A moral obligation model of landowner conservation norms and behavior

A Dissertation
SUBMITTED TO THE FACULTY OF
UNIVERSITY OF MINNESOTA
BY

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IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

Dr. Mae A Davenport

June, 2014

Acknowledgements

Firstly, I would like to thank my adviser, Dr. Mae Davenport, for her guidance and support. I would not have been able to write this dissertation if it was not for the countless times we met to discuss findings and writing plans. I want to thank you deeply for your feedback, your time, and your patience to listen to my 'mad ramblings' about structural models and everything else. I would also like to thank my committee members Dr. David Fulton, Dr. Dean Current and Dr. Geoffrey Maruyama for their insights and support.

I want to extend my gratitude to local partners Mark Zabel, Dakota County, Vermillion River Watershed Joint Powers Organization, Paul Nelson, Scott County Watershed Management Organization and Beth Kallestad, Cannon River Watershed Partnership, for their feedback throughout the projects. I would also like to thank project funders Minnesota Pollution Control Agency (MPCA), Cannon River Watershed Partnership (CRWP), US Geological Survey and the Office of the VP of Research, UMN. Thanks also to the 1042 survey participants for taking the time to respond.

I would like to thank research colleagues Christine Yaeger, Paula Guetter and Darren Bundy for their assistance and support. Thanks to Bjorn Olson for collecting data in the Cannon River Watershed project. Special thanks to my good friends Amanda Sames, Andrew Oftedal and Adam Kokotovich for all the encouragement and moral support. Thanks also to Joe Kaser and Theresa Cira from reading group. Our reading group conversations have really motivated me and challenged me in ways that have always made me excited about graduate school and the future.

I would like to thank my family for their love and encouragement. Thanks to my mother and father for pushing me to reach ever higher standards. I would like to acknowledge my sister, my teacher who has always set high standards for me, listened to me and encouraged me. Thanks to my brother who has always taken on family responsibilities so I could pursue my ambitions. You are the ones I look up to for inspiration. A special thanks to my wife, Barsha Chitrakar, for being there for me, listening to my writing ideas and reading my dissertation chapters. You are rock that has anchored me and kept me on my path. Thanks also to a special friend, Tenzin Choeying Sakya, for lifting me up when I was feeling down.

Lastly I want to thank a friend who I met on a long journey. Your dedication to obtain higher education despite the struggles and the load you were carrying that day have inspired me on my own journey. I never knew your name but wherever you are, you have taught me to be critical, passionate and determined.

Dedication

This dissertation is dedicated to my nephews, Aarnav and Aariz.

Abstract

Despite efforts to reduce water pollution, water resource managers have yet to find a solution to the problem of non-point sources: pollution from diffusely distributed urban and rural land use practices. Current management approaches to NPS pollution are not regulatory and thus require voluntary human action. Changing human behavior, though, is a challenging task. Any intervention aimed at altering behavior should be based on an understanding of the determinants of behavior. Although varying in their theoretical and methodological approaches, researchers have focused on internal motivators such as values, attitudes, beliefs and norms as a basis to understand pro-environmental behavior. The purpose of this dissertation is to examine the factors that influence pro-environmental norms and behaviors in the context of water resource management. To this end, an integrated moral obligation model (MOM) was developed to investigate the relationship between environmental and cultural values, a series of activators, personal norm and behavior. The specific research objectives of this dissertation are to i) determine the factors that activate landowners' personal norms to protect water resources, and ii) determine the influence of activators and personal norm on landowners' civic engagement in water resource issues. Data were collected through a self-administered survey of a random sample of landowners from three Minnesota watersheds: Sand Creek, Vermillion River and Cannon River watersheds. Latent variable structural equation modeling was used to understand the hypothesized relationships between values, beliefs, norms and behavior. Findings provide support for MOM as a useful theoretical basis to understand norms and behaviors related to water resource

management. Structural equation modeling revealed that personal norms to act influence pro-environmental behavior. While personal norms are rooted in collectivistic and altruistic-biospheric values, beliefs about consequences of pollution, local responsibility, social pressure to take action and ability to act fuel personal norms. Overall, findings suggest that intervention strategies are likely to be successful if landowners perceive water resource protection as a moral issue and a collective responsibility of local landowners. Further, findings suggest that conservation programs must provide incentives that address real or perceived barriers.

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Chapter 1: Introduction

According to the Minnesota Pollution Control Agency (MPCA, 2008), 40% of assessed water bodies in Minnesota are impaired for their designated uses. More than 14,000 miles of streams (MPCA, 2014) and 3,500 water bodies (MPCA, 2012) in Minnesota are impaired due to pollutants such as fecal coliform, suspended solids, mercury and nitrate (MPCA, 2010). Despite efforts to reduce water pollution, water resource managers have yet to find a solution to the problem of non-point sources: pollution from diffusely distributed urban and rural land use practices. Nonpoint source (NPS) pollution originates in broad community or governance-level land use planning policies and actions (e.g., urban growth, agricultural land use, stormwater management infrastructure), as well as in individual-level land use decisions and practices (e.g., fertilizer use, riparian area alteration, salting sidewalks).

Although much is known about the biophysical aspects of managing water resources, the human dimensions of water resource management are not as well understood. Managing watersheds is not only about managing the biophysical resources within the watersheds. It also entails managing human activities that individually and cumulatively impact water resources (Brooks, Ffolliott, Gregersen, & DeBano, 2003).

Traditional, top-down approach to water management has led to reductionism, addressing problems one at a time rather than holistically or systematically (Sabatier, Weible, & Ficker, 2005). This approach has viewed water systems as separate from human systems and thus, dialogue and decision making has convened land use planners and water engineers and largely excluded landowners and resource users. Yet, the causes

and consequences of NPS pollution are decidedly societal, requiring changes in the way humans individually and collectively view and interact with water and the natural environment. Further, traditional water management strategies such as regulations, capital improvement projects and payment programs can be costly, difficult to enforce and unsustainable (Feather and Cooper 1995; Davenport, Pradhananga, and Nelson 2013).

Current management approaches to NPS are not regulatory and thus require voluntary human action. Landowners, individually and collectively, play a key role in protecting and improving water quality. Landowners make decisions about whether or not to use conservation practices on their land. In addition to their individual action (i.e., adopting conservation practices), landowners can also influence watershed planning and management through collective action (i.e., civic engagement in water resource conservation) (Morton & Brown, 2011).

Changing human behavior, though, is a challenging task. Any intervention aimed at altering behavior should be based on an understanding of the determinants of behavior (Steg & Vlek, 2009). Environmental psychologists have employed various approaches and models from cognitive, social and experimental psychology to better understand the factors that influence pro-environmental behavior.

Rational approaches (e.g., theory of planned behavior) assume that people are motivated primarily by self-interest (Harland, Staats, & Wilke, 2007; Schultz, 2000). In the theory of planned behavior (TPB), pro-environmental behaviors are driven by an individual's intention to perform the behavior and the perceived ease or difficulty of performing the behavior. However, the theory of planned behavior ignores moral

considerations (Kaiser, Hübner, & Bogner, 2005). Actions without direct and immediate benefits to the actor such as pro-social (e.g., helping others) or pro-environmental (e.g., protecting prairies) behaviors are believed to be morally grounded. In moral approach theories such as norm activation theory (NAT) and value belief norm (VBN), feelings of personal obligation to act, or personal norms are the primary motivators of behavior (Schwartz, 1977; Stern, 2000). VBN extends NAT by exploring the influence of values on beliefs, personal norm and behavior. However, VBN does not examine the influence of social relationships on pro-environmental behavior. These interactions become especially salient in social dilemmas such as water resource conservation where there is a conflict between short-term, individual and long-term, collective interests. The conflict of acting in one's own interest or in the interest of others is represented in two dimensions of cultural values: individualism and collectivism.

Rational and moral approaches to pro-environmental behavior have been applied to examine behaviors such as water conservation (Lam, 1999), green hotel choice (Han, Hsu, & Sheu, 2010), transportation choice (Nordlund & Garvill, 2003), wildlife management activities (Willcox, Giuliano, & Monroe, 2012), willingness to pay higher taxes and support for environmental organizations (Stern, Dietz, Abel, Guagnano, & Kalof, 1999). However, theoretical approaches have not been extensively applied to landowner conservation norms and behaviors in the context of water resource management. For example, a review of literature on agricultural best management practices (BMP) identified the lack of theoretical basis as a limitation in BMP adoption literature (Prokopy, Floress, Klotthor-Weinkauf, & Baumgart-Getz, 2008). Further, only

a few studies have linked individualism-collectivism to specific pro-environmental norms and behaviors.

The purpose of this dissertation is to examine the factors that influence pro-environmental norms and behaviors in the context of water resource management. To this end, an integrated moral obligation model was developed to investigate the relationship between environmental and cultural values, a series of activators, personal norm and behavior. The moral obligation model draws upon norm activation theory (Schwartz, 1977), theory of planned behavior (Ajzen, 1991) and value belief norm theory (Stern, 2000) to understand pro-environmental behavior. In the moral obligation model, feelings of personal obligation or personal norms to act are activated by a set of four activators: awareness of consequences, ascription of local responsibility, subjective norm and ability. These activators are influenced by environmental and cultural values. Personal norm is hypothesized to be a direct antecedent of pro-environmental behavior.

The specific research objectives of this dissertation are to:

i. Determine the factors that activate landowners' personal norms to protect water resources
ii. Determine the influence of activators and personal norm on landowners' civic engagement in water resource issues

This dissertation contributes to the theoretical understanding of the determinants of landowner conservation norms and behavior by proposing and testing an integrative framework of pro-environmental behavior. The integrative framework incorporates

aspects of rational and moral approach theories based on the notion that behavior results from multiple motivations. Study findings will enhance current understanding of the relationship among environmental and cultural values, beliefs, personal norms and pro-environmental behavior. In addition, the moral obligation model will enhance understanding of the norm activation process.

Understanding the determinants of landowner perceptions will help planners and resource managers develop targeted conservation policies and outreach programs to promote voluntary action. An understanding of landowner values, beliefs and norms will also help resource managers identify target audiences and design appropriate communication strategies. Identifying barriers to behavior change will help practitioners design effective programs to promote voluntary action by addressing real and perceived barriers to behavior change.

In the next two chapters of this dissertation, I review literature on psycho-social determinants of pro-environmental behavior and report on the study methods. In the fourth and fifth chapters I present two research articles. First, I examine the relationships between environmental and cultural values, a series of activators and landowners' personal norms to protect water resources in the Vermillion River and Sand Creek Watersheds, Minnesota (study I). Next, I investigate the influence of a series of activators and personal norm to be civically engaged on landowners' civic engagement in water resource conservation in the Cannon River Watershed, Minnesota (study II). Finally, I conclude with an integrated discussion and recommendations for future research in the sixth chapter.

Chapter 2: Literature Review

Environmental problems such as NPS pollution are rooted in human behavior and can thus be managed by changing relevant behaviors. However, changing human behavior is a challenging task. Interventions to change behavior are more effective when the determinants of behavior are understood (Steg & Vlek, 2009). Environmental psychologists have used various approaches from cognitive, social and experimental psychology (Vining & Ebreo, 2002) to understand the factors that influence pro-environmental behavior. Although varying in their theoretical and methodological approaches, researchers have focused on internal motivators such as values, attitudes, beliefs and norms as a basis to understand pro-environmental behavior. The purpose of this chapter is to review theoretical approaches to the study of pro-environmental behaviors.

Most theoretical models largely support a hierarchical organization of cognitions from stable values to peripheral and easily changed behaviors, with beliefs, norms and intentions as mediators (Fulton, Manfredo & Lipscomb 1996; Bruskotter & Fulton 2008). For example, in the value belief norm theory, human cognitions are organized in a causal link of variables from stable values to more focused beliefs and behaviors (Stern, 2000). Further, these approaches vary in their assumptions about human behavior. While the rational approach to pro-environmental behavior assumes that people primarily act in self-interest, theories based on moral approach regard environmental behaviors as situations of moral choice (Steg & Vlek, 2009). These approaches offer empirically tested predictors of pro-environmental behaviors. Theory of planned behavior, based on the

rational approach examines the influence of environmental attitudes, subjective norms and perceptions of behavioral control and behavioral intention on pro-environmental behavior (Ajzen, 1991). Theories based on the moral approach, such as the norm activation theory examine the influence of personal moral norms on environmental behavior (Schwartz, 1977). Value belief norm theory expands the norm activation theory by exploring the influence of values on behavior (Stern, 2000).

Rational and moral approaches have been used to examine specific behaviors such as political action and willingness to pay taxes for improved environmental quality (Stern, Dietz, & Kalof, 1993), water conservation (Trumbo & O'Keefe, 2001), personal car use (Nordlund & Garvill, 2003) and general pro-environmental behavior (Gärling, Fujii, Gärling, & Jakobsson, 2003; Kaiser, Hübner, & Bogner, 2005). Further, researchers examining the antecedents of behavior have defined pro-environmental behavior in different conceptual terms. The multiple definitions of pro-environmental behavior will be presented in the following section. Next, rational and moral approaches to understanding pro-environmental behavior will be reviewed, followed by a discussion of integrative approaches. In the last section, an integrative moral obligation model is proposed.

Pro-environmental behavior

Pro-environmental behavior is defined as behavior that "harms the environment as little as possible, or even benefits the environment" (Steg & Vlek, 2009, p. 309). It has been conceptualized as environmentally concerned behavior (Axelrod & Lehman, 1993),

environmentally significant behavior (Stern, 2000), conservation behavior (Vining & Ebreo, 2002) and ecological behavior (Kaiser, 1998)**.** While ecological behavior and environmentally concerned behavior are defined as "actions which contribute towards environmental preservation and/or conservation" (Axelrod & Lehman, 1993, p.153), environmentally significant behavior is defined in terms of its impact and intent (Stern, 2000). Stern (2000) has defined environmentally significant behavior by the extent to which a behavior alters the ecosystem (impact-oriented), and as a behavior that is performed with an intent to change the environment (intent-oriented). The impact-oriented definition of environmentally significant behavior helps to identify and target behaviors with the greatest impact. Some behaviors (e.g., deforestation, energy use) cause direct environmental change while others (e.g., global trade, environmental policies) cause environmental change by influencing the context in which environmental decisions are made. The intent-oriented definition can be used to understand and change target behaviors by identifying people's beliefs and motives.

Researchers have studied pro-environmental behaviors at different levels of specificity. Some have focused on specific behaviors such as water conservation (e.g., Trumbo & O'Keefe, 2001; Lam, 1999), recycling (e.g., Nigbur, Lyons, & Uzzell, 2010), willingness to reduce car use (Nordlund & Garvill, 2003), political behavior (Gärling et al., 2003), participation in riparian improvement programs (Corbett, 2002) and modes of transportation (e.g., Harland, Staats, & Wilke, 2007), while others have used indices of general environmental behavior (Kaiser, 1998; Kaiser, Hübner, & Bogner, 2005).

Stern (2000) postulated four different types of pro-environmental behaviors: environmental activism, private-sphere environmentalism, non-activist behaviors in the public sphere and other environmentally significant behaviors. Environmental activism includes commitment to behaviors that influence public policy system (e.g., involvement in social movements and demonstrations). Non-activists' support for environmental movement objectives constitutes public sphere non-activist behaviors. Stern (2000) also makes a distinction between active environmental citizenship behaviors (e.g., joining environmental organizations, petitioning on environmental issues) and public policy support (e.g., willingness to pay higher taxes for environmental protection). Private-sphere environmentalism includes behaviors such as household energy conservation, transportation choice and household waste disposal. Finally, other environmentally significant behaviors include an individual's influence on organizational action. Private-sphere and public-sphere environmentalism can result in positive environmental change. Private-sphere behaviors such as household energy conservation can cause these changes directly. However, the environmental impact is small and become significant only when a large number of people engage in the same behavior.

Selecting behaviors that significantly affect the environment is the first step in promoting behavior change (Steg & Vlek, 2009). Distinguishing between different classes of pro-environmental behaviors is useful in identifying and prioritizing behaviors that have the greatest impact on environmental quality. For example, public-sphere environmental citizenship behaviors such as influence on policy decision through voting may have a greater impact on environmental quality than recycling plastic bags. An

understanding of behavior types is useful in directing research towards behaviors that have a significant impact on environmental quality.

Methodologically, it is useful to distinguish between different classes of pro-environmental behaviors. Stern (2000) argues that the distinction between different types of behavior is not only conceptually useful, but is also more statistically reliable. For example, a factor analysis of 17 self-reported behaviors revealed three factors: consumer behaviors (private-sphere environmentalism), willingness-to-sacrifice (public-sphere environmentalism), and non-activist environmental citizenship actions (public-sphere environmentalism) (Stern et al., 1999). The consumer behavior dimension consisted of behaviors such as purchasing paper and plastic products made from recyclable materials and purchasing fruits and vegetables grown without pesticides or chemicals. The willingness-to-sacrifice dimension consisted of behaviors such as willingness to pay higher taxes to protect the environment and accepting cuts in standard of living to protect the environment. The environmental citizenship dimension consisted of behaviors such as voting for a candidate favoring environmental protection and giving money to an environmental group. In another study using the 1993 General Social Survey, Dietz, Stern and Guagnano (1998) reported three dimensions of pro-environmental behavior: consumer behavior (e.g., cut back on driving a car for environmental reasons), willingness to sacrifice for environmental quality (e.g., willingness to pay higher taxes) and collective or political behavior (e.g., signing a petition on an environmental issue).

The theoretical approach and associated socio-psychological variables that are most successful in explaining behavior also depend on the type of behavior studied (Steg

& Vlek, 2009; Stern, 2000; Turaga, Howarth, & Borsuk, 2010). While moral approaches are most successful in explaining low-cost behaviors (e.g., willingness to sacrifice, environmental citizenship), their explanatory power is reduced when examining high cost behaviors (e.g., consumer behavior, reducing car use). For high-constraint behaviors, rational approaches are most successful (Steg & Vlek, 2009; Turaga et al., 2010). From an applied perspective, understanding the predictors that are most powerful in explaining behaviors is useful in designing effective intervention strategies.

Rational approach

Pro-environmental behaviors have often been thought of as situations of rational choice. Individuals weigh the costs and benefits of an action and choose the alternative with the highest personal benefit (Steg & Vlek, 2009; Harland et al., 2007). A rational individual acts in self-interest motivated by the perceived consequences of their actions (Schultz, 2000). In traditional economic theory, this "rational" human being is represented as "economic man" or "homo economicus" (Simon, 1955; Turaga et al., 2010). The economic man is assumed to have the necessary knowledge about an issue, "a well-organized and stable set of preferences", and the cognitive ability to select a course of action that best attains their preferred outcome (Simon, 1955, p. 99). The analysis of cost and benefit, however, is not only in terms of money. The amount of effort required and social approval are also important considerations (Steg & Vlek, 2009). The rational choice approach assumes that people are ultimately rational in that they "make systematic use of information available to them" (Ajzen & Fishbein, 1980, p.5), are not "controlled

by unconscious motives or overpowering desires" (p.5) and their behavior is not thoughtless (Ajzen & Fishbein, 1980).

The earliest rational choice models were simple, linear models predicting the influence of environmental knowledge on awareness and environmental concern, which in turn predicted pro-environmental behavior. These models assumed that education would lead to more pro-environmental behavior. However, a review of the literature suggests that the knowledge- behavior link is weak (Kollmuss & Agyeman, 2002). Furthermore, this is a rather simplistic model that does not address the role of other variables (e.g., social norms).

Theory of Planned Behavior

Perhaps the most influential rational choice model in social psychology is the theory of planned Behavior (TPB). TPB provides a parsimonious framework that examines the influence of attitudes, subjective norms and perceived behavioral control (PBC) on pro-environmental behavior.

TPB is an extension of the theory of reasoned action. The theory of reasoned action assumes that behaviors are under volitional control of an individual. However, there are actions over which individuals have limited volitional control. TPB addresses this limitation of the theory of reasoned action by introducing a measure of behavioral control. Like the theory of reasoned action, the central feature in TPB is intention to perform a behavior. Intention is the proximal determinant of behavior and is defined as the extent to which individuals are willing to put effort into performing a behavior. As a

psychological construct, intention represents an individual's motivations to put effort into taking action. Stronger intentions to perform a behavior lead to actual performance of the behavior. However, factors such as availability of opportunities and resources can inhibit this relationship between intention and behavior. These factors represent actual control over the behavior and can act as barriers to performance of behavior. In TPB, the perception about these barriers to behavior is an important determinant of behavior. Perceived behavioral control (PBC) represents the individual's perception of the ease or difficulty of performing a behavior. The addition of this construct differentiates TPB from theory of reasoned action. PBC affects behavior in two ways: it influences behavior through its influence on intention and it has a direct influence on behavior. People form intentions to engage in a behavior depending on whether or not they believe they have control over them. The extent to which intention translates into action is also dependent on the control one has over the behavior (Eagly & Chaiken, 1993). In addition to PBC, intention is influenced by attitude toward the behavior and subjective norms. Attitude toward the behavior refers to the extent to which one evaluates a behavior as favorable or unfavorable. TPB predicts that the more favorable the attitude towards the behavior, the stronger is the individual's intention to act. Subjective norm is defined as the "perceived social pressure to perform or not perform a behavior" (Ajzen, 1991, p. 188). Individuals are more likely to engage in the behavior if they perceive that significant others approve of that behavior.

In TPB, the relative importance of attitudes, subjective norms and PBC vary across behaviors (Ajzen, 1991). For example, for behaviors where attitudes and

subjective norm are strong predictors, PBC may be less predictive of intention. Researchers have demonstrated a consistently strong influence of attitudes on intention. Similarly, previous studies have also demonstrated an independent influence of PBC on intention (e.g., Armitage & Conner, 2001). However, several authors have argued that subjective norm is the weakest predictor in TPB (e.g., Armitage & Conner, 2001; White, Smith, Terry, Greenslade, & McKimmie, 2009). For example, in a meta-analysis of 185 studies, Armitage and Conner (2001) reported higher attitude-intention and PBC-intention correlation than subjective norm-intention correlation (Armitage & Conner, 2001). PBC independently accounted for 6% of the variance in intention and added 2% to the prediction of behavior. The authors attributed the weak subjective norm-intention correlation primarily to poor measurement of the construct. Most studies included in this meta-analysis used single-item measures of subjective norm. Another important factor is the way subjective norm is conceptualized. A number of researchers have offered alternative conceptualizations of subjective norm. In TPB, subjective norm is operationalized as perceptions of what others approve (i.e., injunctive norm). Various authors have demonstrated the efficacy of descriptive norm as an alternative conceptualization of subjective norm (Cialdini, Kallgren, & Reno, 1991; Manning, 2009; White et al., 2009). Descriptive norms are defined as perceptions of what important others do (White et al., 2009). Personal norm is another type of norm that adds to the prediction of intention (e.g., Harland, Staats, & Wilke, 1999; Nigbur et al., 2010). The social identity approach has also shown some efficacy. In a study of household recycling, White et al. (2009) reported that for individuals who identified strongly with their group,

group norms predicted recycling intentions. Social support and not subjective norm has also been shown to have an influence on intention to exercise (Rhodes, Jones, & Courneya, 2002).

In summary, TPB suggests that human behavior is influenced by attitude toward the behavior, expectations of important others and on beliefs about the ease or difficulty of performing the behavior.

Empirical evidence for TPB

TPB has been used to examine a range of behaviors at varying levels of specificity. Specific behaviors such as water conservation (Trumbo & O'Keefe, 2001; Lam, 1999), participation in riparian improvement programs (Corbett, 2002), conservation technology adoption (Lynne, Franklin Casey, Hodges, & Rahmani, 1995), green hotel choice (Han, Hsu, & Sheu, 2010), wastepaper recycling (Cheung, Chan, & Wong, 1999), willingness to pay for recreational benefits (Bernath & Roschewitz, 2008) and environmental activism (Fielding, McDonald, & Louis, 2008) have been examined using TPB. Other researchers have used TPB as a framework to study general measures of environmental behaviors such as farmer conservation (e.g., hedge management, pesticide use, tree plantings) (Beedell & Rehman, 2000), wildlife management activities (e.g., managing hayfields, building fences) (Willcox et al., 2012) and a scale of general conservation behaviors (Kaiser et al., 2005).

The predictive ability of the variables in TPB is well established. For example, Armitage and Conner (2001) in a meta-analysis of 185 studies reported that attitude,

subjective norm and PBC account for 39% of the variance in intention. Intention and PBC accounted for 27% of the variance in behavior. In a study of wastepaper recycling behavior among college students in Hong Kong, Cheung et al. (1999) reported a significant influence of attitude, subjective norm and PBC on intention to recycle. This regression model explained 54% of variance in intention. Furthermore, intention was a significant predictor of recycling behavior (β=0.45, R^2=20%). Attitude was the strongest predictor of intention to recycle and PBC added to the explanation of intention. Similarly, in another study of private forest owners' choice of reforestation method, attitude, subjective norm and PBC were significant predictors of forest owners' intention to adopt natural reforestation method (Karppinen, 2005). This model explained 36% of the variance in intention. Attitude was the strongest predictor of intention. Lam (1999) demonstrated the efficacy of TPB in predicting intention to conserve water (e.g., intention to use less water, install water-saving appliances). While attitude, subjective norm and PBC were significant predictors of intention to use less water, subjective norm was not a significant predictor of intention to install water-saving appliances.

