. What type of crops do you grow? And, approximately what percent of your total crops is made up of each crop type?

<b>Crop type</b>	<b>% of total crops</b>
<b>Total</b>	<b>100%</b>

5. What crop rotation are you currently using?
6. How far is the distance from your home to your farmland (in miles)?
7. Which of the following best describes the ownership arrangement of the land you farm?
  - a. I own and manage my own farmland.
  - b. I rent my farmland to another party.
  - c. I rent farmland from another party.

- d. I own and manage my own farmland and rent farmland *to* another party.
  - e. I own and manage my own farmland and rent farmland *from* another party.
  - f. Other (please specify): \_\_\_\_\_.
8. Approximately how many acres is your land/property? \_\_\_\_\_
9. Are you involved in any farming-related organization/associations in your community (e.g., MN Corn Growers Association, MN Farmers Union, etc.)? Please specify:
- 
- 

10. What is your gender?            Male                            Female

11. In what year were you born? \_\_\_\_\_.

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

- a. Did not finish high school
- b. Completed high school
- c. Some college but no degree
- d. Associate degree or vocational degree
- e. College bachelor's degree
- f. Some graduate work
- g. Completed graduate degree (Masters or PhD)

13. What percent of your income is dependent on your land?

- a. 0%
- b. 1-25%
- c. 26-50%
- d. More than 50%

14. Which category best describes your **total household income from all sources** in 2010 before taxes?

- a. Under \$10,000
- b. \$10,000-\$24,999
- c. \$25,000-\$34,999
- d. \$35,000-\$49,999
- e. \$50,000-\$74,999
- f. \$75,000-\$99,999
- g. \$100,000-\$149,999
- h. \$150,000 or more

## **APPENDIX I: CONSERVATION PRACTICES CHECKLIST**

ID#: \_\_\_\_\_

**Agricultural Conservation Practices Checklist**

<b>Conservation Practices:</b>	<b>Definition/Benefit:</b>	<b>In Use (U)/Not in Use (N)</b>
Conservation Cover (CRP/land retirement)	Converting environmentally sensitive acreage to vegetative cover to reduce soil erosion, improve water quality, and enhance forest and wetland resources.	
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.	
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.	
Terraces	An earthen embankment, ridge, or ridge-and-channel built across a slope to intercept runoff water and reduce soil erosion.	
Side water inlets	Include rock inlets, drop inlets (standpipe), coil tile inlets, or rock weirs that temporarily store water, settle sediment and nutrients, and reduce stream erosion and flow from on-field drainage.	
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.	
Drainage water management	Technologies and methods that remove excess water from fields while reducing nitrates and other potential pollutants. Includes controlled drainage, shallow drainage, bioreactors, saturated buffers, rock inlets, storage basins, ditch designs.	
Wetland restoration/enhancement	Wetlands store water in landscape depressions, reducing the volume of water delivered to surface waters. Wetlands also filter water and remove nitrogen from runoff.	
Ag waste management facility/system	A properly designed and installed pit, lagoon, or above-ground structure that safely holds agricultural waste.	
Rotation grazing	Raising livestock on subdivided pastures to prevent overgrazing while managing perennial grassland cover.	

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