Other studies provide only partial support for TPB. In a study of wildlife management activities (Willcox et al., 2012) reported that although attitude and subjective norm were significant predictors of intention, the influence of PBC on intention was not statistically significant. Moreover, TPB explained only 16% of the variance in intention to engage in management activities. The authors suggest that wildlife management activities such as managing hayfields and building fences are largely under ranchers' volitional control. Similarly, in another study of Utah

landowners' intention to participate in riparian improvement programs, the only TPB variable of significance was subjective norm related to water resources (Corbett, 2002). The author suggested that TPB may not be effective in explaining behaviors such as participation in riparian improvement programs that require significant monetary commitment. Another reason the author cited was the influence of societal constraints on individual behavior that is not represented in TPB.

Limitations of a rational approach

The major limitation of the rational approach is that human cognitions are not always rational. The "homo economicus" framework of human thought is not always representative of human behavior. TPB regards environmental behaviors as situations of rational choice (Harland et al., 1999; Steg & Vlek, 2009). However, environmental behaviors have often been described as moral situations where one's self-interest is in conflict with the interest of others (Nordlund & Garvill, 2002; Nordlund & Garvill, 2003). TPB ignores these moral considerations (Kaiser et al., 2005).

TPB also does not account for the value basis of motivations to engage in pro-environmental behavior. Although, beliefs about a behavior and evaluation of the outcomes are offered as antecedent to attitudes (Eagly & Chaiken, 1993), TPB does not account for underlying values that may influence these beliefs. The underlying value assumption in TPB is that people act in self-interest. However, altruistic values also play a role in human decision making (Schwartz, 1977). In addition, some research suggests that a distinct biospheric value (e.g., preserving nature for its intrinsic value) may play a

role in people's decisions regarding pro-environmental behavior (Stern, 2000; De Groot & Steg, 2008). The role of moral considerations and values in influencing pro-environmental behaviors are discussed next.

Moral approach

A moral choice situation is one where an individual's actions have consequences for the welfare of others. In a moral choice situation, individuals are aware that others' well-being depends on their actions. Further, they also feel responsible for their action and its consequences. Their actions are evaluated as good or bad based on the consequences of those actions on the welfare of others (Schwartz, 1970). Environmental behaviors are a particular type of moral choice situation where an individual's actions can benefit society and the environment. For example, recycling and consumer behavior have been treated as moral behaviors because these behaviors have the potential to benefit others by reducing environmental harm (Thøgersen, 1996; Thφgersen, 1999). In a moral choice situation, environmental behaviors and attitudes are a function of an individual's moral beliefs about what is the right or wrong course of action (Thøgersen, 1996). Moral norms are the reference point for the evaluation of an action as good or bad (Schwartz, 1970). As opposed to the rational approach, decisions based on feelings of moral obligation are irrational in that they are not based on external influences (Schwartz, 1977).

Norm activation theory

Schwartz (1977) proposed the norm activation theory (NAT) where personal moral norms, self-expectations regarding pro-social behavior, guide people's altruistic behaviors. NAT posits that people act in ways that are consistent with their values. Schwartz (1977) proposed that the intensity of personal obligation an individual feels to take action influences behavior, and that these personal obligations are activated by an individual's cognitive structure of values. However, personal norms may be neutralized by a defense mechanism, thus preventing the performance of behavior. Individual differences in personal norms lead to differences in performance of behavior. Furthermore, the conditions under which personal norms are activated and the conditions that influence the defense against personal norm dictate the norm-behavior relationship.

NAT proposes an activation, obligation and defense step that influence action. In the activation step, an individual first becomes aware of another individual, group or abstract entity in need (*awareness of need*). Further, individuals must be aware that their actions have consequences for the welfare of others (*awareness of consequences).* According to NAT, when individuals become aware of the consequences of their actions on others, they are more likely to generate feelings of personal obligation. Activation of personal norm also requires a perception that there are actions that can alleviate the need *(efficacy)*. This is followed by the recognition that one is capable of taking those actions to relieve the need (*ability)*. Finally, activation of personal norm requires that an individual feels some responsibility to become involved (*situational responsibility).* This process leads to the activation of norms. Personal norms can be deactivated in two ways:

by denying a state of need and by denial of responsibility. Feelings of moral obligation may be neutralized by denying that another entity is in a state of need (*denial of need)* or by denying that one's actions have adverse consequences on others (*denial of responsibility).* Responsibility denial is the tendency to deny responsibility for the consequences of one's actions on others. Individuals less likely to deny responsibility for their actions are more likely to generate feelings of personal obligations.

It is useful to distinguish between two different types of norms: personal and social/subjective norms (an element of TPB). While expectations and sanctions from social norms are tied to the social environment, expectations and sanctions from personal norms are tied to self. Personal norms are held by individuals and can vary from one individual to another, while social norms are shared by members of a group. Social norms can influence personal norms and behavior, if they are used by an individual as bases for self-evaluation. In other words, personal norms are internalized social norms (Schwartz, 1977).

Schwartz (1977) also made distinctions between norms and values. Values are underlying, enduring structures independent of specific situations (Rokeach, 1973), while norms are guides about what should or should not be done under particular circumstances (Schwartz, 1977). Values and norms are also identified as distinct cognitive structures in the cognitive hierarchy model (Fulton et al., 1996). This distinction is useful because values are arranged in a hierarchy based on importance to self and serve as bases for self-evaluation. Personal norms are generated congruent with the value hierarchy. NAT is based on the assumption that people are motivated primarily by altruistic value. The

activation of norms based on other values (e.g., egoistic, biospheric) in an individual's value hierarchy are not considered in this framework. However, Schwartz (1977) argues that norm activation is not necessarily exclusive to altruistic behavior. This suggests that individuals may refer to values other than altruism to construct personal norms. Value-Belief-Norm theory is an extension of NAT that explains the value bases of norm activation under situations that are not exclusively altruistic.

Value belief norm theory

As in NAT, VBN positions personal norm as a key factor that directly influences pro-environmental behavior (Stern, 2000). The VBN theory provides a causal chain of determinants of pro-environmental behavior that moves from stable elements of personality and beliefs to more focused beliefs about the adverse consequences for valued objects, and an individual's personal responsibility to reduce the threat of those consequences.

VBN hypothesizes that personal moral norms are activated when individuals become aware of the adverse consequences of an environmental condition that threaten what the individual values (*awareness of consequences)* and feels a sense of responsibility to reduce the threat of those adverse consequences (*ascription of responsibility)* (Stern, Dietz, and Black, 1986*;* Stern et al., 1999*;* Stern, 2000). In addition, VBN links NAT with values theory. VBN theory postulates that egoistic, altruistic and biospheric values provide bases for beliefs that influence pro-environmental behavior (Stern, 2000). Values act as filters for information leading people to seek or

accept information selectively. Thus values influence individuals in forming beliefs about the consequences for themselves, for other human beings or for other species and the ecosystem (Stern & Dietz, 1994). Egoistic individuals value the aspects of the environment based on how it affects them personally. If personal costs of protecting the environment are perceived to be too high, individuals with egoistic values are more inclined to oppose environmental protection. However, egoists who believe that they are personally threatened by environmental change are likely to be pro-environmental. Altruistic values are seen in individuals who judge aspects of the environment based on costs and benefits to a human group such as a community, nation or all humanity. Individuals with biospheric values judge the environment based on the costs and benefits for the ecosystem. People who value the ecosystem and other species highly are likely to become aware of the adverse consequences of environmental conditions that threaten the ecosystem. Similarly, people who value other people will be concerned about the consequences of environmental conditions that threaten other people (Stern and Dietz, 1994; Stern, Dietz, and Guagnano, 1998).

Empirical evidence

Theories based on moral approach (NAT and VBN) have been applied to various types of pro-environmental behaviors at varying levels of specificity. Specific private-sphere behaviors such as water conservation, transportation choice (Harland et al., 2007), recycling (Bratt 1999; Nigbur, Lyons, and Uzzell 2010), willingness to reduce car use (Nordlund & Garvill, 2003), public transportation use (Bamberg, Hunecke, & Blöbaum,

2007), consumer behavior (e.g., purchasing organic fruits and vegetables) (Stern et al., 1999) and energy conservation (Tyler, Orwin, & Schurer, 1982) have been studied using NAT and VBN. Researchers have also examined the role of personal norms in explaining public-sphere policy support behaviors such as acceptability of energy policies (Steg, Dreijerink, & Abrahamse, 2005) and willingness to sacrifice (e.g., paying higher taxes, lowering standard of living) (Stern et al., 1999). Yet others have applied VBN to environmental citizenship behaviors such as signing petitions in support of environmental laws, contributing money to environmental organizations and voting for candidates based on their position on environmental issues (Stern et al., 1986; Stern et al., 1999; Gärling et al., 2003). Moral approach has also been employed to examine general environmental behavior using a scale that consists of behaviors such as water conservation, consumer behavior, ecological automobile use and volunteering (e.g., Nordlund & Garvill, 2002; Kaiser et al., 2005).

The role of personal norm in predicting conservation behavior has been well established (e.g., Bamberg & Möser, 2007; Stern, 2000; Harland, Staats, & Wilke, 2007). In a meta-analysis of 46 studies on pro-environmental behavior published since 1995, Bamberg and Möser (2007) reported personal norm as a significant independent predictor of behavioral intention. The predictive ability of personal norm (β =0.29) was as strong as that of attitude (β =0.29) and PBC (β=0.31).

In a study examining the factors that affect environmentalism among respondents in the United States, Stern, Dietz, Abel, Guagnano and Kalof (1999) found that personal norm was strongly associated with different indicators of environmentalism. Their study

reported three dimensions of environmentalism: consumer behavior (e.g., purchasing organic vegetables, purchasing recycled products), willingness-to-sacrifice (e.g., willingness to pay higher taxes to protect the environment), and environmental citizenship (e.g., giving money to an environmental group). The variables from the VBN model accounted for 19-35% of the variance in the three dimensions of environmentalism. Personal norm to protect the environment was the only variable with a direct effect on consumer behavior and willingness-to-sacrifice. Similarly, in their study of curbside recycling, Nigbur, Lyons and Uzzell (2010) reported a significant influence of personal norm on intention to recycle.

Steg et al. (2005) provided further support for the causal order of variables in VBN. In a study of acceptability of pricing policies aimed at reducing household carbon dioxide emissions, they reported that *awareness of consequences* of energy use predicted *ascription of responsibility* to self, which in turn predicted personal norm to conserve energy. Personal norm, in turn, was a significant predictor of acceptability of energy policies, explaining 29% of the variance in that behavior. Another study of acceptability of energy policies supported the mediational model of awareness of consequences, ascription of responsibility and personal norm (De Groot & Steg, 2009). Similarly, another study of environmental citizenship (e.g., signing a petition in support of tougher environmental laws) supported the causal chain of variables proposed in VBN (Gärling et al., 2003).

Although most studies have focused on variables proposed in VBN (awareness of consequences and ascription of responsibility), the influence of other factors proposed in

NAT have also received some support within the domain of pro-environmental behaviors. In a study examining the influence of NAT variables on personal norms and behavior, Harland et al. (2007) reported that awareness of need and situational responsibility significantly predicted behavioral intentions to use modes of transportation other than car and to conserve water. Furthermore, adding ability and efficacy to this model increased the proportion of variance explained in pro-environmental behavioral intentions. When ability and efficacy were added to a hierarchical regression, the proportion of variance explained increased from 12% to 43% in the intention to use modes of transportation other than the car and from 21% to 58% in the intention to close the faucet. In an additional study, the ability of activators to predict pro-environmental behavior, and the mediating role of personal norm was investigated. Harland et al. (2007) found that denial of responsibility had a significant negative correlation with volunteering for an environmental organization, and awareness of consequences was marginally significant ($p<0.10$). Personal norm to volunteer was found to mediate the relationship between awareness of need and volunteering.

The structure of environmental values and its predictive ability have been the focus of many studies. For example, in a study of environmentally significant behavior (e.g., donating money to an environmental organization), De Groot and Steg (2008) revealed a three-dimensional value structure: biospheric, altruistic and egoistic. Further, egoistic value was a significant negative predictor of awareness of consequences of energy problems, while biospheric value was a significant positive predictor of ascription of responsibility. All three values were predictive of general beliefs as measured by the

New Environmental Paradigm (NEP). Similarly, in another study of acceptability of energy policies, Steg et al. (2005) established the three-dimensional structure of environmental values. As hypothesized in VBN, these values also predicted NEP beliefs. Further, biospheric value was a significant positive predictor of personal norm to reduce household energy consumption. However, in a study of collective political action, Stern and Dietz (1994) were not able to distinguish between biospheric and social-altruistic values. Similarly, in a study aimed at developing a short scale to measure environmental values, Stern, Dietz and Guagnano (1998) found that a scale that combined biospheric and altruistic values had a higher reliability score than the altruistic value scale alone. Although the structure of environmental values is not well established, it is clear that they have an influence on pro-environmental beliefs and behaviors. The above studies provide support for the VBN hypothesis that values provide bases for beliefs about the adverse consequences of an environmental condition and an individual's responsibility to take action. Further, empirical evidence suggests that values are part of the cognitive structure that activates personal norms. Provided that strong personal norms are activated and are not neutralized in the defense step as outlined in NAT, personal norm should lead to the performance of behavior.

Although environmental values describe human interactions with the environment, they do not relate to human-human interactions. These interactions become especially salient in a social dilemma where there is a conflict between short-term, individual and long-term, collective interests. Acting in the interest of others and the environment (i.e., pro-environmental behavior) is considered a moral choice (Nordlund &

Garvill, 2002). The influence of social value orientation and cultural values on pro-environmental behavior is discussed next.

Moral choice in social dilemmas

The choice of acting or not acting pro-environmentally has often been characterized as a social dilemma. The influence of social relationships on human-environment interactions can be understood using the social dilemma approach. Social dilemmas represent a conflict between immediate individual and collective long term interests. In a social dilemma, an individual receives higher payoff for acting in self-interest than for acting in collective interest, yet, all individuals receive lower payoff if everyone acts in self-interest than in collective interest (Dawes & Messick, 2000; Dawes, 1980). For example, there are immediate benefits to an individual for traveling by car (i.e., self-interest) instead of using public transportation (i.e, collective interest). However, the long term consequences for all individuals in a society is worse (e.g., air pollution) if all individuals act based on self-interest.

Rational approach suggests that human behavior is driven primarily by self-interest. However, studies on pro-environmental behaviors such as recycling (Thøgersen, 1996) and transportation choice (Nordlund & Garvill, 2003) have demonstrated that people sacrifice individual short-term benefits for collective interests. Acting in the collective interest (referred to as cooperation) requires short-term sacrifices (i.e., cost to self) while accumulating benefits for others in the long term. Thus, cooperation in a social dilemma may be considered a moral choice. Similarly, acting pro-environmentally

is considered the morally right thing to do because these behaviors require people to restrain egoistic tendencies in favor of collective interests. These feelings of moral obligation or personal norms are a basis for pro-environmental behaviors (Stern, 2000). Further, individuals who perceive social dilemma as moral choice also tend to cooperate more (Nordlund & Garvill, 2003; Van Lange, 1992).

The extent to which a behavior in a social dilemma is perceived as moral depends on social value orientation (Liebrand, Jansen, Rijken, & Suhre, 1986; Liebrand & McClintock, 1988). Social value orientations are individuals' preferences for distribution of benefits among themselves and others (Liebrand & Van Run, 1985). Messick & McClintock (1968) identified three social value orientations: cooperative, individualistic and competitive. This study employed the "decomposed game" method where participants were asked to allocate money or points to themselves and to others. Participants with individualistic value orientation maximize gain for self, those with cooperative value orientation maximize gain for self and others, and those with competitive value orientation make choices based on relative-gain maximization (i.e., higher gain for self than others). Researchers have generally compared cooperators or pro-socials with pro-selfs (combined individualists and competitors) (e.g., Gärling et al., 2003; Van Vugt, Van Lange, & Meertens, 1996). For example, in a study that presented the use of public transportation as a social dilemma, pro-socials demonstrated higher preferences for public transportation than pro-selfs (Van Vugt et al., 1996). Similarly, in a study evaluating support for an employee trip reduction program in Philadelphia, Cameron, Brown and Chapman (1998) demonstrated that social value orientations

influence an individual's tendency to support or oppose the program. Pro-selfs were more likely to believe that there are higher personal costs associated with the program, and thus were likely to write letters opposing the program. Pro-socials on the other hand were more likely to support the program. Further support for the influence of social value orientation on cooperation comes from a study on water conservation behavior. Using a 10-item scale assessing voluntary water conservation (e.g., taking fewer showers, washing cars less often), Bonaiuto et al. (2008) found a significant difference between pro-socials and pro-selfs. Pro-socials were more likely to conserve water voluntarily than pro-selfs. Pro-socials and pro-selfs also differed in their awareness of environmental consequences. In a study of environmental citizenship behaviors, pro-selfs were more influenced by awareness of environmental consequences for themselves. Providing further support for the moral approach, Gärling et al. (2003) found that both pro-selfs and pro-socials' behavioral intentions were influenced by personal norm. However, this relationship was slightly stronger for pro-socials than pro-selfs.

Pro-social and pro-self values are also reflected in Schwartz's value clusters: self-transcendence and self-enhancement. Self-transcendent value represents acceptance of others as equals and a concern for the welfare of others, while self-enhancement represents valuing one's relative success and dominance over others (Schwartz, 1994). Self-transcendence serves collective interest while self-enhancement serves individual interest. Self-transcendence is positively related to cooperative social value orientation (Gärling, 1999). Further, self-transcendence has been positively correlated with pro-environmental behavior (e.g., Gärling, 1999; Nordlund & Garvill, 2002, 2003; Stern &

Dietz, 1994). In their study of general pro-environmental behaviors (e.g., buying environmentally friendly products, energy conservation), Nordlund and Garvill (2002) found that individuals with self-transcendent values felt a greater sense of moral obligation to protect the environment that those with self-enhancement values. Similarly, in a study of willingness to reduce personal car use, Nordlund and Garvill (2003) reported that the moral obligation to reduce personal car use was influenced positively by self-transcendent value. Personal norm, in turn, was a significant positive predictor of willingness to reduce car use. These findings suggest that in a social dilemma, the more important collective values are to individuals, the more moral obligation they feel thus resulting in higher levels of cooperative behavior.

The conflict of acting in one's own interest or in the interest of others is also represented in two dimensions of cultural values: individualism and collectivism. When described as a social dilemma, pro-environmental behaviors require individuals to restrain their individualistic tendencies, and act altruistically for the benefit of others (Nordlund & Garvill, 2003). In a cross-cultural study comparing cooperative choice among American (individualistic) and Vietnamese (collectivistic) undergraduate students, Vietnamese students cooperated at a higher rate than the Americans (Parks & Vu, 1994). Participants in the study were asked to decide whether to contribute towards provision of public good (i.e, public goods dilemma) or take from a pool (i.e., resource dilemma). In both conditions, cultural dimensions had a significant influence on participants' choice. In another study that employed a prisoner's dilemma game, Hemesath and Pomponio (1998) reported that American students demonstrated more self-interested and less

cooperative behavior that Chinese students. In social dilemma games, cooperation is typically defined by levels of payoff (e.g., points, money) an individual assigns to others (e.g., Hemesath & Pomponio, 1998).

Although the cooperative behavior described in these studies is not pro-environmental behavior, they demonstrate the influence of cultural values on cooperation in social dilemmas. Since pro-environmental behaviors require one to act in collective interest, these value dimensions can be expected to have a similar influence on pro-environmental behaviors. Furthermore, these studies are cross-cultural in nature. However, individuals within a culture can exhibit individualistic and collectivistic tendencies (Triandis 1994). Two major attributes distinguish individualism from collectivism: i) the definition of self, and ii) priority of goals. Collectivists tend to define their self as part of a group, while individualists define themselves as independent. For collectivists, groups are the "basic units of social perception" (Triandis 1994, p.47). Collectivists prioritize group goals over their personal goals, while individualists prioritize personal goals over group goals (Triandis & Gelfand 1998). Collectivists value sharing, cooperation and group harmony, while individualists value achievement and autonomy.

Only a few studies have focused on the influence of individualism-collectivism on pro-environmental behavior. For example, in a study of recycling behavior, McCarty and Shrum (2001) reported that collectivism was a statistically significant positive predictor of beliefs about the importance of recycling. Individualists on the other hand were more likely to believe that recycling is inconvenient. Parboteeah, Addae and Cullen (2012)

demonstrated a positive relationship between collectivism and support for sustainability initiatives (e.g., willingness to pay taxes). Cho, Thyroff, Rapert, Park and Lee (2012) reported indirect effects of individualism and collectivism on willingness to engage in pro-environmental consumer behavior, mediated by environmental attitude.

Comparison across theoretical approaches

Rational and moral approaches to pro-environmental behavior make varying assumptions about pro-environmental behavior. While the rational approach is based on the assumption that individuals act in self-interest, the moral approach considers moral motivations in human decision making (Table 2-1). Further, the theoretical variables offered by these approaches and related theories have received widespread empirical support. TPB provides a useful framework to explain private-sphere behaviors such as water conservation (Trumbo & O'Keefe, 2001) and conservation technology adoption (Lynne et al., 1995). VBN and NAT are good predictors of private-sphere behaviors such as willingness to reduce car use (Nordlund & Garvill, 2003) and water conservation (Harland et al., 2007), as well as public-sphere behaviors such as acceptability of energy policies (Steg et al., 2005) and voting based on environmental issues (Stern et al., 1999).

A few studies have compared the predictive ability of TPB, NAT, and VBN. In a study using structural equation modeling to analyze survey data, Kaiser et al. (2005) found that TPB's intention accounted for 95% of conservation behavior compared to 64% of conservation behavior accounted for by VBN's personal norm. Furthermore, the determinants in TPB, attitude, subjective norms and perceived behavioral control

explained 76% of the variance in behavioral intention. Kaiser et al. (2005) argues that theoretically, VBN is a stronger model than TPB because the relationships among variables in VBN are fully specified. However, TPB is a stronger model in terms of prediction of conservation behavior. In another study of glass recycling behavior, the overall model fit and predictive ability of TPB was better than VBN (Aguilar-Luzón, García-Martínez, Calvo-Salguero, & Salinas, 2012). These findings indicate that TPB variables are good predictors of specific and general private-sphere pro-environmental behaviors. In contrast, other comparative studies have provided support for NAT and VBN variables. In studies comparing TPB, NAT and VBN, researchers have found that NAT and VBN are comparable to TPB in explaining private-sphere and public-sphere behaviors. For example, in a comparative study of American and Chilean students, NAT, VBN and TPB were equally effective in explaining political behavior (e.g., participating in protests against environmental conditions) in both samples (Cordano, Welcomer, Scherer, Pradenas, & Parada, 2011). Providing more support for the moral approach, this study found that personal norms were consistently the best predictor of intention in both samples. Similarly, NAT (R^2=33%) and TPB (R^2=32%) were equally predictive of willingness to pay for forest conservation (Liebe, Preisendörfer, & Meyerhoff, 2011). Wall, Devine-Wright and Mill (2007) demonstrated that NAT (R^2=33%) explains more variance in students' intentions to travel by car than TPB (R^2=23%). In addition, an integrated model of TPB and NAT variables was more predictive (R^2=38%) of intention than either individual models.

These studies demonstrate the efficacy of both the rational and moral approaches in explaining pro-environmental behavior. The theoretical framework best suited to understanding behavior may depend on the type of behavior studied. Furthermore, the variables within each theory may be more or less predictive of behavior. Researchers have successfully combined theoretical approaches and demonstrated that these integrative approaches provide more insights into the relationships between variables than individual models. Examples of these integrative approaches are described next.

Table 2-1. Comparison across theoretical approaches.

	Theoretical approaches		
	Rational approach	Moral approach	
Theories	Theory of Planned Behavior (TPB)	Norm Activation Theory (NAT)	Value Belief Norm (VBN)
Assumptions	Regards environmental behavior as situations of rational choice (Harland et al., 2007; Steg & Vlek, 2009)	Regards environmental behavior as situations of moral choice (Harland et al., 2007; Steg & Vlek, 2009)	Regards environmental behaviors as situations of moral choice (Stern, 2000)
Description	Behavior is influenced by *intention* to perform the behavior and perceived ease or difficulty of performing the behavior (*Perceived behavioral control)* (Ajzen, 1991)	Behavior is influenced by the extent of personal moral obligation (*personal norm*) an individual feels to perform a behavior (Schwartz, 1977).	Behavior is influenced by *personal norm* and indirectly by *values* through its influence on beliefs (Stern, 2000).
Critiques	Ignores moral considerations (Kaiser et al., 2005); assumes self-interest values and does not account for the influence of other values on behavior.	Assumes altruistic values; other value bases for behavior are not considered.	In addition to altruistic value, accounts for egoistic and biospheric values, but not the influence of social relationships on pro-environmental behavior.
Example studies	(Corbett, 2002; Han et al., 2010; Kaiser et al., 2005; Lynne et al., 1995; Trumbo & O'Keefe, 2001)	(De Groot & Steg, 2009; Bamberg & Möser, 2007; Gärling et al., 2003; Harland et al., 2007; Nordlund & Garvill, 2002, 2003; Steg et al., 2005; Stern et al., 1999)	

Towards integration

One approach to integration has been the moral extension of TPB. Researchers have proposed and tested simple models of TPB with an additional variable: personal norm. For example, in an evaluation of an environmental intervention program, Harland et al. (1999) found that when personal norm was added to TPB, the percent variance explained in various behavioral intentions and pro-environmental behaviors (e.g., reducing meat consumption using energy-saving light bulbs) increased by 1-10%. The contribution of personal norm in explaining behavior was greater than that of attitude, subjective norm, and perceived behavioral control for three out of the four behaviors analyzed. The contribution of subjective norm was consistently lower than other constructs in the model. Similarly, in a study of household waste recycling, personal norm along with attitude and PBC were significant predictors of both recycling intention and behavior (Nigbur et al., 2010). Injunctive social norm, however, was not a significant predictor of intention. White et al. (2009) reported similar results in another study of household recycling. These findings suggest that for pro-environmental behaviors that have a moral component, personal norm is particularly salient. Further, the significant influence of PN and not SN suggests that a conceptualization of normative construct not found in TPB is particularly useful in predicting behavior.

Kaiser (2006) argues that personal norms are already represented in environmental attitudes. In an application of the moral extension of TPB, Kaiser (2006) demonstrated that the influence of moral norms on intention is mediated by attitudes. Attitudes and personal norms also had near perfect correlations, indicating lack of

discriminant validity. Kaiser (2006) suggested that moral norms could be the evaluative basis for environmental attitudes. Chan and Bishop (2013) also reported high correlations between attitude and moral norm. They found that a TPB model with moral norm instead of attitude was consistent with the data. Moral norm, subjective norm and perceived behavioral control were significant predictors of intention to recycle, which in turn predicted behavior.

Yet other studies have applied more complex integrative frameworks. For example, in a study of public transportation use among residents of two German cities, Bamberg et al. (2007) tested two integrative models. The first model demonstrated a direct influence of personal norm on behavior. Subjective norm also had a statistically significant direct influence on personal norm. Personal norm influenced 36% of the variance in public transportation use in a subsample of Frankfurt residents. A second, more complex model demonstrated that TPB variables add to the explanation of public transportation use. The influence of personal norm on behavior was mediated by intention. A meta-analysis of the determinants of various pro-environmental behaviors also supports this conclusion (Bamberg & Möser, 2007). While supporting TPB findings that attitudes and PBC influence intention, the integrative framework tested in the meta-analysis also provides support for the influence of personal norm on intention. Further, the significant influence of subjective norm on personal norm suggests that social factors play an important role in the activation of personal norm. Another integrative model referred to as “comprehensive action determination model”, combines variables from TPB and VBN, including self-transcendence and self-enhancement values (Klöckner &

Blöbaum, 2010; Klöckner, 2013). In a recent meta-analysis of the determinants of pro-environmental behavior, Klöckner (2013) argued that TPB variables along with personal norm provide more proximal determinants of pro-environmental behavior than NAT or VBN. The comprehensive action determination model is also consistent with VBN in that awareness of consequences and ascription of responsibility activated personal norm. In addition, self-transcendence was a significant positive predictor of personal norm, while self-enhancement was a negative predictor. As in previous studies, in the comprehensive action determination model, the influence of values, beliefs and norms on behavior were mediated by intention. Based on these findings, Klöckner (2013) suggests that intervention strategies must focus primarily on attitude, PBC, subjective and personal norm, and intention.

In summary, a review of the literature on pro-environmental behavior suggests that behaviors are not driven solely by self-interest; moral considerations are also an important motive. Models of pro-environmental behavior including integrative models generally support the cognitive hierarchy model where human cognitions are organized hierarchically from values that are stable and limited in number to peripheral, numerous and easily changed behaviors, with beliefs, attitudes and intentions as mediators. Consistent with the cognitive hierarchy model, most research on values suggests that their influence on behavior is mediated by several intermediate variables. Although several studies using VBN and related models have demonstrated this indirect influence of environmental values on pro-environmental behavior, only a few studies have examined the influence of cultural values on pro-environmental behavior. Further, recent

studies have also demonstrated that integrative frameworks that combine elements of the rational (TPB) with the moral approach (NAT and VBN) provide more insights into the relationships between variables than individual models. Thus, an integrative framework is proposed and discussed in the next section.

An integrative framework: Moral Obligation Model

The moral obligation model (MOM) of pro-environmental behavior (Figure 2-1) draws from both the rational and moral approaches. Aspects of TPB (Ajzen, 1991), NAT (Schwartz, 1977), and VBN (Stern, 2000) have been incorporated into this framework. The primary outcome of interest in this framework is pro-environmental behavior. For the purposes of this study, pro-environmental behavior is conceptually defined as "actions which contribute to environmental preservation and/or conservation" (Axelrod and Lehman, 1993).

As in the cognitive hierarchy model, the variables are organized from stable values to peripheral and profuse behaviors with activators and personal norm as intermediate variables. An individual has stable values, defined as "an enduring belief that a specific mode of conduct or end-state of existence is personally or socially preferable to an opposite or converse mode of conduct or end-state of existence" (Rokeach, 1973, p. 5)**.** These values are not easily altered during an individual's life. However, personal norms can be activated in individuals with differing values.

Personal norms are rooted in values. Personal norms are conceptually different from values in that values are independent of specific situations (Schwartz, 1977). These

norms are activated by the four activators in this framework. The extent to which personal norms are activated depends upon whether an individual is aware of the consequences of environmental conditions (*awareness of consequences),* ascribes relevant actors with the responsibility to take action (*responsibility*), perceives that one can take action (*ability*), and believes that significant others think that they should engage in the behavior (s*ubjective norm*).

These activators are in turn influenced by the stable, underlying values. Studies employing VBN suggest that environmental values act as filters for information, leading people to seek or accept information selectively. The three dimensions of environmental values are- egoistic, altruistic, and biospheric (Stern, 2000). Environmental values influence individuals in forming their beliefs about the consequences an environmental condition (i.e. *awareness of consequences*) (Stern and Dietz, 1994). Two dimensions of cultural values: individualism and collectivism are included in this framework to expand on the value dimensions from VBN. When environmental problems are defined as social dilemmas, individualism and collectivism represent the conflict between individual and collective interest. This model explores the influence of these values on norms and behaviors.

Personal norm predict behavior, provided that an individual has the ability to take action. The ability to take action in MOM influences behavior in two ways: it has a direct influence on behavior, and it influences behavior through its influence on personal norm.

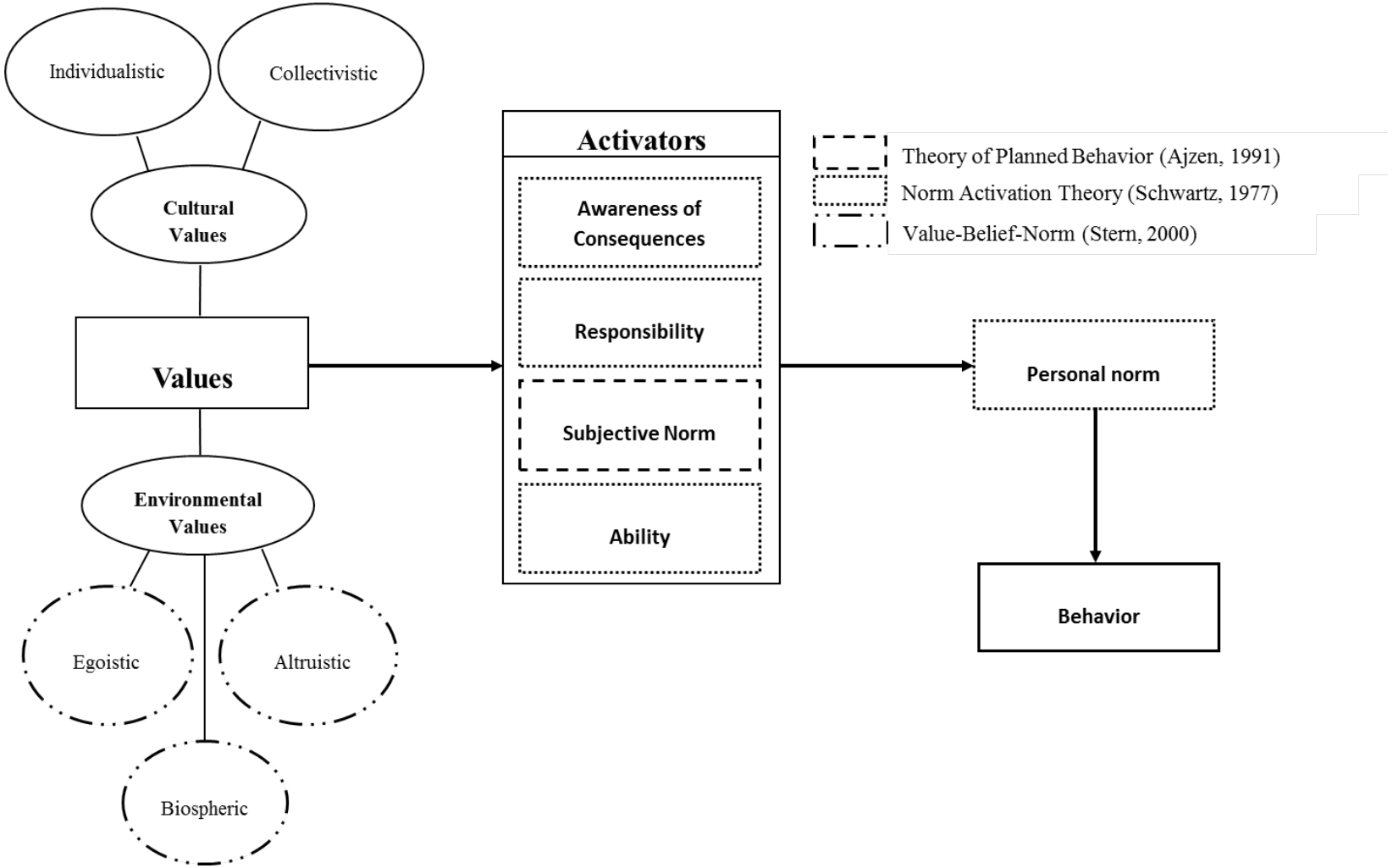

Figure 2-1. Moral obligation model of pro-environmental behavior

Chapter 3: Methods

Study I

Study Area

The study was conducted in two watersheds in southern Minnesota: Sand Creek and Vermillion River watersheds. The Vermillion River watershed, a subwatershed of Mississippi River watershed, stretches across Scott, Dakota and Goodhue counties (Table 3-1, Appendix AI). The Sand Creek watershed is a subwatershed of the Minnesota River watershed. It stretches across Scott, Le Sueur and Rice counties (Table 3-1, Appendix AII).

Table 3-1. Study watershed characteristics: Vermillion River and Sand Creek watersheds

Watershed	**Watershed area**[a]	**Counties**	**Population (1990)**	**Population (2010)**	**Population density (per square mile, 2010)**
Vermillion River	348 sq. miles	Dakota	275,227	398,552	709
		Scott[b]	57,846	129,928	172
		Goodhue	40,690	46,183	103
Sand Creek	279 sq. miles	LeSueur	23,239	27,703	56
		Rice	49,183	64,142	180

Data from US Census Bureau
a. Watershed areas calculated based on GIS data from Minnesota Department of Natural Resources Data Deli.
b. Scott county extends through both the watersheds.

The Vermillion River watershed is the largest watershed in the metropolitan area. The primary land use in the watershed is agricultural with significant portions of urban and undeveloped land (Table 3-2). In the Vermillion River watershed, Scott and Dakota

counties have seen the most significant population increases in the last two decades (Table 3-1). The Vermillion River is the only world class trout stream in the United States within a metropolitan area (*Vermillion River Corridor Plan*, 2010). The cumulative effects of land management within the watershed have led to water quality problems. Stretches of the Vermillion River are listed as impaired by the MPCA due to fecal coliform, low dissolved oxygen, polychlorinated biphenyls, and turbidity. Water quality in the watershed is dependent on decisions made by landowners within the watershed, especially riparian landowners (*Vermillion River Corridor Plan*, 2010). Resource managers in the watershed are concerned about the water quality impacts of land use practices at the individual landowner level. One of the needs as identified in the Vermillion River Corridor Plan (2010) is greater adoption of best management practices by landowners in the watershed.

Although smaller in size than Vermillion River watershed, Sand Creek watershed has also seen significant population growth in the last two decades, most notably in Scott County (Table 3-1). The major land use in the watershed is agricultural. However, urban development is scattered throughout the watershed (Table 3-2). One of the issues identified by a technical advisory committee in 2007 was the impact of agricultural and urban development on the landscape (*Sand Creek Watershed TMDL and Impaired Waters Resource Investigations*, 2010). Sand Creek and its tributaries are listed as impaired by MPCA for aquatic life due to turbidity and fish index of biotic integrity (*Sand Creek Watershed TMDL and Impaired Waters Resource Investigations*, 2010). Scott county watershed management organization (WMO) has set several goals to

address the issues and needs identified in its comprehensive water resource management plan (2009). One of the issues identified in this plan is the need for public involvement and behavior change. In addition, awareness of consequences of actions among residents in the watershed was also identified as a need. To that end, Scott county WMO set the goal to "increase public participation and land and water stewardship" (*Scott WMO Comprehensive Water Resource Management Plan*, 2009, p. 3-47).

Table 3-2. Land cover by county: Vermillion River and Sand Creek watersheds

Watershed	County	Agriculture	Grass/ shrub/ wetland	Forest	Water	Urban
Vermillion	Dakota	49.64%	12.74%	11.94%	2.72%	22.97%
	Scott	45.99%	23.12%	13.80%	3.17%	13.92%
	Goodhue	59.00%	11.76%	19.51%	2.50%	7.22%
Sand Creek	LeSueur	61.85%	18.44%	7.13%	5.00%	7.58%
	Rice	58.65%	18.85%	10.17%	3.31%	9.01%

Source: land.umn.edu

Data collection

Data were collected using a self-administered survey of a stratified random sample of riparian landowners who live within 300 feet of a stream or ditch. The sampling frames were generated from county tax records. Surveys were mailed to a random sample of 1000 landowners in each watershed. In order to increase response rates, Dillman's (2009) Tailored design method was used and included four waves: pre-notice postcard, a questionnaire with a cover letter and a postage-paid envelope, a reminder postcard and a replacement questionnaire and cover letter.

A pre-test and a pilot of the survey instrument were also conducted. The pre-test was conducted using a focus group. Participants were asked to complete the survey

questionnaire and provide feedback on the content and structure of the questionnaire. A pilot of the survey was conducted by mailing the survey to local natural resource professionals and watershed residents. The participants were asked to complete the survey questionnaire and provide feedback using a survey comment sheet. Feedback from the pre-test and pilot were used to develop the questionnaire.

Questionnaire Development

The questionnaire assessed landowners' values, beliefs, norms and behaviors through closed-ended questions in fixed-choice and Likert-type scales (Appendix AIII). The questionnaire includes a page describing the purpose of the survey and definitions of a watershed and streamside buffer. The questionnaire is designed based on extensive literature review. Several questions are adapted from other research (Blasczyk, Your views on local water resources, 2010; Seekamp, Davenport and Brehm, Lower Kaskaskia River Watershed Resident Survey, 2009; Harland, Staats, & Wilke, 2007; Matsumoto, Weissman, Preston, Brown, & Kupperbusch, 1997; Prokopy et al., 2009; Schwartz, 1977; Stern, Dietz, & Guagnano, 1998; Stern, Dietz, & Kalof, 1993). The questionnaire also collected socio-demographic information (e.g., age, gender, income, ownership arrangement). Examples of items for specific theoretical constructs relevant to this study are presented below.

Environmental values: Environmental values were measured using a scale adapted from Stern, Dietz and Guagnano (1998). The three value dimensions: egoistic, altruistic and biospheric were measured using three items each. Consistent with values research by

Schwartz (1994) and others, the question stem was framed as “How important are each of the following as guiding principles in your life?” The response format was in a five-point scale from “not at all important” to “extremely important.” Three items that measure biospheric values are “To preserve nature for its own sake”, “To maintain unity with nature” and “To respect the earth”. Altruistic values will be measured using items such as “To protect nature for human health and well-being” and “To distribute natural resources fairly”. Egoistic values will be measured with items such as “To protect private property rights” and “To use natural resources for personal income”.

Cultural values: Cultural values were measured using a short version of the Individualism-Collectivism Interpersonal Assessment Inventory (ICIAI) developed by Matsumoto et al. (1997). This scale measures individualism and collectivism in relation to a referent group (e.g., community). The question stem was framed as “How important are each of the following as guiding principles in your life?” Participants were asked to rate each item on a five-point scale from “not at all important” to “extremely important”. Collectivism was measuring using four items including “To identify myself as a member of my community” while individualism was measured using two items: “To be different from members of my community” and “To pursue my personal goals even if they conflict with broader community goals.”

Awareness of consequences: Items measuring awareness of consequences are largely adapted from Hansla et al. (2008). This construct was measured using three items

including “The effects of water pollution on public health are worse than we realize” and “Water pollution poses serious threats to the quality of life in my community”. Respondents were asked to rate each item on a 5-point Likert scale from “strongly disagree” to “strongly agree”.

Ascription of local responsibility: Two items assessed ascription of responsibility to the community: “Landowners/property owners in my community should be responsible for protecting water quality” and “Local government should be responsible for protecting water quality.” Respondents rated each item on a 5-point Likert scale from “strongly disagree” to “strongly agree”.

Ability: Respondents’ perceived *ability* to protect water resources was measured using items such as “If I wanted to, I have the ability to change the way I use my land/property to protect water resources.” Respondents rated each item on a 5-point Likert scale from “strongly disagree” to “strongly agree”.

Personal norm: Personal norm to protect water resources was measured using items such as “I feel a personal obligation to do whatever I can to protect water resources” and “I feel a personal obligation to use conservation practices on my land/property.” Respondents rated each item on a 5-point Likert scale from “strongly disagree” to “strongly agree”.

Statistical Analyses

Responses were numerically coded and entered into a database using Statistical Package for Social Sciences (SPSS release 19.0). All descriptive analyses were conducted using SPSS release 19.0. Internal consistency of the scales was measured using coefficient alpha. Multiple items are used to measure each theoretical construct. Hence, factor structure of each construct will be assessed using confirmatory factor analysis (CFA).

Multiple measures improve the measurement properties of a theoretical construct (Maruyama, 1998). When multiple measures are used, different sources of variance can be disentangled. Multiple measures also help to estimate and establish reliability of a theoretical construct. Most models require multiple measures for each theoretical construct. Factor analysis allows for the use of multiple measures for each conceptual variable. It links the observed measures with the conceptual variable. Factor analysis is a way of accounting for the influence of observed measures on the underlying theoretical construct. These theoretical constructs, when used in factor analysis, become known as factors. In confirmatory factor analysis, the measures that define each factor are assigned to the factor rather than letting the factor analysis method define those factors, as in exploratory factor analysis. Using theoretical knowledge about a construct or variable, multiple measures can be assigned in advance to each theoretical construct in a model. Confirmatory factor analysis helps to estimate the relationship among the variables. The plausibility of the hypothesized factors (or theoretical models) can then be assessed. Plausibility or model fit can be assessed using model fit statistics similar to the fit

statistics for structural equation models. In fact, CFA models are a type of latent variable structural equation model. However, only the inter-correlations of these variables can be analyzed using confirmatory factor analysis (Maruyama, 1998).

Latent variable structural equation modeling was used to understand the hypothesized relationships between latent variables. Confirmatory factor analysis and latent variable structural equation modeling was conducted using LISREL version 8.8. Structural equation modeling provides estimates of the relationships between variables in a hypothesized model. This method provides information about the direct and indirect influence of one variable on another. Hypothesized models can either be accepted as consistent with the data or rejected as inconsistent. Therefore, structural equation methods are a useful tool to examine plausibility of a theoretical model (Maruyama, 1998). Structural equation modeling makes use of regression methods while providing additional information about the influence of various predictors on the criterion variable. Structural equation modeling is more advantageous than regression methods because it helps to distinguish between the direct influence of a predictor variable on a criterion variable from the influence resulting from the inter-correlations between the predictor variables. Furthermore, unlike regression methods, latent variable structural equation modeling allows the use of multiple measures for each theoretical construct in the model. Latent variable SEM makes use of factor analysis. Each latent variable is measured using multiple measures. The factors that are extracted using confirmatory factor analysis are then used as variables in structural equation models.

Matrices for LISREL syntax were set up using the procedure outlined by Maruyama (1998). Model fit were assessed using the following fit indices: the maximum likelihood χ^2, the relative χ^2 (χ^2/df), the root mean-square error of approximation (RMSEA), comparative fit index (CFI), incremental fit index (IFI), non-normed fit index (NNFI) and standardized root mean square residual (SRMR). Larger values of χ^2 indicate poorer model fit. χ2 is distributed with mean and standard deviation equal to its degrees of freedom, so we use relative χ^2 to assess model fit compared to an expected model. A relative χ^2 of five or less indicates an acceptable model fit (Schumacker & Lomax, 2004). However, χ2 is directly related to sample size, so additional indexes are needed to assess model fit. RMSEA values below 0.10 are acceptable. RMSEA is also an appropriate index to compare fit of nested models. Values of CFI, IFI and NNFI above 0.95 are recommended as a cutoff value. A cutoff of 0.08 is recommended for SRMR (Hu & Bentler, 1999). After obtaining a fitting measurement model for environmental values, the other latent variables were introduced into the model. Model fit of the structural model will be assessed using the same indices as described above.

Study II

Study Area

The study was conducted in Cannon River watershed. The two major rivers in the Cannon River watershed, Cannon and Straight Rivers, drain into the Mississippi River. The Cannon River watershed stretches across Dakota, Rice, LeSueur, Waseca, Steele and Goodhue counties (Table 3-3, Appendix BI).

Table 3-3. Study watershed characteristics: Cannon River watershed

Watershed	Watershed area[a]	Counties	Population (1990)	Population (2010)	Population density (per square mile, 2010)
Cannon River	1460 sq. miles	Dakota	275,227	398,552	709
		Rice	49,183	64,142	180
		LeSueur	23,239	27,703	56
		Waseca	18,079	19,136	45
		Steele	30,729	36,576	85
		Goodhue	40,690	46,183	103

Population data from US Census Bureau
[a]Source: Cannon River Watershed Partnership (2011)

The major land use in the watershed is agricultural, with approximately 70% of the land used for agricultural production (Table 3-4). The watershed has seen significant population growth in the last two decades, most notably in Dakota County. The major pollutants of concern in the watershed are sediment, phosphorus, *E. coli* and pesticides (Cannon River Watershed Partnership, 2011).

Table 3-4. Land cover by county: Cannon River watershed

Watershed	County	Agriculture	Grass/ shrub/ wetland	Forest	Water	Urban
Vermillion	Dakota	49.64%	12.74%	11.94%	2.72%	22.97%
	Rice	58.65%	18.85%	10.17%	3.31%	9.01%
	LeSueur	61.85%	18.44%	7.13%	5.00%	7.58%
	Waseca	82.15%	6.26%	2.84%	1.93%	6.81%
	Steele	79.65%	7.80%	3.56%	0.43%	8.58%
	Goodhue	59.00%	11.76%	19.51%	2.50%	7.22%

Source: land.umn.edu

The existing management structure in the watershed includes multiple government entities at the state and local levels. While local counties, soil and water conservation districts and cities have water management plans, Minnesota Board of Soil and Water Resources (BWSR) is responsible for ensuring that local plans are coordinated

with state water protection efforts. Cannon River Watershed Partnership (CRWP), a citizen-initiated non-profit group, in partnership with Minnesota Pollution Control Agency (MPCA) and other local partners developed a watershed-wide management strategy. Their management strategy emphasizes the need for adoption of best management practices and landowners' civic engagement in watershed protection (Cannon River Watershed Partnership, 2011).

Data collection

Data were collected using a self-administered survey of a random sample of landowners in the Cannon River watershed. The sampling frames were generated from county tax records. Surveys were mailed to a random sample of 1082 landowners. An adapted Dillman's (2009) Tailored design method was used and included three waves; each wave included a cover letter, a questionnaire and a postage-paid envelope.

A pilot of the survey instrument was also conducted. A pilot of the survey was conducted by mailing the survey to local natural resource professionals and watershed residents. The participants were asked to complete the survey questionnaire and provide feedback using a survey comment sheet. Feedback from the pre-test and pilot were used to develop the questionnaire.

Questionnaire Development

The questionnaire assessed landowners' values, beliefs, norms and behaviors through closed-ended questions in fixed-choice and Likert-type scales (Appendix BII). The cover page of the questionnaire describes the purpose of the survey, provides definitions of water resources and conservation practices, and provides instructions for

returning the survey. The questionnaire also collects socio-demographic information (e.g., age, gender, income, ownership arrangement and size of property). Examples of items for specific theoretical constructs relevant to the analysis in this study are presented below.

Ascription of local responsibility: Two items assessed ascription of local responsibility: "Landowners/property owners in my community should be responsible for protecting water quality" and "Local government should be responsible for protecting water quality." Respondents rated each item on a 5-point Likert scale from *strongly disagree* to *strongly agree*.

Subjective norm: Two items measured subjective norm to protect water resources in the study: "People who are important to me expect me to use conservation practices on my land/property" and "People who are important to me expect me to do whatever I can to prevent water pollution". Respondents were asked to rate each item on a five-point Likert scale from *strongly disagree* to *strongly agree.*

Ability: Landowners' perceived ability to protect water resources (e.g., by using conservation practices) was assessed using two items: "I have the knowledge and skills I need to use conservation practices on my land/property" and "I have the time to use conservation practices on my land/property." Respondents were asked to rate each item on a five-point Likert scale from *strongly disagree* to *strongly agree.*

Personal norm: Three items measured personal norm to protect water resources. An example item is “I feel a personal obligation to work with other community members to protect water quality”. Respondents were asked to rate each item on a five-point Likert scale from *strongly disagree* to *strongly agree.*

Civic engagement: Civic engagement was measured using three items. Respondents were asked to report the number of times they have engaged in the three civic engagement behaviors in the past 12 months. Example behaviors are “attended a meeting, public hearing or community discussion about a water resource issue” and “worked with community members to protect water resources”. Responses were coded in a five-point scale as 0 times (1), 1 time (2), 2-4 times (3), 5-10 times (4) and more than 10 times (5).

Statistical Analyses

Responses were numerically coded and entered into a database using Statistical Package for Social Sciences (SPSS release 19.0). All descriptive analyses were conducted using SPSS release 19.0. Internal consistency of the scales was measured using coefficient alpha.

As in study I, the hypothesized relationships were analyzed using structural equation modeling. The correlation matrix of the observed variables was used as the input matrix. The analysis was conducted using the maximum likelihood method in LISREL 8.80.

Model fit were assessed using the following fit indices: the maximum likelihood χ^2, the relative χ^2 (χ^2/df), the root mean-square error of approximation (RMSEA), comparative fit index (CFI), incremental fit index (IFI), non-normed fit index (NNFI) and standardized root mean square residual (SRMR). Larger values of χ^2 indicate poorer model fit. χ2 is distributed with mean and standard deviation equal to its degrees of freedom, so we use relative χ^2 to assess model fit compared to an expected model. A relative χ^2 of five or less indicates an acceptable model fit (Schumacker & Lomax, 2004). However, χ2 is directly related to sample size, so additional indexes are needed to assess model fit. RMSEA values below 0.10 are acceptable. RMSEA is also an appropriate index to compare fit of nested models. Values of CFI, IFI and NNFI above 0.95 are recommended as a cutoff value. A cutoff of 0.08 is recommended for SRMR (Hu & Bentler, 1999).

Chapter 4: Study I and II Research Articles

An integrated moral obligation model for landowner conservation behavior (Study I)

Introduction

Despite the growing number and diversity of initiatives aimed at reducing water pollution in the last two decades, water resource managers have yet to find a solution to the problem of non-point sources, defined as pollution from diffusely distributed urban and rural land use practices. In Minnesota, like many Midwest states, the water quality problem persists. More than 11,500 miles of streams (MPCA, 2010) and 3,500 water bodies (MPCA, 2012) are listed as impaired for one or multiple uses. Although much is known about the biophysical aspects of managing water resources, the human dimensions of water resource management are not as well understood. Managing watersheds is not only about managing the biophysical resources within the watersheds, but it also entails managing human activities that individually and cumulatively impact water resources (Brooks et al., 2003). Within a watershed, landowners play a key role in protecting and improving water quality.

Traditional watershed management strategies such as regulations, capital improvement projects and payment programs can be costly, difficult to enforce and unsustainable (Davenport et al., 2013; Feather & Cooper, 1995). Current management approaches to non-point sources rely heavily on voluntary human action. Local conservation personnel employ strategies such as education and technical assistance in an attempt to persuade landowners to adopt conservation practices. While there is evidence

that these strategies have increased knowledge levels and reduced financial and physical (i.e., equipment, labor) barriers associated with water resource conservation (Davenport & Pradhananga, 2012; Eckman et al., 2013; Feather & Cooper, 1995), their success in changing landowner behavior and ultimately resolving the problem of non-point source pollution has been questioned (Morton & Weng, 2009; Schultz, 2011). We argue that a broader approach to behavior change might be required to address the real determinants of conservation behavior (Steg & Vlek, 2009).

To better understand the factors that influence pro-environmental behavior, environmental psychologists have adapted various behavior models from cognitive, social and experimental psychology (Vining & Ebreo, 2002)**.** Most theoretical models largely support a hierarchical organization of cognitions from stable values to peripheral and easily changed behaviors, with beliefs, norms and intentions as mediators (Fulton et al., 1996; Bruskotter & Fulton, 2008).

Actions without direct and immediate benefits to the actor such as pro-social (e.g., helping others) or pro-environmental (e.g., protecting prairies) behaviors are believed to be morally grounded. A moral approach to conservation decision making suggests that people are more likely to act pro-environmentally in situations where they feel a moral obligation to act (Harland et al., 2007). According to the norm-activation theory (NAT), these feelings of moral obligation, or personal norms are central to altruistic behavior (Schwartz, 1977). Similarly, the value-belief-norm (VBN) theory positions personal norm as a direct antecedent of pro-environmental behavior (Stern, 2000). Personal norms serve as the reference point for the evaluation of an action as good or bad (Schwartz, 1970).

When individuals view the action as a moral choice, they are more likely to engage in that behavior (Nordlund & Garvill, 2003). Studies on environmental behaviors (e.g., recycling) suggest that pro-environmental behaviors are driven by an individual's moral beliefs or personal norms (e.g., Thøgersen, 1996). When personal norms are activated, individuals take voluntary action. For example, in a study of acceptability of energy policies, Steg et al. (2005) demonstrated that personal norms have a significant positive influence on the support for energy policies aimed at reducing carbon-dioxide emissions. In the context of water resource management, understanding personal norms helps resource managers design effective conservation strategies to promote voluntary behavior change (e.g., adopt conservation practices).

The influence of personal norms on conservation behavior has been well established (e.g., Bamberg & Möser, 2007; Stern, 2000); Harland et al., 2007). Behaviors such as water conservation, transportation choice (Harland et al., 2007), support for environmental protection (Stern, Dietz, and Black, 1986), recycling (Bratt, 1999; Nigbur et al., 2010), willingness to reduce car use (Nordlund & Garvill, 2003), political behavior (Gärling et al., 2003) and energy conservation (Tyler et al., 1982) have been studied using NAT and VBN. In a meta-analysis of 46 studies published since 1995, Bamberg and Möser (2007) reported personal norm as a significant independent predictor of behavioral intention. The predictive ability of personal norm ($\beta = 0.29$) was independent of and as strong as that of attitude ($\beta = 0.29$) and perceived behavioral control ($\beta = 0.31$). In a study based on NAT, Harland, Staats and Wilke (2007) reported a statistically significant influence of personal norm on behavioral intention (e.g., using transport forms

other than the car, turning off the faucet). Similarly, Stern et al. (1999) found that personal norms were the strongest predictor of consumer behavior and willingness to sacrifice. More recently, in a study of curbside recycling, Nigbur et al. (2010) reported a significant influence of personal norm on intention to recycle.

NAT and VBN also help explain the process of norm activation. According to NAT, when individuals become aware of the consequences of their actions on others and take responsibility for their actions, they are more likely to generate feelings of personal obligation to act. In addition, *ability,* an individual's perception of the availability of resources to perform the behavior activates personal norms (Schwartz, 1977; Harland, Staats, and Wilke 2007). Similarly, VBN hypothesizes that personal moral norms are activated by beliefs about adverse consequences to entities or conditions the individual finds important (*awareness of consequences)* and the ascription of responsibility to relevant actors to reduce the threat of those adverse consequences (*ascription of responsibility)* (Stern, Dietz, and Black 1986*;* Stern et al. 1999*;* Stern 2000). In addition, VBN links NAT with values theory. Studies employing VBN have provided evidence for the hypothesis that egoistic, altruistic and biospheric values provide a basis for beliefs that drive pro-environmental behavior (e.g., Stern et al., 1999; Stern, 2000; Hansla et al., 2008). Values act as filters for information, leading people to seek or accept information selectively. Thus values influence individuals in forming beliefs about the consequences for themselves, for other human beings or for other species and ecosystems (Stern & Dietz, 1994). Individuals with egoistic value orientations value the aspects of the environment based on how it affects them personally. Altruistic values are seen in

individuals who judge aspects of the environment based on consequences to a human group such as a community, nation or all humanity. Individuals with biospheric values judge the environment based on consequences for the ecosystem and value the environment for its own sake (Stern and Dietz, 1994; Stern, Dietz, and Guagnano, 1998). The structure of environmental values has been the focus of many studies. For example, in a study of environmentally significant behavior (e.g., donating money to an environmental organization), De Groot and Steg (2008) reported a three-dimensional value structure: biospheric, altruistic and egoistic. However, in a study of collective political action, Stern and Dietz (1994) were not able to distinguish between biospheric and social-altruistic values. Similarly, in a study aimed at developing a short scale to measure environmental values, Stern, Dietz and Guagnano (1998) found that a scale that combined biospheric and altruistic values had a higher reliability score than the altruistic value scale alone.

Pro-environmental behaviors are also described as social dilemma situations (Nordlund & Garvill, 2002). In a social dilemma, cooperation has benefits for all individuals, but the immediate individual gain is always greater if the individual acts in self-interest (Dawes, 1980). As a social dilemma, pro-environmental behaviors may require individuals to restrain their individualistic tendencies, and act altruistically for the benefit of others (Nordlund & Garvill, 2003). The conflict of acting in one's own interest or in the interest of others is represented in two dimensions of cultural values: individualism and collectivism. Cultural values and specifically dimensions of individualism and collectivism may help us understand the influence of these tendencies

in shaping pro-environmental behavior. Although most often employed in cross-cultural studies, individuals within a culture can exhibit individualistic and collectivistic tendencies (Triandis, 1994). Two major attributes distinguish individualism from collectivism: i) the definition of self and ii) priority of goals. Collectivists tend to define self as part of a group, while individualists define themselves as independent. Collectivists prioritize group goals over their personal goals, while individualists prioritize personal goals over group goals (Triandis & Gelfand, 1998).

Only a few studies have focused on the influence of individualism-collectivism on pro-environmental behavior. For example, in a study of recycling behavior, McCarty and Shrum (2001) reported that collectivism was a statistically significant positive predictor of beliefs about the importance of recycling. Individualists on the other hand were more likely to believe that recycling is inconvenient. Parboteeah et al. (2012) demonstrated a positive relationship between collectivism and support for sustainability initiatives (e.g., willingness to pay taxes). Cho et al. (2013) reported indirect effects of individualism and collectivism on willingness to engage in pro-environmental consumer behavior, mediated by environmental attitude.

A moral approach to pro-environmental behavior has been applied to private-sphere environmental behaviors (e.g., consumer behavior), policy support (e.g., willingness to pay higher taxes) and environmental citizenship (e.g., support for environmental organizations) (Stern et al. 1999; Stern, 2000). However, moral approaches have not been extensively applied to landowner conservation behaviors in the context of water resource management. For example, a review of literature on agricultural

best management practices (BMP) revealed that very few studies have examined water management practices (Prokopy et al., 2008). Further, researchers have identified a lack of theoretical basis as a limitation in BMP adoption literature (Prokopy et al., 2008; Reimer, Thompson, & Prokopy, 2012). Although researchers have demonstrated the influence of values and norms on pro-environmental behavior, studies have not linked individualism-collectivism to specific pro-environmental norms. This study applies an expanded VBN model to explain the role of values and beliefs in the activation of landowner conservation norms.

Study conceptual model

This study's conceptual model, the integrated moral obligation model (Figure 4-1) draws from previous models including NAT and VBN to describe relationships between values, beliefs and norms. Individuals act in ways that are consistent with their values and norms. Actions such as voluntary adoption of conservation practices are altruistic behaviors because they benefit others and the environment. Actions that benefit others are driven by moral norms (Schwartz 1977). According to moral theories such as NAT and VBN, personal moral norms are activated by an individual's cognitive structure of values and beliefs (Schwartz 1977; Stern 2000). The causal link of variables from values to awareness of consequences, ascription of responsibility and personal norms in VBN has received widespread support (Stern and Dietz 1994; Stern et al. 1999; Nordlund and Garvill 2002; Gärling et al., 2003; Hansla et al., 2008; De Groot & Steg, 2009). Stern and Dietz (1994) demonstrated the links between biospheric, altruistic and egoistic values and

awareness of consequences in a study of political behavior (e.g., willingness to participate in demonstrations). Using structural equation modeling, Gärling et al. (2003) demonstrated that awareness of consequences significantly predicts ascription of responsibility, which in turn was predictive of personal norm to protect the environment. De Groot and Steg (2009) also provided support for a similar mediational model of awareness of consequences, ascription of responsibility and personal norm in their study of acceptability of energy policies.

Based on previous studies employing NAT and VBN, biospheric and altruistic values are hypothesized to have a positive influence on awareness of consequences while egoistic values are predicted to have a negative influence. Collectivists value sharing, cooperation and group harmony. For collectivists, groups are the "basic units of social perception" (Triandis 1994, p.47). Summarizing the relationships between individualism/collectivism and personality traits, Triandis (2001) reported a positive correlation between collectivism and social responsibility. Collectivists are more likely to ascribe responsibility to reduce adverse consequences of a collective/social problem (water pollution in this study) to local actors (e.g., other landowners, local government). In this study, collectivism is predicted to have a positive influence on ascription of local responsibility while individualism is predicted to have a negative influence. Awareness of consequences, ascription of local responsibility and ability are predicted to influence personal norms to protect water resources.

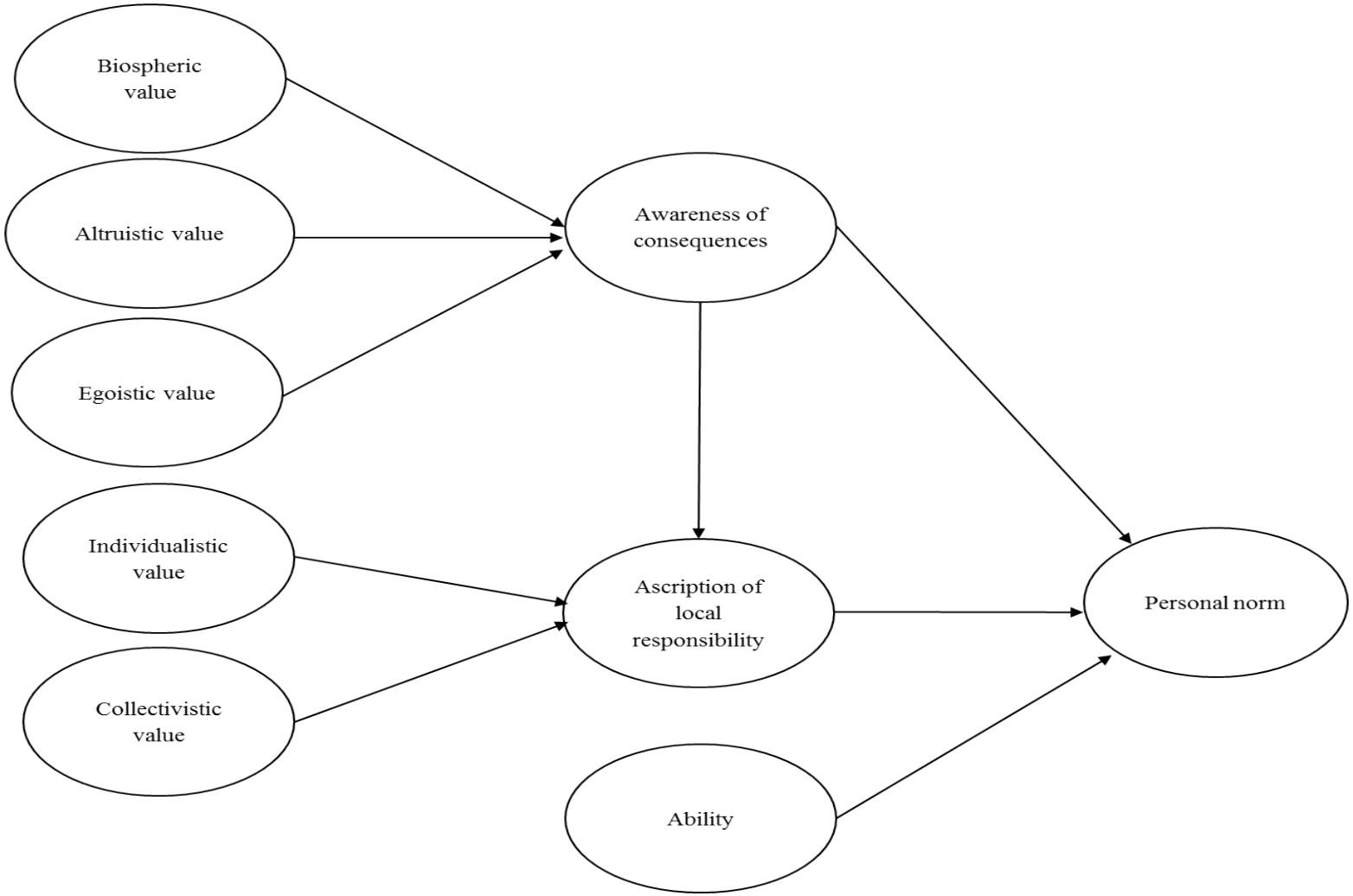

Figure 4-1. Study conceptual model: Moral obligation model

Methods

Study watersheds

Data for this study were collected through a self-administered survey of riparian landowners in Sand Creek and Vermillion River watersheds. The Sand Creek watershed is a subwatershed of the Minnesota River watershed. It stretches across Scott, Le Sueur and Rice counties in south-central Minnesota. The Vermillion River watershed, a subwatershed of Mississippi River watershed, stretches across Scott, Dakota and Goodhue counties. The major land use in both the watersheds is agricultural with scattered urban development.

Non-point source pollution is a concern in both watersheds. Stretches of the Vermillion River are listed by the Minnesota Pollution Control Agency (MPCA) as impaired due to fecal coliform, low dissolved oxygen, polychlorinated biphenyls, and turbidity (*Vermillion River Corridor Plan*, 2010). Sand Creek and its tributaries are listed as impaired for aquatic life because of turbidity and diminished biotic integrity for fish (*Sand Creek Watershed TMDL and Impaired Waters Resource Investigations*, 2010). In order to promote adoption of conservation practices, Scott County and the Scott Soil and Water Conservation District initiated a Technical Assistance and Cost Share (TACS) program in 2006 (Davenport et al., 2013). This program provides incentive payments for practices such as filter strips and wetland restoration and cost share for 20 practices. In addition, resource managers in Scott County aim to create a “buffered environment” as a long term approach to manage stream impairments. To inform these strategies and direct

others, watershed managers partnered with the University of Minnesota to investigate the determinants of landowner conservation behaviors.

Data collection

Data were collected from a geographically stratified, random sample of riparian landowners who live within 300 feet of a stream or ditch. The sampling frames were generated from county tax records. A random sample of 1000 landowners was selected to receive a questionnaire from each watershed. An adapted version of (Dillman et al., 2009) Tailored Design Method was employed and included four waves: a pre-notice postcard, a questionnaire with a cover letter and a postage-paid envelope, a reminder postcard and a replacement questionnaire and cover letter. Data were collected from March through August 2011.

Measures

Environmental values: Environmental values were measured using a scale adapted from Stern, Dietz and Guagnano (1998). Consistent with values research by Schwartz (1994) and others, the question stem was framed as "How important are each of the following as guiding principles in your life?" The response format was in a five-point scale from "not at all important" to "extremely important." This construct was measured using nine items including "To preserve nature for its own sake", "To conserve natural resources for human use" and "To use natural resources for personal income."

Cultural values: Cultural values were measured using a short version of the Individualism-Collectivism Interpersonal Assessment Inventory (ICIAI) developed by Matsumoto et al. (1997). This scale measures individualism and collectivism in relation to a referent group (e.g., community). The question stem was framed as "How important are each of the following as guiding principles in your life?" Participants were asked to rate each item on a five-point scale from "not at all important" to "extremely important". Collectivism was measuring using four items including "To identify myself as a member of my community" while individualism was measured using two items: "To be different from members of my community" and "To pursue my personal goals even if they conflict with broader community goals."

Awareness of consequences: Items measuring awareness of consequences are largely adapted from Hansla et al. (2008). This construct was measured using three items including "The effects of water pollution on public health are worse than we realize" and "Water pollution poses serious threats to the quality of life in my community". Respondents were asked to rate each item on a 5-point Likert scale from "strongly disagree" to "strongly agree".

Ascription of local responsibility: Two items assessed ascription of responsibility to the community: "Landowners/property owners in my community should be responsible for protecting water quality" and "Local government should be responsible for protecting

water quality." Respondents rated each item on a 5-point Likert scale from "strongly disagree" to "strongly agree".

Ability: Respondents' perceived *ability* to protect water resources was measured using three items including "If I wanted to, I have the ability to change the way I use my land/property to protect water resources." Respondents rated each item on a 5-point Likert scale from "strongly disagree" to "strongly agree".

Personal norm: Personal norm was measured using three items including "I feel a personal obligation to do whatever I can to protect water resources" and "I feel a personal obligation to use conservation practices on my land/property." Respondents rated each item on a 5-point Likert scale from "strongly disagree" to "strongly agree".

Analysis

Cronbach's alpha was used to assess internal consistency of each latent variable measured with more than two items, while Pearson's correlation was used for latent variables measured with two items. We used confirmatory factor analysis to identify the best fitting measurement model for each latent variable in the structural model. Given an acceptable measurement model fit, the structural model with values, beliefs and personal norm was analyzed. The correlation matrix of the observed variables was used as the input matrix. Confirmatory factor analysis and the structural equation modeling analyses were conducted using the maximum likelihood method in LISREL 8.80.

We assessed model fit using maximum likelihood χ^2, relative χ^2 (χ^2/df), root mean-square error of approximation (RMSEA), comparative fit index (CFI), incremental fit index (IFI), non-normed fit index (NNFI) and standardized root mean square residual (SRMR). Larger values of χ^2 indicate poorer model fit. χ2 is distributed with mean and standard deviation equal to its degrees of freedom, so we use relative χ^2 to assess model fit compared to an expected model. A relative χ^2 of five or less indicates an acceptable model fit (Schumacker & Lomax, 2004). However, χ2 is directly related to sample size, so additional indexes are needed to assess model fit. RMSEA values below 0.10 are acceptable. RMSEA is also an appropriate index to compare fit of nested models. Values of CFI, IFI and NNFI above 0.95 are recommended as a cutoff value. A cutoff of 0.08 is recommended for SRMR (Hu & Bentler, 1999).

Results

Of the 2000 surveys mailed, 118 were returned undeliverable and 750 completed surveys were received, resulting in a final response rate of 40%. After employing listwise deletion for missing values on all model variables, the effective sample size was 492. Most of the respondents were male (73%), white (98%) and own and manage their own land/property (77%). The median age of respondents was 53. Compared to census statistics, our study sample represents a higher proportion of men, white and non-Latino populations, individuals with bachelor's degree or higher and individuals who earn $100,000 or more. The median age of the study respondents was also higher than the county population. These differences indicate that our sample may not be representative

of county population. However, our study specifically targeted riparian landowners, a subpopulation within the watershed. We also conducted a wave analysis of early and late respondents to assess potential non-response bias effects (Lankford, Buxton, Hetzler, & Little, 1995). There were no significant differences between early and late respondents in sociodemographic characteristics, except age. The mean age of early respondents (mean=55) were slightly higher than late respondents (mean=53).

Measurement model

Fit for a measurement model with nine latent variables (Model A) including three dimensions of environmental values (i.e., *biospheric, altruistic* and *egoistic*), *individualistic* and *collectivistic values, awareness of consequences, ascription of responsibility, ability* and *personal norm* was assessed. Although the model chi-square was significant, the relative chi-square (χ^2/df) was less than 5 (χ^2/df = 2.54). The CFI, IFI and NNFI were also above the cutoff value of 0.95 and RMSEA of the model was within the acceptable limit of 0.10 (RMSEA = 0.056). SRMR was also within the threshold of 0.08 (SRMR = 0.074). Overall, model fit statistics indicated an acceptable fit to data (Table 4-1). However, high correlations between biospheric and altruistic values (r = 0.90) indicate lack of discriminant validity. Thus altruistic and biospheric value items were combined to create a single biospheric-altruistic factor. An alternative measurement model with eight latent variables (Model B) including two dimensions of environmental values (i.e., *biospheric-altruistic* and *egoistic*), *individualistic* and *collectivistic values*, *awareness of consequences, ascription of responsibility, ability* and *personal norm* was

assessed. The overall fit of Model B was comparable to the fit of Model A. Relative chi-square was less than 5 (χ^2/df = 2.75) and RMSEA was also within acceptable limit (RMSEA = 0.060). The CFI, IFI and NNFI were above the cutoff value of 0.95. SRMR was within the threshold of 0.08 (SRMR = 0.079). Therefore, Model B with a two-factor structure of environmental values was used in the structural model. In addition, one item measuring the biospheric-altruistic factor ("To distribute natural resources fairly") was removed from further analysis because of low factor loading.

Biospheric-altruistic values ($\alpha = 0.87$), collectivistic values ($\alpha = 0.76$), awareness of consequences ($\alpha = 0.80$) and personal norms ($\alpha = 0.84$) exhibited acceptable internal consistency. However, measures of internal consistency for individualistic values (r = 0.28), egoistic values ($\alpha = 0.43$), ability ($\alpha = 0.55$) and ascription of responsibility (r = 0.29) were less than the desirable threshold of 0.70 (Kline, 2011). Factor loading values of each item on their respective factors ranged from 0.40 to 0.85 (Table 4-2).

Structural model

The structural model consisting of environmental values, individualism, collectivism and ability defined as exogenous variables, and awareness of consequences, ascription of responsibility and personal norm defined as endogenous variable exhibited an acceptable model fit (Figure 4-2). The relative chi-square of the model was less than 5 (χ^2/df= 2.86). CFI and IFI were also over the cutoff value of 0.95. NNFI was marginally below the threshold of 0.95 (NNFI = 0.94). RMSEA of the model was also within the acceptable limit of 0.10 (RMSEA=0.062). SRMR was within the threshold of 0.08

(SRMR = 0.08). All of the proposed paths in the model were significant with the exception of the path from individualistic values to ascription of local responsibility. Biospheric-altruistic values had a statistically significant positive effect on awareness of consequences (β=0.84), while egoistic values had a statistically significant negative effect on awareness of consequences (β=-0.32). As predicted, collectivistic values had a significant positive effect on ascription of local responsibility (β=0.34). Awareness of consequences had a significant positive effect on ascription of local responsibility (β=0.65), which in turn was significantly related to personal norms (β==0.51). Awareness of consequences also had a significant direct effect on personal norms (β=0.25). The path from ability to personal norms (β=0.22) was also statistically significant. The model accounts for 37% of the variance in personal norms, 65% of the variance in awareness of consequences and 54% of the variance in ascription of responsibility.

Table 4-1. Comparison of measurement models

	χ^2	df	χ^2/df	RMSEA	CFI	IFI	NNFI	SRMR
Model A (3-factor environmental values)	669.35	263	2.54	0.056	0.96	0.96	0.95	0.074
Model B (2-factor environmental values)	745.57	271	2.75	0.060	0.96	0.96	0.95	0.079

Table 4-2. Descriptive statistics, reliability analysis and factor loadings of items measuring constructs in the structural model

Latent Variable	Survey item	Mean	SD	Standardized Factor loadings (λ)	Coefficient alpha (α)
Individualistic value[a]	To be different from members of my community.	1.86	1.04	0.44	0.28[c]
	To pursue my personal goals even if they conflict with broader community goals.	2.32	1.12	0.64	
Collectivistic value[a]	To identify myself as a member of my community.	3.07	1.09	0.65	0.76
	To cooperate with members of my community.	3.49	0.96	0.82	
	To follow norms of behavior established by my community.	2.85	1.10	0.56	
	To nurture or help other members of my community.	3.45	1.00	0.63	
Biospheric-Altruistic value[a]	To preserve nature for its own sake.	3.96	0.91	0.82	0.87
	To conserve natural resources for human use.	3.89	0.91	0.57	
	To protect nature for human health and well-being.	3.90	0.97	0.75	
	To maintain unity with nature.	3.54	1.18	0.85	
	To respect the earth.	4.07	1.00	0.82	
Egoistic value[a]	To use natural resources for personal income.	2.04	1.10	0.43	0.43
	To protect private property rights.	3.94	1.04	0.49	
	To conserve natural resources for my recreational use.	3.39	1.14	0.47	
Ability[b]	If I wanted to, I have the ability to change the way I use my land/property to protect water resources.	0.44	1.16	0.40	0.55
	I have the financial resources I need to take care of my land.	0.36	1.15	0.69	
	I have the knowledge and skills I need to take care of my land.	0.57	1.00	0.55	

Latent Variable	Survey item	Mean	SD	Standardized Factor loadings (λ)	Coefficient alpha (α)
Awareness of consequences[b]	The effects of water pollution on public health are worse than we realize.	0.66	1.16	0.77	0.80
	Water pollution poses serious threats to the quality of life in my community.	0.46	1.19	0.72	
	The balance of nature is delicate and easily upset.	0.83	1.08	0.74	
Ascription of responsibility[b]	Landowners/property owners in my community should be responsible for protecting water quality.	1.19	0.85	0.65	0.29[c]
	Local government (i.e. county, city/township) should be responsible for protecting water quality.	0.98	0.97	0.42	
Personal norm[b]	I feel a personal obligation to do whatever I can to prevent water pollution.	1.29	0.81	0.79	
	I feel a personal obligation to take actions to stop the loss of wildlife habitat.	1.05	0.90	0.79	0.84
	I feel a personal obligation to use conservation practices on my land/property.	1.25	0.82	0.81	

[a]Variables measured on a 5-point scale from "not at all important" to "extremely important";
[b]Variables measured on a 5-point scale from "strongly disagree" to "strongly agree";
[c]Bivariate correlation for latent variables with two indicators

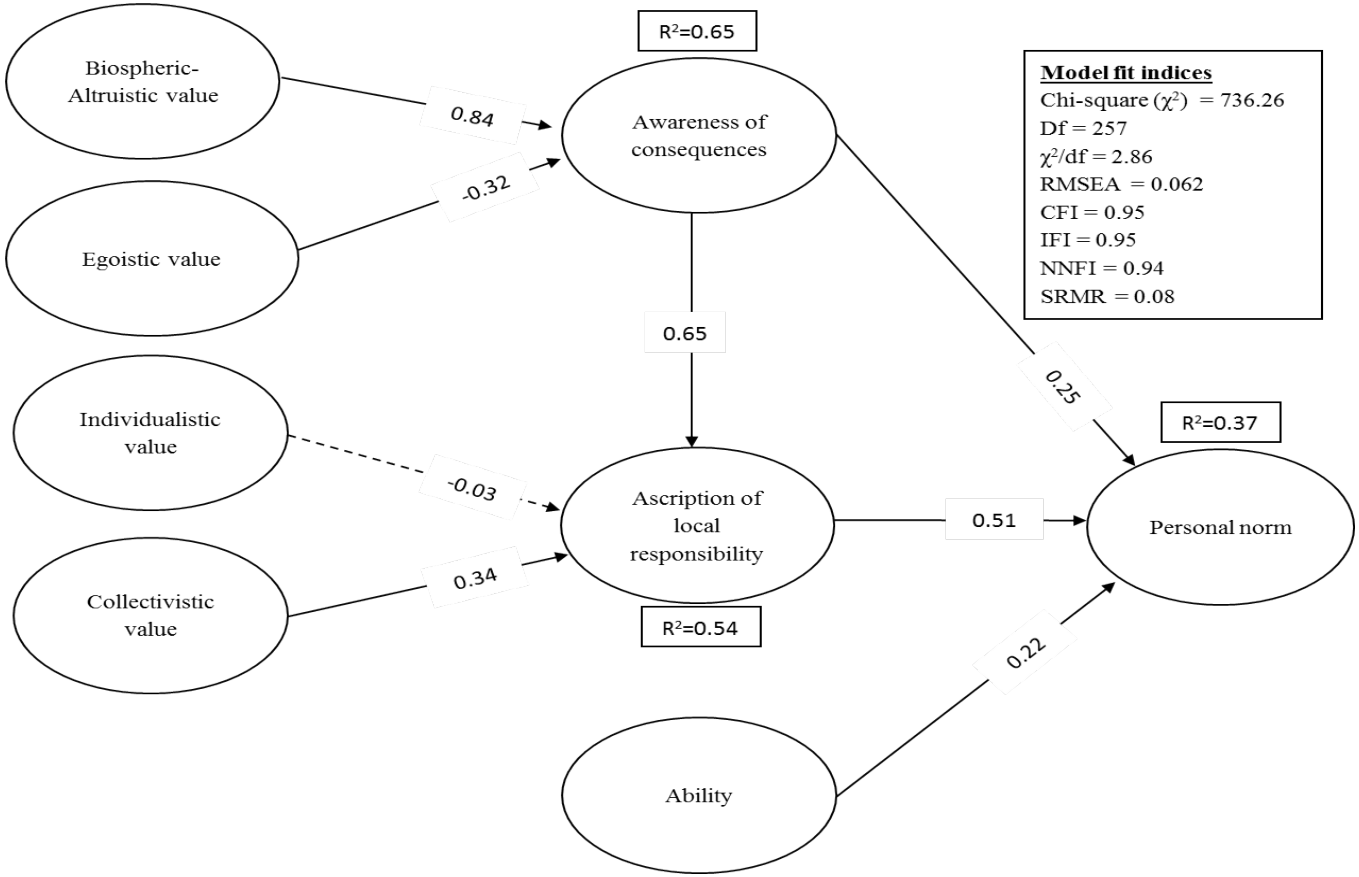

Figure 4-2. Standardized solution for final structural model of values, beliefs and personal norm to protect water resources.
Note: RMSEA, root mean square error of approximation; CFI, comparative fit index; IFI, incremental fit index. All latent variables measured with three indicators except *ascription of responsibility* (2 indicators)

- - ► Non-significant paths
→ Significant paths ($p \leq 0.05$)

Discussion

This study investigated landowners' sense of moral obligation to protect water resources and specifically examined the personal norm activation process. Personal norms are believed to be a central driver of pro-environmental behavior. Yet, little research exists that examines the norm activation process. Two existing models of moral behavior, NAT and VBN, were adapted to test an integrated moral obligation model. Study findings support the norm activation process postulated in NAT and VBN. Findings also enhance current understanding of the relationship among values, awareness of consequences, ascription of local responsibility and personal norms of pro-environmental behavior.

Personal norms for water resource conservation are rooted in collectivistic and biospheric-altruistic values

Values that serve as a basis for self-evaluation activate personal norms (Schwartz, 1977). Researchers studying environmental behavior have focused almost exclusively on the three dimensions of environmental values: egoistic, altruistic and biospheric, as the basis for personal norm activation. In the integrated moral obligation model we posited that environmental values and cultural values are salient to personal norms for water resource conservation. Study results confirm and expound upon this relationship. The results demonstrate that a sense of moral obligation for water resource conservation is rooted in collectivistic values, as well as biospheric-altruistic values. The more important these values are to an individual, the more morally obligated they feel to protect water

resources. Study findings are in line with past research on the value basis for personal norm. For example, Steg, Dreijerink and Abrahamse (2005) demonstrated that personal norms to conserve energy are rooted in biospheric values. In addition, ecocentric and self-transcendent values have also been reported as bases for personal norms to reduce car use (Nordlund and Garvill 2002, 2003). In summary, collectivistic cultural values and biospheric/altruistic environmental values are strong predictors of water resource conservation norms.

Beliefs about consequences of pollution, local responsibility and ability to act fuel personal norms

Consistent with previous studies in NAT and VBN (e.g., Stern et al. 1999; Harland, Staats, and Wilke 2007; Kaiser et al., 2005) personal norms were activated by three sets of beliefs: awareness of consequences of environmental problems, ascription of responsibility and ability to alleviate the problem. Study results indicate that landowners are more likely to feel a personal obligation to protect water resources if they are aware of the consequences of water pollution, believe that their community is responsible for protecting water resources and feel that they have the ability to protect water resources. This finding suggests that norms regarding water resource protection can be influenced by water resource science, the communication of that science to the general public, the emphasis placed on consequences to certain values and the need for action by local communities including local government agencies.

Environmental values act as a filter of awareness of the negative consequences of water pollution

The findings of this study also suggest that values are the basis for beliefs about consequences of environmental problems. Individuals who value the environment for its intrinsic value or for its value to others are more likely to be aware of the adverse consequences of environmental problems than those who value the environment for their personal use. This finding is consistent with the hypothesis that values act as filters for information (Stern and Dietz, 1994). Individuals seek and filter information depending on what is consistent with their values. Therefore, individuals who value the environment for its own sake or for human health and well-being are more likely to hold beliefs that water pollution has adverse consequences for public health and quality of life in their community. Individuals with egoistic values likely do not hold similar beliefs about negative consequences of water pollution for others, because it is inconsistent with their values.

Collectivists and those with awareness of negative consequences of water pollution assign responsibility for water resource conservation to local actors

Collectivists define themselves in terms of their group, prioritize group goals over personal goals and their behaviors are influenced by their group (Triandis, 1994). In the context of water resource conservation, collectivists' reference group is the local community. Thus, collectivists are likely to believe that local landowners and governments are responsible for water resource protection. The present findings also

indicate that greater awareness of negative consequences of water pollution leads individuals to assign responsibility for water resource protection to local actors. Non-point source pollution is a diffuse and collective problem with negative consequences for all in a community. When people are aware of these negative consequences, they believe that it is the responsibility of local actors (i.e. landowners and local government) to solve collective problems such as water pollution. Stern, Dietz and Black (1986) also found that people who were aware of the adverse consequences of chemicals believed that it is local government responsibility to act to solve collective problems (pollution from toxic chemicals).

Conclusions

Study findings suggest that collectivists perceive social dilemmas such as water resource conservation as a moral situation. Thus, for many landowners, water resource conservation has a moral component. Further, beyond environmental values, cultural values also determine the extent to which individuals view water resource conservation as a moral situation. According to Rokeach (1973), values are organized in terms of their relative importance in a given situation. An individual can hold different values, but the decision making situation dictates which value sets become most salient (Rokeach, 1973). In social dilemmas such as water resource conservation, the more important collectivistic values are to an individual, the more morally obligated the individual feels to protect water resources (Nordlund & Garvill, 2003). Moral theories of pro-environmental behavior suggest that feelings of personal obligation to act drive pro-

environmental behaviors (e.g., Stern, 2000). Feelings of moral obligation or personal norms come with internal sanctions. Conforming to one's personal norm results in positive self-evaluations such as pride and self-esteem, while non-conformance results in negative self-evaluations such as guilt and loss of self-esteem (Schwartz, 1977). People act consistent with their personal norms to reduce negative internal sanctions. Thus, in the context of water resource management, personal norms to protect water resources could drive landowners to take action to protect water resources (e.g., adopt conservation practices).

Researchers studying social dilemmas have found strong relationships between values and moral obligation. For example, Nordlund and Garvill (2002) found that individuals with strong self-transcendent values (i.e., collectivism) were more likely than individuals with strong self-enhancement values (i.e., individualism) to feel a moral obligation to protect the environment. The positive effect of collectivistic values on personal norms, mediated by ascription of responsibility, suggests that collectivists perceive water resource conservation as a moral situation. The influence of individualistic values on personal norms was not statistically significant. For those exhibiting strong individualistic values, water resource conservation is not perceived as a moral situation. Individualists prioritize personal goals over group goals (Triandis, 1994). If solving collective problems such as water pollution interfere with personal goals, individualists are not likely to generate feelings of moral obligation to protect water resources.

Future research

The model consisting of values and beliefs presented in this study accounted for 37% of the variance in personal norms. From a theoretical point of view, other factors not accounted for in this study may influence personal norms. Other factors in NAT (Schwartz 1977): awareness of need and efficacy, were not addressed in this study. Research on NAT shows that awareness of environmental problems predicts personal norm (Bamberg and Möser 2007; Nordlund and Garvill 2003). Similarly, individuals' perception that there are actions that could help alleviate the need or problem (*efficacy*) is also a determinant of personal norm (Schwartz, 1977). Understanding landowner awareness of water resource problems and their perceptions regarding the efficacy of conservation practices in protecting water quality can help resource managers understand the constraints to behavior change and design informational strategies to raise awareness. Social norms are perceptions of social pressure to engage in a behavior (Ajzen, 1991). The role of social norms in the norm activation process is not well understood. Some research suggests that an individual internalizes social standards, thus providing a basis for personal norms (Bamberg and Möser, 2007; Bamberg, Hunecke, and Blöbaum, 2007). The social context in which norms are activated is an area of research that needs to be further explored. Study findings demonstrate that landowners perceive water resource conservation as a moral situation and that personal norms to protect water resources are activated by the cognitive structure of values and beliefs. The extent to which this

personal moral norm translates into action among landowners is a question for future research.

Methodologically, there are certain limitations in this study. Developing reliable measures of theoretical constructs has been a challenge both in this study and in previous studies of conservation behavior. Skewed distribution of responses to survey items because of the effects of social desirability is a potential problem in surveys about environmental issues (Gärling et al., 2003; De Groot & Steg, 2009). Another methodological issue was that biospheric and altruistic values were not clearly distinguishable in this sample of riparian landowners. Previous research on value orientations have produced mixed findings. While some research has been able to distinguish between these two dimensions of values (De Groot and Steg, 2008), others have not (Stern and Dietz, 1994; Stern, Dietz, and Guagnano, 1995). Whether or not a distinct biospheric value orientation that provides a distinct basis for pro-environmental norms and behaviors is emerging is a question for future research.

Management implications

The findings from this study are encouraging for watershed managers promoting voluntary conservation programs. This study provides a much needed theoretical basis to explain landowner norms of behavior in the context of water resource management. Past research suggests that moral approaches are best suited to explain low-cost environmental behaviors such as environmental citizenship and political behavior (Steg & Vlek, 2009) and not high-cost behaviors such as landowner conservation practices (e.g., riparian

buffer maintenance). In contrast, the current study demonstrates that in the case of water resource conservation, personal norms of behavior are activated by environmental and cultural values, beliefs about consequences of water pollution, local responsibility and ability to protect water resources.

In Sand Creek and Vermillion River watersheds, water resource managers are developing strategies to promote voluntary adoption of conservation practices. The success of voluntary conservation strategies such as education and outreach programs depends on the understanding of intrinsic motivators that influence landowners. An understanding of landowner values, beliefs and norms helps managers identify target audiences and design appropriate communication strategies. Studies on informational strategies for residential energy use shows that these strategies can be successful if tailored information is delivered to a target audience and if the information reinforces existing norms (Stern, 1999; Abrahamse, Steg, Vlek, & Rothengatter, 2005). The findings from this study suggest that in order to establish water resource protection as a norm, conservation programs must provide information about specific consequences of water pollution to riparian landowners while reinforcing the idea that protecting water quality is a collective responsibility. Individualized and specific information about the adverse consequences of water pollution on public health and quality of life along with communication campaigns that encourage civic responsibility are likely to reinforce pro-environmental norms. Furthermore, these programs could be more effective by appealing to collectivistic and biospheric-altruistic values by focusing communication on ecological and community benefits of conservation. Our research results suggest that

communication campaigns that present water resource issues as collective problems that require cooperation with other community members would be effective.

Results indicate that landowner perception about the availability of resources such as knowledge, skills and financial resources to protect water resources (i.e., *ability)* is an activator of personal norm. Lack of these resources may be perceived or real barriers to norm activation. Conservation programs can address these barriers to activation of norms. Educational programs in combination with technical assistance and cost sharing programs, such as the TACS program in Scott County can be especially successful in activating moral norms to protect water resources among riparian landowners.

This study provides support for the norm activation process postulated in NAT and VBN in the context of landowner conservation norms. Furthermore, collectivistic values seem to play an important role in the activation of norms. However, other theoretical constructs could be used in future research to further our understanding of the activation of personal norms. Voluntary conservation strategies that appeal to biospheric-altruistic and collectivistic values, emphasize adverse consequences of water pollution, highlight water resource protection as a local responsibility, and provide the resources needed to activate moral norms among landowners would be more effective at changing voluntary behavior.

Landowners' motivations to engage in civic action to protect water resources (Study II)

Introduction

Non-point source (NPS) pollution, the contamination of water resources from diffuse anthropogenic sources, originates in broad community or governance-level land use planning policies and actions (e.g., urban growth, agricultural land use, stormwater management infrastructure), as well as in individual-level land use decisions and practices (e.g., fertilizer use, riparian area alteration, salting sidewalks). NPS pollution has largely been defined as a technical problem requiring engineering solutions targeting pollutant sources, fate and transport. In this paper, we examine NPS pollution instead as a social dilemma requiring solutions that attend to individual moral choices and the collective and coordinated action of human communities.

Like many natural resource management regimes, the traditional decision making structure in water management has been agency dominated. A top-down approach has led to reductionism, addressing problems one at a time, stream segment by stream segment (Sabatier et al., 2005) rather than a holistic or systematic approach. The approach has viewed water systems as separate from human systems and thus, dialogue and decision making has convened land use planners and water engineers and largely excluded landowners and resource users. Yet, the causes and consequences of NPS pollution are decidedly societal, requiring changes in the way humans individually and collectively view and interact with water and the natural environment.

An increasing body of literature has examined water resource conservation action in the private sphere, investigating the determinants of best management practices for water resource protection (e.g., riparian buffer adoption or conservation tillage) among landowners and resource users (Armstrong & Stedman, 2012; Knowler & Bradshaw, 2007; Soule, Tegene, & Wiebe, 2000). However, few studies have examined the determinants of *public-sphere conservation action* like conservation citizenship or advocacy (Stern, 2000).

Social dilemmas are situations in which collective interests compete with self-interests. In a social dilemma, when individuals prioritize self-interests (e.g., behave rationally versus morally), the interests of the collective (e.g., social group, organization, or society) suffer (Dawes & Messick, 2000; Dawes, 1980). Environmental decision making has often been characterized as social dilemmas (e.g., Nordlund & Garvill, 2003; Thøgersen, 1996). Solving social dilemma problems such as NPS pollution requires civic engagement in water resource discourse, deliberation and decision making. Fagotto and Fung (2009) define civic engagement as "making public decisions and taking collective actions through processes that involve discussion, reasoning, and citizen participation *rather than* through the exercise of authority, expertise, status, political weight, or other such forms of power" (p. 1). Scholars and water resource professionals recognize that citizens must get involved in water resource issues to make water quality improvements (Brooks, Franzen, Holmes, Grote, & Mulder, 2006; Morton & Brown, 2011). However, levels of civic engagement in water resource issues can be low, especially when problems are ill-defined or diffusely defined, such as commonly the case in NPS pollution. A study

examining riparian landowners' sense of personal obligation to engage in water resources conservation action in two impaired Midwestern watersheds found that more than 80% of study respondents reported feeling a personal obligation to adopt conservation practices on their land, while fewer than 50% reported feeling a personal obligation to talk to others about conservation practices (Davenport et al., 2013). This civic engagement gap is problematic for addressing water resource impairments that depend on the collective action of landowners and resource users. Moreover, several studies have shown that conservation behaviors are influenced by perceived social pressure or social norms of behavior (Bamberg et al., 2007; Klöckner & Blöbaum, 2010). To be successful, interventions intended to engage individuals in dialogue, develop social norms of conservation behavior and inspire collective action must be based on an understanding of the determinants of public-sphere behavior.

Past research suggests that individuals with higher income and higher levels of formal education are more likely to be civically engaged (e.g., participation in environmental organizations) (Larson & Lach, 2010; Manzo & Weinstein, 1987; Smith, 1994). Other socio-demographic factors such as age, gender, homeownership, and length and location of residence have also been associated with civic engagement (Koehler & Koontz, 2008; Larson & Lach, 2010; Martinez & McMullin, 2004). However, only a few studies have focused on the psycho-social determinants of civic engagement in water resource management. In a study of civic participation in watershed councils, Larson & Lach (2010) reported that individuals who are involved in watershed councils have stronger pro-ecological worldviews and are more supportive of water resource protection.

In another study, feelings of self-efficacy and beliefs about activism influenced volunteerism in an environmental organization (Martinez & McMullin, 2004). Awareness of watershed issues and personal responsibility to protect water resources have also been reported as positive predictors of residents' intentions to be civically engaged (e.g., talk to others about the watershed) (Story & Forsyth, 2008). The purpose of this study is to further explore the psycho-social factors that influence landowner civic engagement in water resource protection. Given that conservation behavior is largely a moral decision (Harland et al., 2007; Stern, 2000; Thøgersen, 1996), we use the norm activation theory (Schwartz, 1977) as a basis to examine the determinants of civic engagement in water resource conservation.

Personal norms and civic engagement

Moral theories regard pro-environmental behaviors as situations of moral choice when an individual's actions have consequences for the welfare of others (e.g., Harland, Staats, & Wilke, 2007; Nordlund & Garvill, 2003). In contrast to rational choice theories, moral theories suggest that behaviors, especially pro-social (e.g., helping others) or pro-environmental behaviors (e.g., protecting water resources), are influenced by feelings of moral obligation or personal norms. According to the norm activation theory (NAT), the intensity of personal obligation an individual feels to take action influences behavior (Schwartz, 1977). Similarly, personal norm is a central driver of behavior in the value belief norm (VBN) theory (Stern, 2000). In a study of environmental citizenship behaviors (e.g., signing petitions in support of environmental laws), Stern, Dietz, Abel,

Guagnano and Kalof (1999) reported a statistically significant influence of personal norms to act on environmental citizenship. Similarly, in another study of collective pro-environmental behavior (e.g., donating money to an environmental organization), personal norm to protect the environment was a significant predictor of pro-environmental behavior intention. In a study of Dutch university students, individuals who felt a personal obligation to volunteer were more likely to volunteer for an environmental organization (Harland et al., 2007). In another application of VBN, Johansson, Rahm and Gyllin (2013) reported that landowners who had participated in conservation programs felt a greater sense of personal obligation to participate in biodiversity conservation programs than landowners who had not participated.

Activators of personal norm

Personal norms are activated by an individual's cognitive structure of values and beliefs (Schwartz, 1977). NAT and VBN postulate that personal norms are activated when an individual is aware of the adverse consequences of an environmental condition (*awareness of consequences)* and ascribes responsibility to relevant actors to reduce the threat of those adverse consequences (*ascription of responsibility)* (Stern, 2000). In an application of Schwartz's NAT, Gärling et al. (2003) demonstrated the influence of awareness of consequences and ascription of responsibility on personal norms to protect the environment, which in turn predicted pro-environmental behavioral intention (e.g., contributing money to an environmental organization). Similarly, Stern and colleagues' work (Stern et al., 1999; Stern & Dietz, 1994; Stern, 2000) also demonstrates the

predictive ability of awareness of consequences and ascription of responsibility. Beliefs about consequences are in turn influenced by three sets of stable, underlying values: egoistic, altruistic and biospheric values.

For water resource professionals, it is more effective and efficient to develop civic engagement interventions that focus on behavioral determinants that are more salient and prone to change. The primacy and stability of varying activators has been one focus of normative research. Normative research suggests that interventions focusing solely on information and education may be less effective than a more multi-dimensional approach. In the cognitive hierarchy model, human thought is organized from stable, difficult to change values to numerous, peripheral and easily changed attitudes, norms and behaviors. Thus, beliefs and norms are more vulnerable to interventions than basic values (Fulton et al., 1996). Stern and Dietz (1994) have argued that because information seeking and processing is filtered by values—people accept information only if it is congruent with their values, awareness of adverse consequences of environmental conditions is not easily influenced. Research on interventions has shown that awareness and information strategies alone may not result in the behavior change desired (Abrahamse et al., 2005; Schultz, 2011). Moreover, a review of best management practices (BMP) adoption literature revealed that for BMPs related to water management, information is not a significant predictor of BMP adoption. As Schultz (2011) argues, individuals' decision making around conservation is driven by motivation and not information.

Other norm activators have received increasing attention. Activators such as ascription of responsibility, social norms and ability have been determined to be a more

proximal determinant of personal norms than awareness of consequences (Bamberg & Moser, 2007; Harland et al., 2007; Steg, Dreijerink, & Abrahamse, 2005). According to NAT, individuals feel a sense of personal obligation when they believe that they have the ability to take action (Schwartz, 1977). Further, the ability to take action is also a direct determinant of behavior. In a study examining the influence of NAT variables on personal norms and behavior, Harland et al. (2007) reported that ability to act significantly influenced behavioral intentions to use modes of transportation other than car and to conserve water. The authors also reported that individuals who perceived that they had the ability to volunteer were also more likely to volunteer for an environmental organization. Schwartz (1977) argues that social norms can influence personal norms and behavior, if they are used by an individual as bases for self-evaluation. In some studies, the relationship between subjective norm and behavioral intention has been weak (Armitage & Conner, 2001). Subjective norm is defined as the "perceived social pressure to perform or not perform a behavior" (Ajzen, 1991, p.188). Cialdini and colleagues (Cialdini, Kallgren, & Reno, 1991; Cialdini, Reno, & Kallgren, 1990) argue that additional sources of norms, including personal norms, influence the norm-behavior relationship. In a meta-analysis of the determinants of pro-environmental behavior, Bamberg and Möser (2007) demonstrated the influence of subjective norm on personal norm, suggesting that social factors play an important role in the activation of personal norms. In another study of public transportation use among residents of two German cities, Bamberg et al. (2007) reported a significant influence of subjective norm on personal norm to use public transportation. The comprehensive action determination

model (Klöckner & Blöbaum, 2010; Klöckner, 2013) provides further support for the role of subjective norm in activating personal norm. These studies indicate that as Schwartz (1977) suggested social norms may be internalized as personal norms.

Theoretical approaches to pro-environmental behaviors have been applied to individual behaviors (e.g., recycling, willingness to pay taxes). However, these approaches have not been applied to collective behaviors such as civic engagement in water resource issues. Despite efforts to involve citizens in water resource planning and management, landowners are not highly engaged in water resource issues (Davenport & Pradhananga, 2012). Understanding landowners' motivations to be civically engaged in water resource issues will help water resource managers design civic engagement interventions to promote landowner engagement in water issues. This study applies an integrative framework to examine the influence of beliefs and norms on landowners' civic engagement in water resource issues.

Study conceptual model

This study's conceptual model (Figure 4-3) draws on NAT and TPB to examine the proximal determinants of civic engagement behavior that are prone to change: beliefs about responsibility to protect water resources (ascription of local responsibility), perceived ability to protect water resources (ability), social expectations of important others (subjective norm) and feelings of personal obligation to be civically engaged (personal norm). Researchers applying moral theories to pro-environmental behaviors have demonstrated that behaviors are driven by an individual's personal obligation to act

(Stern, 2000). Further, these theories also establish that personal norms are activated by beliefs about the consequences of an environmental condition, ascription of responsibility to relevant actors and their own ability to act (Schwartz, 1977; Stern, 2000). However, because individuals selectively accept information consistent with their values (Stern & Dietz, 1994), beliefs about the consequences of environmental conditions are stable cognitive elements that are not easily changed. Thus, ascription of responsibility and not awareness of consequences is included as an activator of personal norm. In addition, researchers have demonstrated that expectations of important others (subjective norms) are internalized as personal norms (Bamberg & Möser, 2007; Klöckner, 2013; Schwartz, 1977). We hypothesize that landowners are more likely to be civically engaged if they feel a personal obligation to be civically engaged in water resource issues and if they feel that they have the ability to protect water resources. Further, we hypothesize that landowners generate feelings of personal obligation when they ascribe responsibility for water resource protection to local actors (e.g., landowners), are influenced by expectations of important others regarding conservation behavior, and perceive that they have the ability to protect water resources.

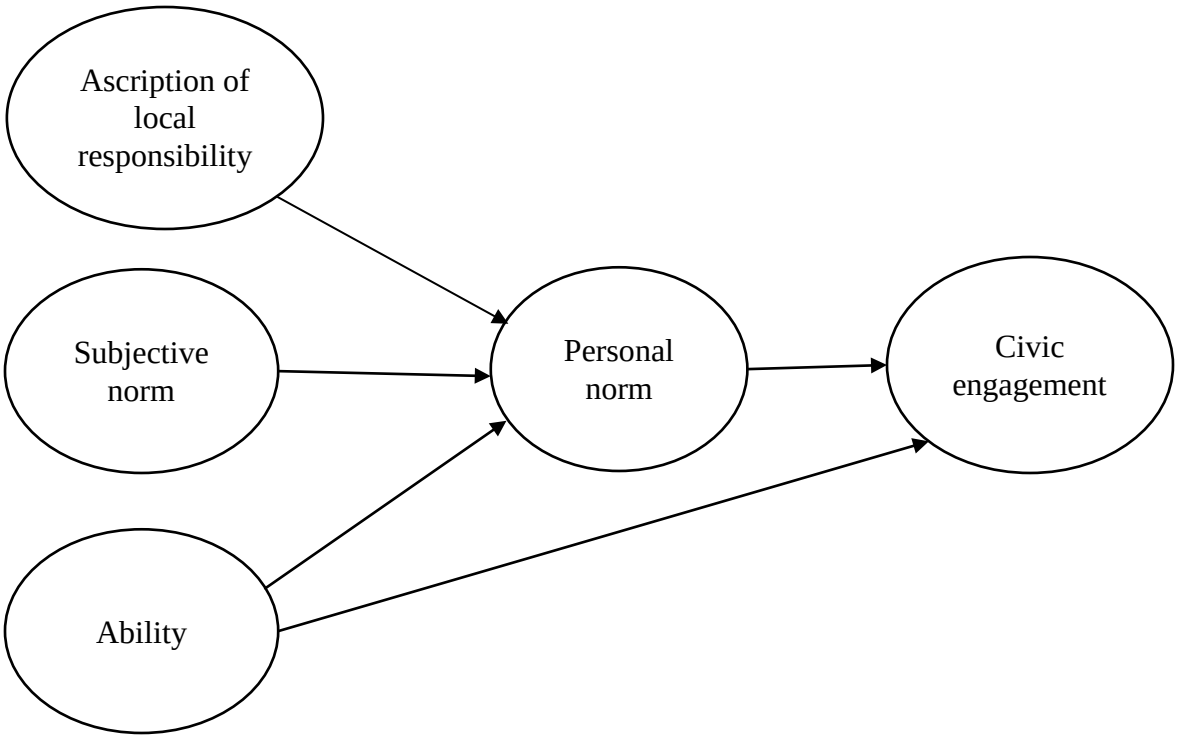

Figure 4-3. Study conceptual model

Methods

Study site

Data for this study comes from the Cannon River watershed. The two major rivers in the Cannon River watershed, Cannon and Straight Rivers, drain into the Mississippi River. The major land use in the watershed is agricultural, with approximately 70% of the land used for agricultural production. The major pollutants of concern in the watershed are sediment, phosphorus, *E. coli* and pesticides (Cannon River Watershed Partnership, 2011).

The existing management structure in the watershed includes multiple government entities at the state and local levels. While local counties, soil and water conservation districts and cities have water management plans, Minnesota Board of Soil and Water Resources (BWSR) is responsible for ensuring that local plans are coordinated with state water protection efforts. Cannon River Watershed Partnership (CRWP), a citizen-initiated non-profit group, in partnership with Minnesota Pollution Control Agency (MPCA) and other local partners developed a watershed-wide management strategy. Their management strategy emphasizes the need for landowners' civic engagement in watershed protection (Cannon River Watershed Partnership, 2011).

Procedure and sample

Data were collected using a self-administered mail survey of stratified random sample of 1082 landowners in the Cannon River watershed. The sampling frame was generated from county tax records. An adapted version of Dillman's (2009) tailored design method was employed and included three mailing waves, each with a cover letter and a survey questionnaire.

Measures

Ascription of local responsibility: Two items assessed ascription of local responsibility: "Landowners/property owners in my community should be responsible for protecting water quality" and "Local government should be responsible for protecting water

quality." Respondents rated each item on a 5-point Likert scale from *strongly disagree* to *strongly agree*.

Subjective norm: Two items measured subjective norm to protect water resources in the study: "People who are important to me expect me to use conservation practices on my land/property" and "People who are important to me expect me to do whatever I can to prevent water pollution". Respondents were asked to rate each item on a five-point Likert scale from *strongly disagree* to *strongly agree.*

Ability: Landowners' perceived ability to protect water resources (e.g., by using conservation practices) was assessed using two items: "I have the knowledge and skills I need to use conservation practices on my land/property" and "I have the time to use conservation practices on my land/property." Respondents were asked to rate each item on a five-point Likert scale from *strongly disagree* to *strongly agree.*

Personal norm: Three items measured personal norm to protect water resources. An example item is "I feel a personal obligation to work with other community members to protect water quality". Respondents were asked to rate each item on a five-point Likert scale from *strongly disagree* to *strongly agree.*

Civic engagement: Civic engagement was measured using three items. Respondents were asked to report the number of times they have engaged in the three civic engagement

behaviors in the past 12 months. Example behaviors are “attended a meeting, public hearing or community discussion about a water resource issue” and “worked with community members to protect water resources”. Responses were coded in a five-point scale as 0 times (1), 1 time (2), 2-4 times (3), 5-10 times (4) and more than 10 times (5).

Analysis

Cronbach’s alpha was used to assess internal consistency of each latent variable measured with more than two items, while Pearson’s correlation was used for latent variables measured with two items. The hypothesized relationships were analyzed using structural equation modeling (SEM). The correlation matrix of the observed variables was used as the input matrix. The analysis was conducted using the maximum likelihood method in LISREL 8.80.

We assessed model fit using maximum likelihood χ^2, relative χ^2 (χ^2/df), root mean-square error of approximation (RMSEA), comparative fit index (CFI), incremental fit index (IFI), non-normed fit index (NNFI) and standardized root mean square residual (SRMR). Non-significant χ^2 value indicates that the model is consistent with the data. Larger and non-significant values of χ^2 indicate poorer model fit. However, maximum likelihood χ^2 is directly related to sample size. Therefore, additional fit indexes are needed to assess model fit. A relative χ^2 of five or less indicates an acceptable model fit (Schumacker & Lomax, 2004). RMSEA values below 0.10 are acceptable. RMSEA is also an appropriate index to compare fit of nested models. Values of CFI and IFI above

0.95 are recommended as a cutoff value. A threshold of SRMR ≤ 0.08 is recommended for a model with acceptable fit (Hu & Bentler, 1999).

Multiple measures improve the measurement properties of a theoretical construct (Maruyama, 1998). Scales consisting of more measures will also allow for better estimates of internal consistency of the theoretical construct (Vaske, 2008). A methodological limitation of this study is that the three exogenous latent variables (i.e., ascription of local responsibility, subjective norm and ability) are measured with only two items. Typically, three or more measures of latent constructs are recommended in structural equation modeling (Kline, 2011). However, two measures still allow us to disentangle different sources of variance in latent variable SEM. Past research on pro-environmental behavior have reported reliable model estimates using two item constructs in latent variable SEM (Kaiser et al., 2005). Future studies should develop scales of latent variables that consist of three or more items with acceptable score reliability.

Results

Of the 1082 surveys mailed, 246 were returned undeliverable and 290 completed surveys were received, resulting in a final response rate of 35%. Most of the respondents were male (79%), non-hispanic (99%) and white (97%). The average age of respondents was 61. Listwise deletion of model variables yielded an effective sample size of 274.

Personal norm (α=0.85) and civic engagement (α=0.79) exhibited acceptable internal consistency. Bivariate correlations of items measuring ascription of local responsibility (r=0.50), subjective norm (r=0.69) and ability (r=0.52), demonstrate

moderate to strong correlations. Factor loading values of each item on their respective factors ranged from 0.40 to 0.85 (Table 4-3).

Structural model

The structural model consisting of *ascription of local responsibility, subjective norm* and *ability* as exogenous variables and *personal norm* and *civic engagement* as endogenous variables exhibited an acceptable model fit (Figure 2). The relative chi-square of the model was less than 5 (χ^2/df = 1.57). CFI, IFI and NNFI were also over the cutoff value of 0.95. RMSEA of the model was within the acceptable limit of 0.10 (RMSEA=0.046). SRMR was below the threshold of 0.08 (SRMR = 0.045). All of the proposed paths in the model were significant. *Ascription of local responsibility* had a statistically significant positive influence on *personal norm* (β=0.30). *Subjective norm* (β = 0.27) and *ability* (β = 0.22) were also statistically significant positive predictors of *personal norm.* The path from *personal norm* to *civic engagement* was statistically significant (β = 0.42). In addition, *ability* was a significant predictor of behavior (β = 0.19) (Figure 4-4).

Table 4-3. Descriptive statistics, reliability analysis and factor loadings of items measuring constructs in the structural model.

Latent Variable	Survey item	Mean	SD	Standardized Factor loadings (λ)	Coefficient alpha (α)
Ascription of local responsibility[a]	Landowners/property owners in my community should be responsible for protecting water quality.	1.57	.64	0.78	0.50[c]
	Lakeshore and streamside landowners should be responsible for protecting water quality.	1.62	.60	0.64	
Subjective norm[a]	People who are important to me expect me to use conservation practices on my land/property.	.73	.90	0.86	0.69[c]
	People who are important to me expect me to do whatever I can to prevent water pollution.	.86	.83	0.80	
Ability[a]	I have the knowledge and skills I need to use conservation practices on my land/property.	.41	1.08	0.79	0.52[c]
	I have the time to use conservation practices on my land/property.	.55	.99	0.65	
Personal norm[a]	I feel a personal obligation to learn more about water resource issues in my watershed.	.70	.79	0.85	0.85
	I feel a personal obligation to talk to others about conservation practices.	.49	.83	0.80	
	I feel a personal obligation to work with other community members to protect water quality.	.53	.85	0.78	
Civic engagement[b]	Attended a meeting, public hearing or community discussion about a water resource issue.	1.35	.741	0.84	0.79
	Worked with community members to protect water quality.	1.34	.74	0.82	
	Talked to others about conservation practices	2.29	1.16	0.60	

[a]Variables measured on a 5-point scale from *strongly disagree* (-2) to *strongly agree* (2);
[b]Response coded as 0 (1), 1 (2), 2-4 times (3), 5-10 times (4) and more than 10 times (5);
[c]Bivariate correlations for constructs measured with two items;SD= Standard Deviation.

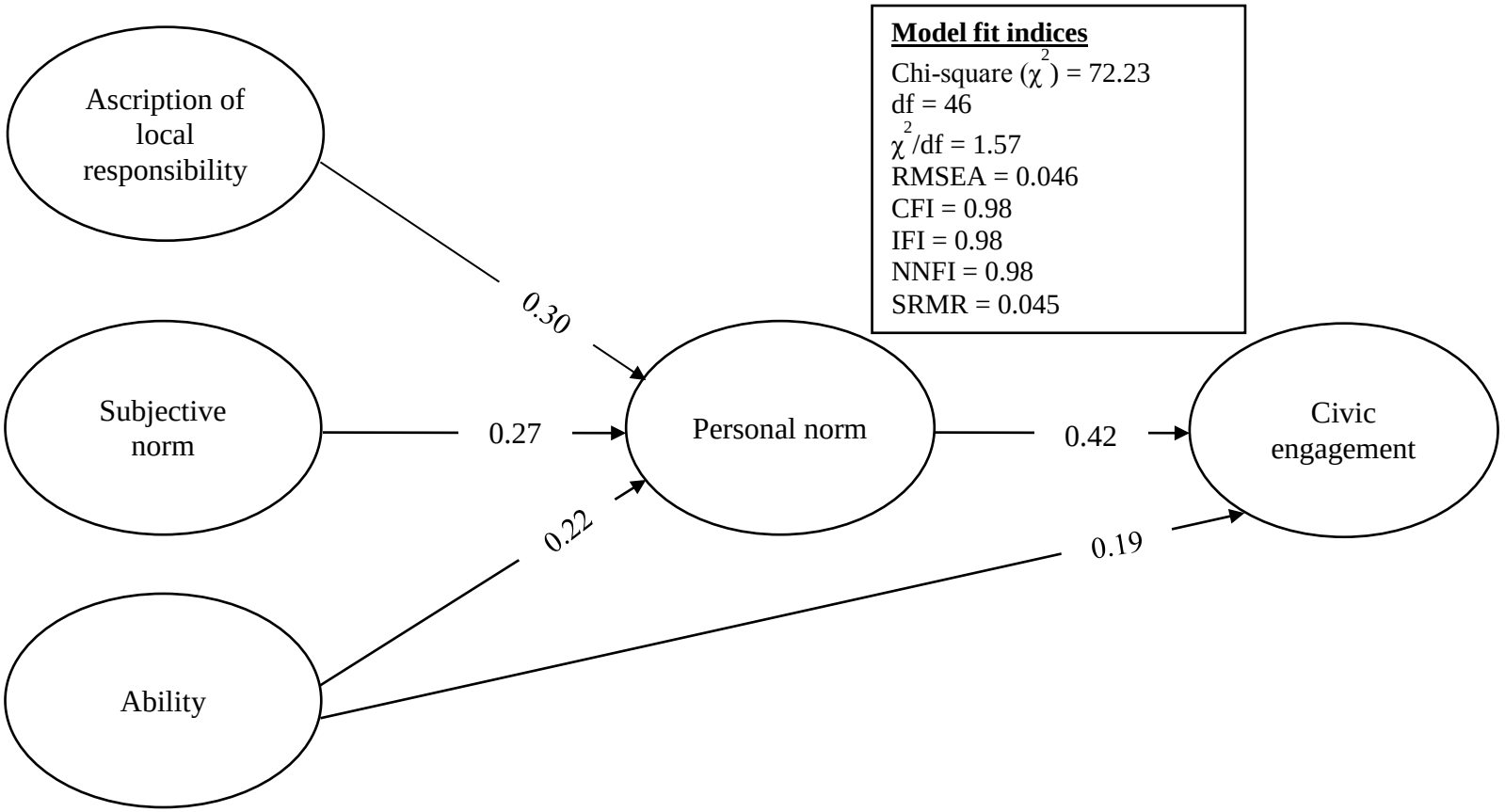

Figure 4-4. Standardized solution for final structural model of values, beliefs and personal norm to protect water resources
Note: RMSEA, root mean square error of approximation; CFI, comparative fit index; IFI, incremental fit index.
- - ► Non-significant paths
——► Significant paths ($p \leq 0.05$)

Discussion

Theoretical contributions

While past research has focused primarily on socio-demographic and geographic determinants of civic engagement, this study provides a theoretical framework to explore the psycho-social determinants of civic engagement in water resource conservation. Specifically, this study investigates the influence of personal norms on landowners' civic engagement in water resource conservation.

Prior research suggests that individuals who are more civically engaged exhibit supportive attitudes and beliefs towards water resource protection (Larson & Lach, 2010; Martinez & McMullin, 2004). Findings from this study expand on the relationships between beliefs, norms and landowner civic engagement in water resource conservation. The study's conceptual model is parsimonious and offers a moral basis to understand landowners' civic engagement in water resource conservation. In addition, the role of three activators: ascription of local responsibility, subjective norm and ability, in activating personal norm to be civically engaged were investigated. Study findings support the moral approach (e.g., NAT) of understanding pro-environmental behavior. Further, this study expands on the relationship between social and personal norms and behavior.

Landowners' beliefs about local responsibility to protect water resources, social expectations and ability to protect water resources activate their personal norms of civic engagement in water resource issues.

Study findings support the norm activation process outlined in NAT. Personal norms to take civic action were activated by three sets of beliefs: ascription of local responsibility to protect water resources, subjective norm and ability to protect water resources. Study results indicate that landowners are more likely to feel a personal obligation to act, if they believe in a water resource protection is a local responsibility, perceive that important others expect them to protect water resources, and believe that they have the ability to protect water resources.

Study results also support previous findings that subjective norms are internalized as personal norms (Bamberg & Möser, 2007; Klöckner, 2013; Nigbur et al., 2010). In this study subjective norms appear to serve as a basis for self-evaluation, thus activating personal norms. Expectations of important others are fundamental considerations for activating self-expectations. These findings indicate that when making decisions about whether or not to engage civically in conservation, landowners consider what important others think.

Landowners are more likely to be civically engaged in water resource issues, if they feel a personal obligation to take civic action and perceive that they have the ability to protect water resources.

Consistent with previous applications of NAT and VBN (e.g., Gärling, Fujii, Gärling, & Jakobsson, 2003; Harland, Staats, & Wilke, 2007; Stern, Dietz, Abel, Guagnano, & Kalof, 1999), personal norm was predictive of civic engagement. While previous studies have demonstrated that personal norms influence individual behaviors such as water conservation (Harland et al., 2007), willingness to reduce car use (Nordlund & Garvill, 2003), and recycling (Nigbur et al., 2010), this study indicates that personal norms also drive conservation citizenship and advocacy in water resource protection. Landowners who feel a personal obligation to be civically engaged are more likely to take civic actions such as attending a meeting or community discussion about a water resource issue or working with community members to protect water resources.

While study findings support the role of ability in activating personal norms as outlined in NAT, study results also demonstrate that ability has a significant direct influence on civic engagement. Thus, even in situations when personal norms to protect water resources are activated, real or perceived lack of resources such as time and skills may constrain landowners' civic engagement in water resource conservation. (Lynne et al., 1995) reported a similar influence of financial capability on farmer adoption of water conservation technology (e.g., micro-drip irrigation). The present study demonstrates that ability to act has a similar influence on a collective pro-environmental behavior: civic engagement in water resource conservation.

Practical contributions

This study offers a theoretical basis to understand landowners' civic engagement in water resource conservation. Although civic engagement in water resource conservation increasingly is recognized by water resource professionals as critical to solve NPS water pollution problems, the drivers of such behavior are not well understood. Study results reveal that landowners are more likely to be civically engaged in water resource conservation if they feel *personally obligated* to do so.

Study findings also suggest some strategies to better engage landowners and resource users in water resource conservation citizenship and advocacy in the study watershed and beyond. In the study watershed, the Cannon River Watershed Partnership (CRWP) has identified civic engagement as a key component in their watershed management strategy. Its civic engagement objectives emphasize connecting people to each other and involving citizens in water resource initiatives (Cannon River Watershed Partnership, 2011). This study offers some strategic guidance for meeting those objectives. First, a combination of intervention strategies will be most effective, especially for addressing the civic engagement gap in which landowners are far more likely to view conservation as an individual versus a collective concern (Davenport et al., 2013). Communication and outreach programs should emphasize water resource protection as both a moral obligation and a collective responsibility. Further, communication and outreach programs that present conservation action, including civic engagement, as a social or community norm are likely to influence local landowners and resource users.

Resource professionals have long known that perceived ability (e.g., resources, knowledge, and skills) affects adoption of best management practices (i.e., private-sphere behaviors) among landowners and resource users. This study indicates that the same is true for civic engagement behaviors such as conservation citizenship and advocacy. Those who have the knowledge, skill and time to use conservation practices on their own properties are more likely to attend community meetings on water resource issues, work with other community members in water resource conservation and talk to others about conservation practices. Thus, clearly opportunities exist to further develop existing conservation champions' (i.e., practice adopters) skills in communication, leadership and community organizing. This finding also points to the ongoing need to address barriers and constraints to perceived ability and provides support for communication and outreach programs that enhance knowledge and skills around conservation practices.

The CRWP has identified citizen-based watershed councils as another approach to increase civic engagement in water resource conservation. How can the organization best cultivate interest in and support for this program? Study findings suggest that civic leaders are more likely to have social referent groups that put pressure on them to use conservation practices. Further descriptive analysis of the study data revealed that respondents who perceived the greatest social pressure to act were most commonly influenced by family members, neighbors, environmental advocacy organizations, soil and water conservation districts (SWCD), CRWP, University researchers, local extension agents, local co-ops and agronomists in their conservation decisions. In other words, there are a variety of social groups and organizations who have influence on conservation

decision making and ultimately, civic action. These groups should be brought to the table in watershed council and other initiatives aimed at promoting conservation as a social norm and civic responsibility.

Future Research

From a theoretical standpoint, there may be additional factors that activate personal norms or directly influence behavior. The social identity approach posits that behaviors are also driven by the extent to which an individual identifies with their in-group. When individuals identify strongly with their in-group, group norms influence behavior (Terry & Hogg, 1996; White et al., 2009).

Stryker's identity theory (Stryker & Burke, 2000; Stryker, 1987) argues that individuals act in accordance with their self-identity. Self-identity as an environmental activist is a strong predictor of intention to engage in environmental activism among those who strongly identified with environmental groups (Fielding, McDonald, & Louis, 2008). Future research should explore the role of landowners' social identification with their communities and their self-identity as water resource stewards to explain civic engagement behaviors. An alternative conceptualization of social norm: descriptive norm, or the behavior of others, has also been suggested as a factor that influences behavioral intention. Research suggests that individuals comply with descriptive norms by imitating the behaviors of others (Nigbur et al., 2010; White et al., 2009). Similarly, seeing other community members attend meetings or discussions may spur landowners to

take civic action themselves. The relationship between descriptive norm and behavior, and its role in activating personal norm should be explored in future research.

Conclusion

Study findings reveal that landowners' civic engagement in water resource conservation is driven by moral considerations. When landowners feel a moral obligation to be civically engaged, they are more likely to engage with others in water resource conservation action. As Schwartz (1977) suggests, study findings indicate that personal norms are activated by the cognitive structure of beliefs including perceived local responsibility for water resource protection, subjective norms of conservation action and the ability to protect water resources on one's own property. Importantly, study findings also establish subjective norms as a useful addition to moral approach theoretical models such as NAT and VBN. What important others think is a significant determinant of landowners' civic engagement in water resources conservation.

Chapter 5: Discussion and Conclusion

Theoretical contributions

Although social-psychological theories have been applied to various pro-environmental behaviors, theoretical approaches have not been extensively applied to landowner conservation norms and behaviors in the context of water resource management. The integrated MOM provides a theoretical framework to understand the relationships between values, beliefs, and landowner conservation norms and behavior. While study I provides a theoretical framework to understand the influence of values and beliefs on landowners' personal norms to protect water resources, study II examines the influence of beliefs and personal norms on landowners' civic engagement in water resource conservation. Findings across the two studies support the norm activation process and the personal norm-behavior relationship postulated in the moral obligation model.

MOM is a useful theoretical basis to understand norms and behaviors related to water resource management.

A review of literature on agricultural best management practices (BMP) revealed that very few studies have examined water management practices (Prokopy, Floress, Klotthor-Weinkauf, & Baumgart-Getz, 2008). Further, the lack of theoretical basis is a major limitation in the understanding of BMP adoption. MOM provides a theoretical framework to understand landowner norms and behaviors related to water resource management. MOM enhances the understanding of the relationships between values,

beliefs, personal and subjective norms, and behaviors by integrating variables from multiple theoretical perspectives. Specifically, MOM draws on moral (NAT and VBN) and rational (TPB) theories to explain the relationships between values, beliefs, norms and behavior.

Water resource conservation is a moral choice situation.

Study findings suggest that for many landowners water resource conservation is a moral choice. Findings from both studies indicate that landowners feel personal obligations to act to protect water resources. Further, personal norms to act drive landowners' civic engagement in water resource conservation. Landowners are more likely to be civically engaged in water resource conservation if they perceive water resource conservation as a moral issue.

Personal norms are rooted in collectivistic and biospheric-altruistic values.

MOM also expands on previous understanding of the relationships between values and personal norms. Norms are constructed in reference to the cognitive structure of values. Values are organized in a hierarchy of importance to self and are used by individuals as bases for self-evaluation. The more important particular values are to an individual, the stronger are the feelings of personal obligation experienced by the individual (Schwartz, 1977). Researchers studying environmental behavior have focused almost exclusively on the three dimensions of environmental values: egoistic, altruistic and biospheric, as the basis for personal norm activation. In MOM, environmental and

cultural values were hypothesized as the basis for personal norms to protect water resources. Findings from study I demonstrate that the sense of moral obligation for water resource conservation is rooted in collectivistic values, as well as biospheric-altruistic values. The more important these values are to an individual, the more morally obligated they feel to protect water resources.

Personal norms are activated by beliefs about the consequences of water pollution, local responsibility, social pressure to take action and ability to act.

Findings from the two studies support the norm-activation process hypothesized in MOM. In study I, personal norms were activated by three sets of beliefs: awareness of consequences of environmental problems, ascription of responsibility to local actors (e.g., landowners) and landowners' perceived ability to protect water resources. Findings from study 2 suggest that in addition to ascription of local responsibility and perceived ability to protect water resources, landowners' perceptions of the social pressure from important others to protect water resources activates their personal norm to act. Findings indicate that as suggested by Schwartz (1977) and others (e.g., Bamberg, Hunecke, & Blöbaum, 2007; Klöckner & Blöbaum, 2010) perceived social pressures from important others regarding water resource protection are internalized as personal norms. Social norms activate feelings of personal obligation if an individual accepts social norms as basis for self-evaluation (Schwartz, 1977). Results from study II suggest that for some landowners, social expectations regarding conservation are important bases for self-evaluation.

Management implications

The findings from this study inform intervention strategies aimed at voluntary behavior change. Solutions to NPS pollution require both individual (e.g., adoption of conservation practices) and collective action (e.g., civic engagement). Interventions aimed at voluntary behavior change are more likely to be successful if they are based on an understanding of the motivations of behavior (Steg & Vlek, 2009). The integrative MOM provides a framework to understand landowner motivations to take voluntary action. Study I demonstrates that in the case of water resource conservation, landowners' feelings of personal obligation to protect water resources are activated by environmental and cultural values, beliefs about consequences of water pollution, local responsibility and ability to protect water resources. Findings from study I indicate that landowners who feel a personal obligation to act are more likely to be civically engaged in water resource issues. Further, study II highlights determinants of behaviors that are prone to change through interventions.

An understanding of landowner perceptions and motivations helps water resource professionals develop a targeted approach (Knowler & Bradshaw, 2007) to promoting conservation practices. Findings from this study helps water resource professionals identify target audiences and design appropriate informational and structural strategies. While informational strategies are aimed at changing beliefs and norms, structural strategies aim to change the circumstances under which landowners make decisions about conservation (Steg & Vlek, 2009). Further, informational strategies can be useful in the

implementation of structural strategies such as conservation programs by informing landowners about the programs.

A combination of intervention strategies are needed to promote voluntary behavior change

Research on household energy conservation and recycling indicate that information alone does not result in behavior change (Abrahamse et al., 2005; Stern, 1999). However, information when combined with incentives and social influences are more effective (Stern, 1999). Further, studies on informational strategies for residential energy use shows that these strategies can be successful if tailored information is delivered to a target audience and if the information reinforces existing norms (Stern 1999; Abrahamse et al. 2005). Overall, study findings suggest that intervention strategies are likely to be successful if landowners perceive water resource protection as a moral issue and a collective responsibility of local landowners.

Findings from study I suggest that outreach programs that provide landowners with tailored information about adverse consequences of water pollution to public health and quality of life along with communication campaigns that present water resource protection as a collective responsibility can help establish water resource protection as a personal norm. Further, these programs should also appeal to landowners' collectivistic and biospheric-altruistic values by focusing communication on the ecological and community benefits of conservation.

Findings from both studies suggest that landowners' perceptions about availability of resources (e.g., financial resources, knowledge, skills, time) to protect water resources influences their personal norms to act and their civic engagement in water resource issues. These findings suggest that conservation programs must provide incentives that address real or perceived barriers. Monetary incentives such as cost-sharing programs could help offset the initial cost of voluntary adoption of conservation practices, while technical assistance programs could provide the knowledge and skills needed to adopt and maintain conservation practices. A combination of outreach programs and financial and technical assistance programs may be most effective at inducing voluntary behavior change.

Strategies that build relationships with landowners encourage landowners to be civically engaged in water resource issues.

Findings from study II demonstrate that social relationships and perceived social pressure influence landowners' civic engagement in water resource conservation. Landowners who believe that social referent groups expect them to protect water resources are more likely to be civically engaged. Social norms are shared by social groups and are learned through social relationships (Schwartz, 1977). Strategies such as watershed councils, peer-to-peer networks and community events around water resource protection can help build relationships and establish conservation as a social norm. Once established, these shared social expectations around water resource protection can influence others in their conservation decisions. Further social referent groups such as

family members, neighbors, environmental advocacy organizations, soil and water conservation districts (SWCD), CRWP, University researchers, local extension agents, local co-ops and agronomists influence landowners' conservation decisions. These groups should be brought to the table in watershed council and other initiatives aimed at promoting conservation as a social norm and civic responsibility.

Study findings also suggest that local water resource agencies and organizations should take a strategic approach to building relationships with landowners. Steg and Vlek (2009) suggest two types of intervention strategies to promote pro-environmental behavior: informational and structural. However, beyond developing strategies to address landowner motivations (e.g., landowner conservation norms) and constraints to behavior change (e.g., lack of resources), water resource managers should also approach building relationships as a distinct type of intervention strategy. A qualitative study of decision-makers and residents in the Minnehaha Creek watershed demonstrates that relationship-building between residents and organizations is an effective way to engage community members in water resource management (Pradhananga & Davenport, 2013). Further, building trust through formal and interpersonal relationships was identified as a strategy to increase community engagement in water resource issues (Pradhananga & Davenport, 2013). In Sand Creek watershed, individual SWCD staff members work directly with large landowners while county staff members work with water resource organizations such as lake associations. Staff members are also asked to check in monthly with landowners instead of waiting for landowners to contact them when information is needed (Davenport et al., 2013). Positive interactions with resource agency staff can help

build trusting relationships, making it more likely that landowners will be more receptive to participation in future conservation programs.

Water resource professionals should identify and develop civic leaders.

Findings from study II suggest that civic leaders in the watershed feel a strong sense of personal obligation to be civically engaged, believe that protecting water resources is a collective responsibility, have the knowledge, skills and time to use conservation practices and have social referent groups that put pressure on them to use conservation practices. Civic leaders, through their interactions with other landowners can help establish water resource conservation as a community norm. Strategies such as citizen recognition programs that present civic leaders as role models can reinforce the idea that being an active community member means taking civic action to protect water resources.

Future research

Future research should build on theoretical frameworks to understand landowner behavior in the context of water resource management. MOM provides a useful framework to understand the relationships between values, beliefs, norms and landowner behavior. However, other social-psychological constructs can be integrated to enhance the understanding of landowners' conservation norms and behaviors. Future research should examine the influence of landowners' self-identity (Nigbur et al., 2010; Stryker, 1987) and their identification with social groups (e.g., community) (Terry & Hogg, 1996; White et al., 2009) on their conservation norms and behaviors. Research suggests that the behavior of others or descriptive norms are distinct from subjective norms (Kallgren,

Reno, & Cialdini, 2000; Nigbur et al., 2010). The role of descriptive norm as a driver of water conservation norms and behavior has to be explored in future research.

Research around environmental values needs to be further explored and refined. While some researchers suggest that a distinct biospheric value orientation based on concerns about the ecosystem is emerging (De Groot & Steg, 2008), others have not been able to distinguish biospheric from altruistic values (Stern, Dietz, & Guagnano, 1995; Stern & Dietz, 1994). Future research should examine whether a distinct biospheric value is emerging and whether it provides a distinct basis for conservation norms and behaviors.

Behaviors are not driven by motivations alone. Contextual factors (e.g., public policy, access to resources) may facilitate or constrain pro-environmental behavior. Contextual factors may directly influence behavior or may influence public attitudes and norms towards conservation (Steg & Vlek, 2009). The extent to which behaviors can be changed through motivation-based interventions depends upon the strength of contextual forces (Stern, 1999). MOM only considers individuals' perceptions of contextual factors, measured as *ability*. Contextual factors such as actual availability of financial and technical resources, eligibility for conservation programs and economic variables (e.g., prices for agricultural products and environmental services) may influence landowner conservation behaviors. The influence of these factors on conservation behavior and motivational factors such as beliefs and norms should be studied in future research.

Future research should also examine the efficacy of MOM in explaining conservation norms and behaviors of traditionally underrepresented groups (e.g., racial

and ethnic minority or low-income communities) in order to help resource managers design tailored intervention strategies targeted at diverse audiences. A qualitative study in Minnehaha Creek watershed, an urban and diverse watershed, suggests that although minority community members are willing to engage in community issues, their civic engagement in water resource planning and management is limited (Pradhananga & Davenport, 2013). MOM suggests that conservation behavior is driven by feelings of personal obligation or personal norms and that personal norms are activated based on the saliency of beliefs about the consequences of water resource problems, the responsibility to take action, perceived social pressure to take action and beliefs about one's own ability to take action. In the Minnehaha Creek watershed, minority community members' personal norms around water resource conservation may not have been activated because the activators of personal norms were not salient in the decision making situation, thus resulting in limited civic engagement in water resource issues. In the Minnehaha Creek study, participants suggested lack of awareness of water resource problems and their own connections to water as constraints to community engagement in water resource issues. Further, minority community members highlighted lack of time and resources as constraints to their engagement in water resource conservation. However, minority community members described a strong sense of community within their ethnic groups as an asset in their community, suggesting that perceived social pressure from their in-group (i.e., ethnic group) may activate personal norms of conservation behavior among minority community members. Resource managers should link water resources to other community concerns (e.g., drinking water), address constraints to civic engagement and

build trusting relationships with minority communities using connections with respected minority leaders (Pradhananga & Davenport, 2013).

Future research should also integrate social information with biophysical information to enhance watershed management. Social information such as landowner values, beliefs and norms can be integrated with biophysical information such as slope and hydrology to identify "best opportunity areas" for a targeted conservation approach. Resource managers can then promote conservation practices appropriate to particular locales by designing intervention strategies tailored to local landowners' values and beliefs.

The efficacy of intervention strategies is also an area that needs to be explored in future research. Informational and structural strategies should be evaluated for their effectiveness in changing landowners' conservation norms and behavior. Future research should explore whether intervention strategies lead to adoption of conservation practices and greater levels of civic engagement in water resource issues. Strategies must also be evaluated against specific water resource outcomes. Research in this area will enhance the understanding of interventions strategies that are most effective at inducing voluntary behavior change.

Current management approaches rely heavily on voluntary behavior change at the individual and collective levels to solve NPS pollution problems. Strategies aimed at behavior change must be based on an understanding of the determinants of behavior. MOM offers an integrative theoretical framework to understand the determinants of landowner conservation norms and behavior in the context of water resource

management. Theoretically, it enhances current understanding of the relationships between values, beliefs, personal and subjective norms, and pro-environmental behavior. In study I, I examined the influence of environmental and cultural values, and a series of activators on landowners' personal norms to protect water resources. In study II, I investigated the influence of a series of activators and personal norm on landowners' civic engagement in water resource conservation. Findings indicate that for many landowners water resource conservation is a moral choice. Biospheric and collectivistic values determine the extent to which landowners view water resource conservation as a moral situation. Further, landowners' feelings of personal moral obligation or personal norm also influence their civic engagement in water resource conservation. MOM also expands on previous understanding of the norm activation process. Four sets of activators: awareness of consequences of environmental problems, ascription of local responsibility, ability to act and subjective norms activate landowners' personal norm to act. Importantly study findings establish subjective norms as a useful addition to moral approach theoretical models. Study findings help resource managers design appropriate intervention strategies based on an understanding of landowner values, beliefs and norms. Findings suggest that a combination of informational (e.g., outreach and education) and structural (e.g., financial and technical assistance) strategies could be most effective at promoting voluntary behavior change. Communication and outreach programs should emphasize water resource protection as both a moral obligation and a collective responsibility. Further, communication and outreach programs that present conservation

action, including civic engagement, as a social or community norm are likely to influence local landowners and resource users.

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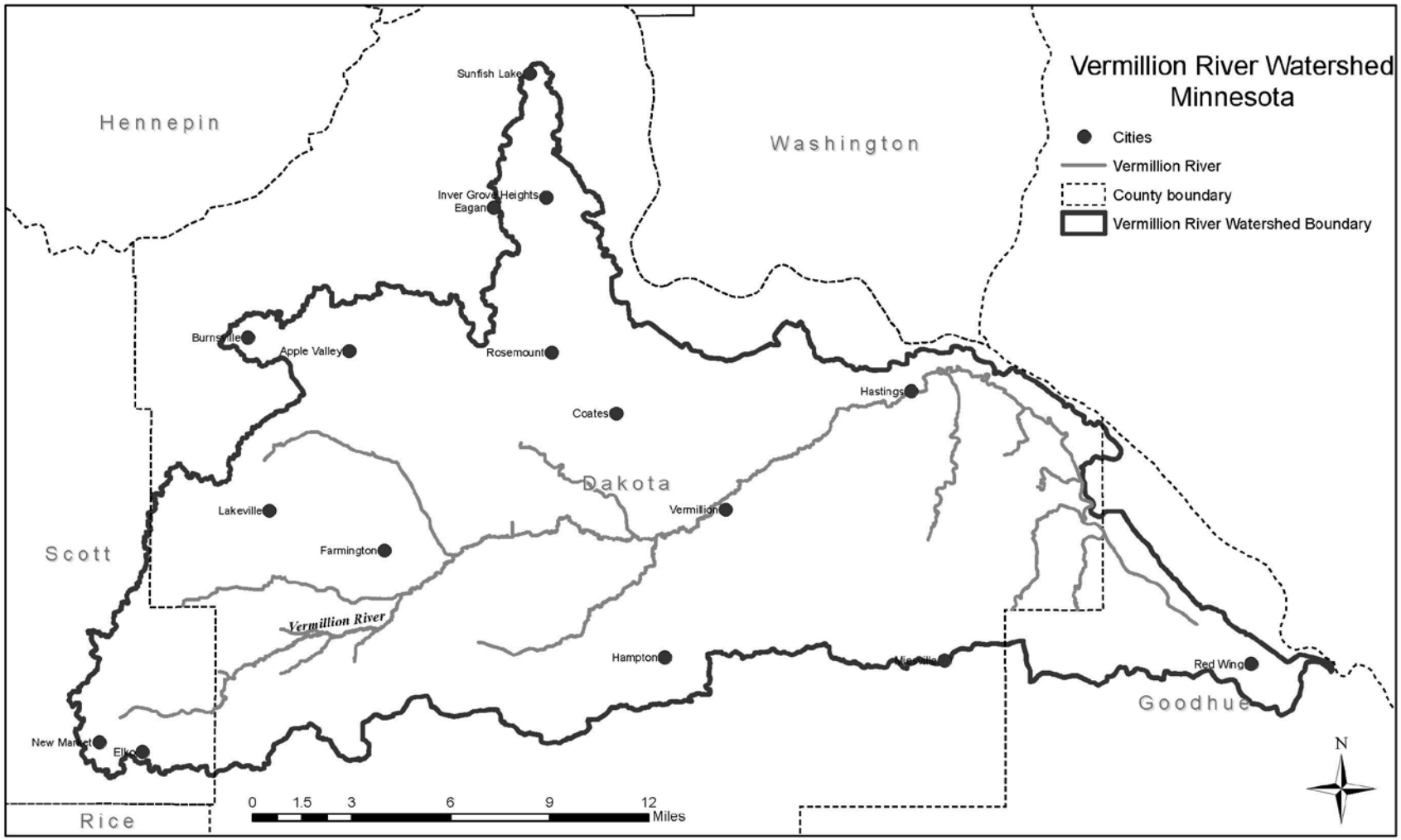
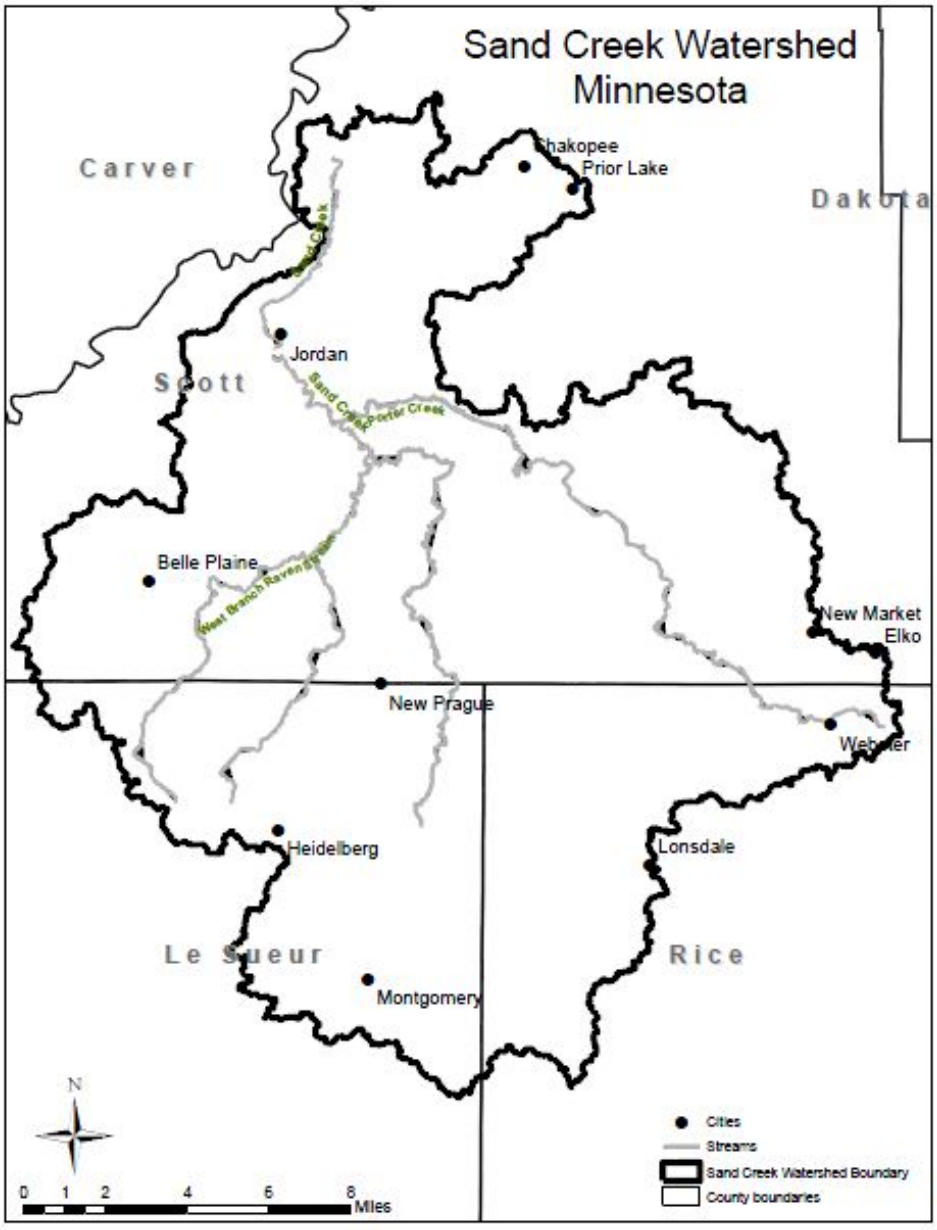
Appendices

Appendix A: Study I

I. Vermillion River watershed map


Vermillion River Watershed
Minnesota
Cities
Vermillion River
County boundary
Vermillion River Watershed Boundary
Hennepin
Washington
Dakota
Scott
Rice
Goodhue
Sunfish Lake
Inver Grove Heights
Eagan
Burnsville
Apple Valley
Rosemount
Coates
Hastings
Lakeville
Farmington
Vermillion
Vermillion River
Hampton
Red Wing
New Market
Elko
0 1.5 3 6 9 12
Miles
N

II. Sand Creek watershed map

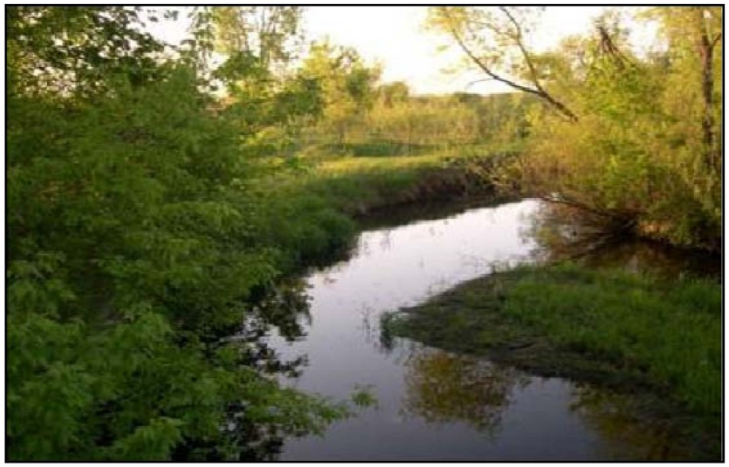

Sand Creek Watershed
Minnesota
Carver
Dakota
Scott
Le Sueur
Rice
Shakopee
Prior Lake
Jordan
Belle Plaine
New Market
Elko
New Prague
Webster
Heidelberg
Lonsdale
Montgomery
Sand Creek
Spring Creek
West Branch Raven Stream
N
0 1 2 4 6 8
Miles
Cities
Streams
Sand Creek Watershed Boundary
County boundaries

III. Survey Questionnaire

ID# _____

Your Perspectives on Local Water Resources

A survey of landowners in Sand Creek and Vermillion River Watersheds



Department of FOREST RESOURCES
University of Minnesota

2011

Thank you for taking the time to answer questions about your community and your watershed.

The purpose of this survey is to understand the perspectives of landowners on their community and water resources. The findings from this study will be used to help resource managers and community leaders understand landowner perspectives on water resources and to facilitate communication and conservation programs.

Your opinions are very valuable to us. This survey is voluntary and completely confidential. Please answer the questions as completely as possible. It should take you about 20 minutes to complete the questionnaire. Please complete the survey, fold it in half, and mail it back in the enclosed self-addressed stamped envelope.

Please keep in mind the following definitions while you are completing this questionnaire.

A watershed is an area of land that drains water and suspended or dissolved materials to a common outlet at some point along a stream or river. The natural watershed drainage area can be altered by engineered drainage networks.

A streamside buffer is an area of land adjacent to streams or ditches that filters water, stabilizes the stream bank, and provides habitat for wildlife. To maintain or establish a streamside buffer, a landowner typically retains or plants native vegetation along a stream edge.

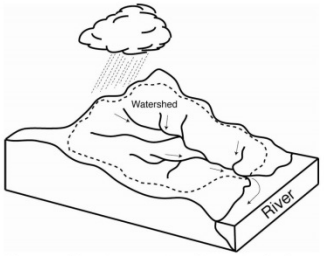


Diagram of the stream systems in a watershed

I. Perspectives on Your Community

First, we would like to know how you define and relate to your community.

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

When I think of my community, I think of...	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree	Don't Know/ Not sure
a. My nearest neighbors.	-2	-1	0	1	2	DK
b. People who live within 1-3 miles from my home.	-2	-1	0	1	2	DK
c. The city or township in which I live.	-2	-1	0	1	2	DK
d. The county in which I live.	-2	-1	0	1	2	DK
e. The watershed in which I live.	-2	-1	0	1	2	DK
f. The entire state of Minnesota.	-2	-1	0	1	2	DK
g. Other (please specify):_____	-2	-1	0	1	2	DK

2. How important are each of the following as guiding principles in your life? ***(Please circle one number for each row)***

	Not at all important	Slightly important	Moderately important	Very important	Extremely important	Don't Know/ Not sure
a. To identify myself as a member of my community.	1	2	3	4	5	DK
b. To be different from members of my community.	1	2	3	4	5	DK
c. To cooperate with members of my community.	1	2	3	4	5	DK
d. To pursue my personal goals even if they conflict with broader community goals.	1	2	3	4	5	DK
e. To follow norms of behavior established by my community.	1	2	3	4	5	DK
f. To nurture or help other members of my community.	1	2	3	4	5	DK

II. Perspectives on the Environment

Next, we would like to know your thoughts on the natural environment.

3. How important are each of the following as guiding principles in your life? ***(Please circle one number for each row)***

	Not at all important	Slightly important	Moderately important	Very important	Extremely important	Don't Know/ Not Sure
a. To preserve nature for its own sake.	1	2	3	4	5	DK
b. To conserve natural resources for human use.	1	2	3	4	5	DK
c. To use natural resources for personal income.	1	2	3	4	5	DK
d. To protect nature for human health and well-being.	1	2	3	4	5	DK
e. To maintain unity with nature.	1	2	3	4	5	DK
f. To protect private property rights.	1	2	3	4	5	DK
g. To respect the earth.	1	2	3	4	5	DK
h. To conserve natural resources for my recreational use.	1	2	3	4	5	DK
i. To distribute natural resources fairly.	1	2	3	4	5	DK

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

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree	Don't Know/ Not sure
a. Protecting the environment will threaten jobs for people like me.	-2	-1	0	1	2	DK
b. Laws to protect the environment limit my choices and personal freedom.	-2	-1	0	1	2	DK
d. The effects of water pollution on public health are worse than we realize.	-2	-1	0	1	2	DK
e. Water pollution poses serious threats to the quality of life in my community.	-2	-1	0	1	2	DK
f. The balance of nature is delicate and easily upset.	-2	-1	0	1	2	DK
g. Claims that current levels of pollution are changing the earth's climate are exaggerated.	-2	-1	0	1	2	DK
h. Streamside buffers help to improve water quality for people living downstream.	-2	-1	0	1	2	DK
i. Streamside buffers reduce the value of land.	-2	-1	0	1	2	DK
j. Streamside buffers should be protected because they provide habitat for wildlife.	-2	-1	0	1	2	DK

III. Perception of Water Resources

In this section, we ask more specific questions related to your perspectives on water resources.

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

I am concerned about the consequences of water pollution for...	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree	Don't Know/ Not sure
a. My health	-2	-1	0	1	2	DK
b. Future generations	-2	-1	0	1	2	DK
c. Wildlife	-2	-1	0	1	2	DK
d. My lifestyle	-2	-1	0	1	2	DK
e. Aquatic life	-2	-1	0	1	2	DK
f. People in my community	-2	-1	0	1	2	DK

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

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree	Don't Know/ Not sure
a. Water resources in my community are adequately protected.	-2	-1	0	1	2	DK
b. Someone who uses a conservation practice contributes to a clean environment.	-2	-1	0	1	2	DK
c. What I do on my land doesn't make much difference in overall water quality.	-2	-1	0	1	2	DK
d. It is my personal responsibility to help protect water quality.	-2	-1	0	1	2	DK
e. Landowners/property owners in my community should be responsible for protecting water quality.	-2	-1	0	1	2	DK
f. The federal government should be responsible for protecting water quality.	-2	-1	0	1	2	DK
g. The state government should be responsible for protecting water quality.	-2	-1	0	1	2	DK
h. Local government (i.e. county, city/township) should be responsible for protecting water quality.	-2	-1	0	1	2	DK

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

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree	Don't Know/ Not sure
a. If I wanted to, I have the ability to change the way I use my land/property to protect water resources.	-2	-1	0	1	2	DK
b. I have the financial resources I need to take care of my land.	-2	-1	0	1	2	DK
c. I have the knowledge and skills I need to take care of my land.	-2	-1	0	1	2	DK
d. My community has the ability to change the way land is currently used to protect water resources.	-2	-1	0	1	2	DK
e. My community has the ability to change the way land will be developed in the future to protect water resources.	-2	-1	0	1	2	DK
f. My community has the financial resources it needs to protect water resources.	-2	-1	0	1	2	DK
g. My community has the leadership it needs to protect water resources.	-2	-1	0	1	2	DK

IV. Conservation Practices and Civic Engagement

Now, we have a few questions about your conservation practices and civic engagement.

8. How likely or unlikely is it that the following individuals or groups would influence your decisions about conservation practices on your land/property? ***(Please circle one number for each row)***

	Very Unlikely	Somewhat Unlikely	Neither likely nor unlikely	Somewhat likely	Very likely	Don't Know/ Not sure
a. My family	-2	-1	0	1	2	DK
b. My neighbors	-2	-1	0	1	2	DK
c. People in my community	-2	-1	0	1	2	DK
d. My local government	-2	-1	0	1	2	DK
e. Environmental organizations	-2	-1	0	1	2	DK
f. Sportspersons clubs	-2	-1	0	1	2	DK
g. Property rights organizations	-2	-1	0	1	2	DK
h. My county's Soil and Water Conservation District	-2	-1	0	1	2	DK
i. My county's Farm Bureau	-2	-1	0	1	2	DK
j. My local Watershed Management Organization	-2	-1	0	1	2	DK
k. The MN Department of Natural Resources	-2	-1	0	1	2	DK
l. The MN Pollution Control Agency	-2	-1	0	1	2	DK

Next, we would like to know to what extent you feel a *personal obligation* to engage in the following actions.

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

I feel a personal obligation to...	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree	Don't Know/ Not sure
a. Do whatever I can to prevent water pollution.	-2	-1	0	1	2	DK
b. Take actions to stop the loss of wildlife habitat.	-2	-1	0	1	2	DK
c. Use conservation practices on my land/property.	-2	-1	0	1	2	DK
d. Maintain a streamside buffer on my land/ property.	-2	-1	0	1	2	DK
e. Talk to others about conservation practices.	-2	-1	0	1	2	DK
f. Work with other community members to protect the environment.	-2	-1	0	1	2	DK

Now, we would like to know *the likelihood that you would* engage in the following actions.

10. How likely or unlikely is it that you would engage in the following actions in the future? ***(Please circle one number for each row)***

	Very unlikely	Somewhat unlikely	Neither likely nor unlikely	Somewhat likely	Very likely	Don't Know/ Not sure
a. Do whatever I can to prevent water pollution.	-2	-1	0	1	2	DK
b. Take actions to stop the loss of wildlife habitat.	-2	-1	0	1	2	DK
c. Use conservation practices on my land/property.	-2	-1	0	1	2	DK
d. Maintain a streamside buffer on my land/ property.	-2	-1	0	1	2	DK
e. Talk to others about conservation practices.	-2	-1	0	1	2	DK
f. Work with other community members to protect the environment.	-2	-1	0	1	2	DK

We want to know about your experiences with and beliefs about streamside buffers **(See definition on inside cover)**

11. To what extent do you maintain streamside buffers on your land/property? ***(Please check one box)***

- ☐ I **do not have** streams/ditches on or adjacent to my property **(Skip to Question 13)**
- ☐ I maintain buffers **on all** streams/ditches on or adjacent to my property.
- ☐ I maintain buffers **on some** streams/ditches on or adjacent to my property.
- ☐ I **do not** maintain buffers on any streams/ditches on or adjacent to my property.

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

I would be more likely to maintain or continue to maintain streamside buffers on or adjacent to my property if...	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree	Don't Know/ Not sure
a. I knew more about the benefits of streamside buffers.	-2	-1	0	1	2	DK
b. I knew more about how to plant and maintain streamside buffers.	-2	-1	0	1	2	DK
c. I had help with the physical labor of planting and maintaining streamside buffers.	-2	-1	0	1	2	DK
d. I had access to financial resources to help me plant and maintain streamside buffers.	-2	-1	0	1	2	DK
e. I were compensated for lost crop production because of streamside buffers.	-2	-1	0	1	2	DK
f. I could attend a community workshop or field day on streamside buffers.	-2	-1	0	1	2	DK
g. I could be enrolled in a registry program that recognizes local conservation stewards.	-2	-1	0	1	2	DK
h. My neighbors maintained streamside buffers.	-2	-1	0	1	2	DK
i. I could learn how to maintain streamside buffers for wildlife benefits.	-2	-1	0	1	2	DK
j. I could learn how to maintain streamside buffers for scenic quality.	-2	-1	0	1	2	DK
k. I could learn how to maintain streamside buffers for soil conservation.	-2	-1	0	1	2	DK
l. I could learn how to maintain streamside buffers for water quality.	-2	-1	0	1	2	DK

13. Have you engaged in the following actions in the past 12 months? ***(Please check yes or no for each row)***

In the past 12 months, have you ...	Yes	No	Don't Know/Not Sure
a. Discussed water quality issues with community members?	☐	☐	☐
b. Attended a meeting, public hearing or community discussion group about an environmental issue?	☐	☐	☐
c. Read any newsletters, magazines or other publications written by environmental groups?	☐	☐	☐
d. Given money to an environmental group?	☐	☐	☐
e. Written a letter or called a government official to support strong environmental protection?	☐	☐	☐
f. Joined or been a member of any group whose main aim is to protect the environment?	☐	☐	☐
g. Voted for a candidate in an election at least in part because he or she was in favor of strong environmental protection?	☐	☐	☐

V. Watershed Management in Minnesota

Next, please consider the impact of future management actions on the quality of Minnesota's water resources.

14. In your opinion, how likely is it that the following management actions will protect the quality of water resources in Minnesota? ***(Please circle one number for each row)***

		Very unlikely	Somewhat unlikely	Neither likely nor unlikely	Somewhat likely	Very likely	Don't Know/ Not Sure
a.	Conducting more water quality research and monitoring.	-2	-1	0	1	2	DK
b.	Enforcing existing land use laws and regulations.	-2	-1	0	1	2	DK
c.	Increasing regulations that specifically address water resource management.	-2	-1	0	1	2	DK
d.	Expanding incentive-based programs that offer payments to landowners for conservation practices	-2	-1	0	1	2	DK
e.	Promoting voluntary adoption of conservation practices through increased education and outreach programs.	-2	-1	0	1	2	DK
f.	Coordinating land use and water planning efforts across communities.	-2	-1	0	1	2	DK
g.	Engaging more citizens in local land use and water resource decision making.	-2	-1	0	1	2	DK

VI. Information about You

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

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

16. In what year were you born? _____

17. What is your gender?

☐ Male ☐ Female

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

☐ Did not finish high school
☐ Completed high school
☐ Some college but no degree
☐ Associate degree or vocational degree
☐ College bachelors degree
☐ Some college graduate work
☐ Completed graduate degree (Masters or Ph.D.)

19. Are you of Hispanic, Latino or Spanish Origin? ***(Please check Yes or No)***

☐ Yes ☐ No

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

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

21. Which of the following best describes your total household income from all sources in 2010 before taxes? ***(Please check one box)***

☐ Under $10,000
☐ $10,000-$24,999
☐ $25,000-$34,999
☐ $35,000-$49,999
☐ $50,000-$74,999
☐ $75,000-$99,999
☐ $100,000-$149,999
☐ $150,000 or more

22. Which of the following best describes the size of your current land/property? ***(Please check one box)***

☐ No property (e.g., apartment, condo)
☐ Under 1 acre
☐ 1-5 acres
☐ 6-20 acres
☐ 21-50 acres
☐ 51-150 acres
☐ 151 acres or more

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

☐ Yes ☐ No

24. What percent of your income is dependent on your land/property? ***(Please check one box)***

- ☐ 0%
- ☐ 1-25%
- ☐ 25-50%
- ☐ More than 50%

25. Which of the following best describes the ownership arrangement of your land/property? ***(Please check one box)***

- ☐ I own and manage my own land/property
- ☐ I rent my land/property to another party
- ☐ I rent my land/property from another party
- ☐ Other (please specify):_____

26. Who makes the management decisions on your property? ***(Please check one box)***

- ☐ I make my own decisions
- ☐ I leave it up to my renter
- ☐ I leave it up to the landowner/property owner
- ☐ I work together with renter/landowner to make decisions

27. Does the land/property you own or rent border a stream/ditch or have streams/ditches running through it? ***(Please check yes or no)***

- ☐ Yes
- ☐ No **(Please skip to Question 29)**

28. How would you characterize the quality of water in the stream/ditch? ***(Please check one box)***

- ☐ Very poor
- ☐ Poor
- ☐ Good
- ☐ Fair
- ☐ Very good
- ☐ Don't Know/Not sure

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

Thank you for your help!

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

If you have questions about the survey or the project, please contact Dr. Mae Davenport, Department of Forest Resources, 115 Green Hall, 1530 Cleveland Avenue N., St. Paul, MN 55108. Phone: (612) 624-2721 or Amit Pradhananga by email at prad0047@umn.edu.

Image Credits: Cover Photo: Vermillion River Corridor Plan Draft 2010, Watershed diagram: E. Seekamp

Appendix B: Study II

I. Cannon River watershed map

Cannon River Watershed

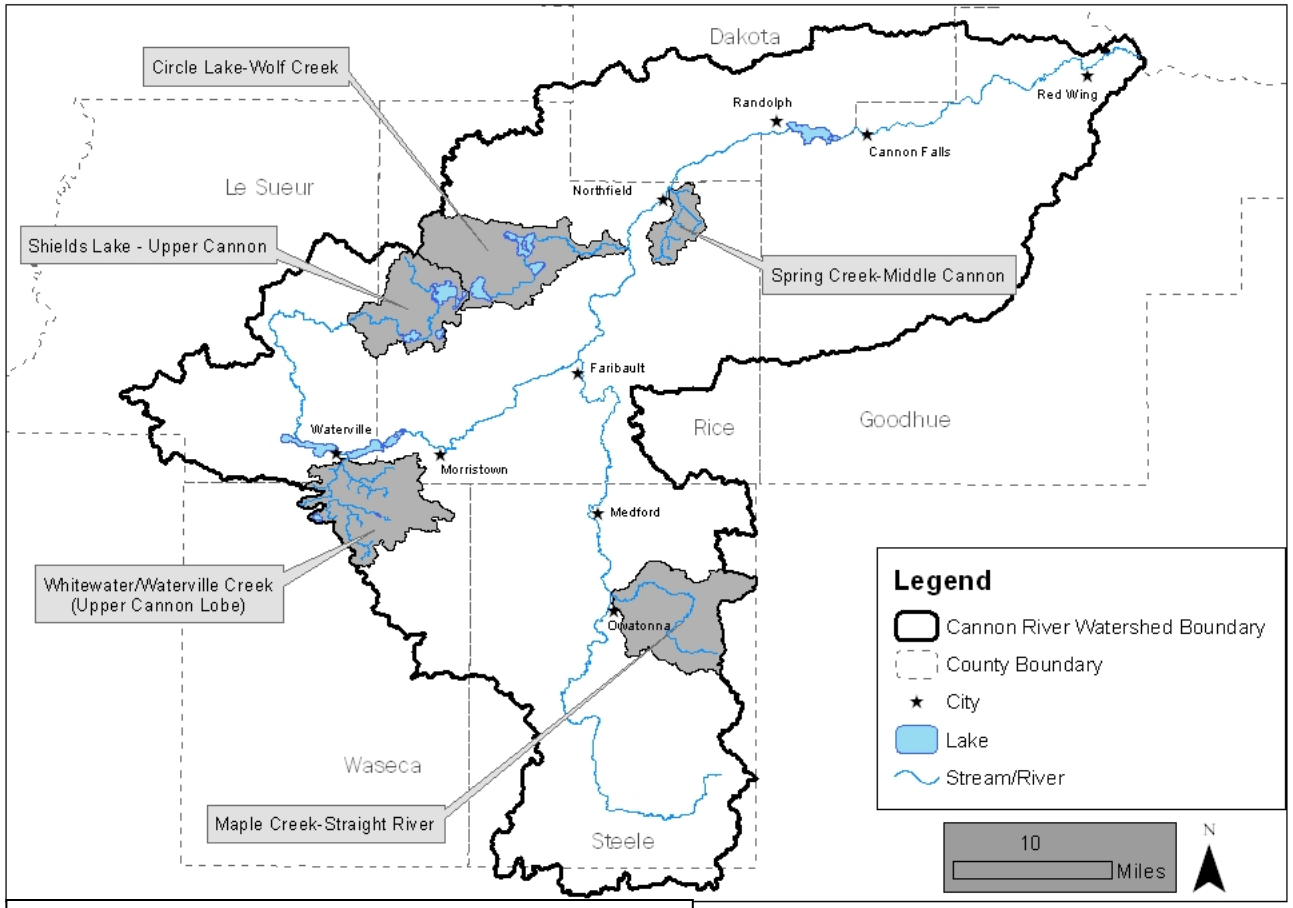


Image by Cannon River Watershed Partnership

II. Survey Questionnaire

ID# _____

Cannon River Watershed Survey

Cannon River Watershed Partnership
Northfield, MN
and
Department of Forest Resources
University of Minnesota
St. Paul, Minnesota

Before you begin:

- We are conducting this survey to better understand property owners' beliefs and behaviors and to improve communication and conservation programming for property owners.
- **This survey is voluntary and confidential.** It should take about 20 minutes to complete this questionnaire. Please answer the questions as completely as possible.

Once you've completed the survey:

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

Please keep in mind the following definitions while you are completing this survey:
Water resources include both surface water (lakes, streams, rivers, etc.) and groundwater.

A conservation practice refers to any effort or practice that prevents and/or minimizes degradation of water resources.

Thank you for your help!

I. Perspectives on Your Community

First, we would like to know your thoughts on your community.

1. When you think of <u>your community</u>, what geographic area primarily comes to mind? *(Please check one)* [ ] Neighborhood [ ] Township [ ] City [ ] County [ ] Watershed

2. How important are each of the following as guiding principles in your life? *(Please circle one number for each row)*

	Not at all important	Slightly important	Moderately important	Very important	Extremely important
a. To identify myself as a member of my community.	1	2	3	4	5
b. To be different from members of my community.	1	2	3	4	5
c. To cooperate with members of my community.	1	2	3	4	5
d. To pursue my personal goals even if they conflict with broader community goals.	1	2	3	4	5
e. To nurture or help other members of my community.	1	2	3	4	5
f. To be self-reliant rather than depend on other community members.	1	2	3	4	5

II. Perspectives on the Environment

Next, we would like to know your thoughts on the natural environment.

3. How important are each of the following as guiding principles in your life? *(Please circle one number for each row)*

	Not at all important	Slightly important	Moderately important	Very important	Extremely important
a. To preserve nature for its own sake.	1	2	3	4	5
b. To conserve natural resources for human use.	1	2	3	4	5
c. To use natural resources for personal income.	1	2	3	4	5
d. To protect nature for human health and well-being.	1	2	3	4	5
e. To maintain unity with nature.	1	2	3	4	5
f. To protect private property rights.	1	2	3	4	5
g. To respect the earth.	1	2	3	4	5
h. To conserve natural resources for my use (e.g., recreation, production, etc.)	1	2	3	4	5
i. To share natural resource benefits among all people.	1	2	3	4	5

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

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
a. Protecting water resources will threaten jobs for people like me.	-2	-1	0	1	2
b. Laws to protect the environment limit my choices and personal freedom.	-2	-1	0	1	2
c. Water pollution can affect human health.	-2	-1	0	1	2
d. Water pollution can affect my lifestyle.	-2	-1	0	1	2
e. Conservation practices contribute to quality of life in my community.	-2	-1	0	1	2
f. Conservation practices protect aquatic life.	-2	-1	0	1	2
g. Water resources in my community are adequately protected.	-2	-1	0	1	2
h. Water resources in Minnesota need better protection.	-2	-1	0	1	2

III. Perception of Water Resources Problems and Conservation

In this section, we ask more specific questions related to your perspectives on water resources.

5. How familiar are you with water resource issues in your watershed? (Please check one)
[ ] Not at all familiar [ ] Slightly familiar [ ] Moderately familiar [ ] Very familiar

6. <u>Before this survey</u>, did you know your property is in the Cannon River Watershed? (*see enclosed map)* [ ] Yes [ ] No [ ] My property is not in the Cannon River Watershed

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

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

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

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
a. It is my personal responsibility to help protect water quality.	-2	-1	0	1	2
b. It is my personal responsibility to make sure that what I do on my land doesn't contribute to water pollution.	-2	-1	0	1	2
c. Landowners/property owners in my community should be responsible for protecting water quality.	-2	-1	0	1	2
d. The federal government should be responsible for protecting water quality.	-2	-1	0	1	2
e. The state government should be responsible for protecting water quality.	-2	-1	0	1	2
f. Local government should be responsible for protecting water quality.	-2	-1	0	1	2
g. Landowners upstream should be responsible for impacts downstream.	-2	-1	0	1	2
h. Lakeshore and streamside landowners should be responsible for protecting water quality.	-2	-1	0	1	2

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

	Not a problem	Slight problem	Moderate problem	Severe problem	Don't know
a. Sediment (cloudiness)	1	2	3	4	DK
b. Phosphorus	1	2	3	4	DK
c. Nitrogen in surface water	1	2	3	4	DK
d. Nitrogen in drinking water	1	2	3	4	DK
e. Flooding	1	2	3	4	DK
f. Drought	1	2	3	4	DK
g. *E. coli* (bacteria)	1	2	3	4	DK
h. Pesticides	1	2	3	4	DK
i. Herbicides	1	2	3	4	DK
j. Non-native and invasive aquatic plants	1	2	3	4	DK
k. Non-native and invasive aquatic animals	1	2	3	4	DK
l. Soil loss	1	2	3	4	DK

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

	Not a problem	Slight problem	Moderate problem	Severe problem	Don't know
a. Industrial discharge to streams, rivers, and lakes	1	2	3	4	DK
b. Land development (e.g., residential, commercial)	1	2	3	4	DK
c. Improperly sized/maintained septic systems	1	2	3	4	DK
d. Soil erosion from farm fields	1	2	3	4	DK
e. Use of fertilizers for crop production	1	2	3	4	DK
f. Confined animal feedlot operations (CAFOs)	1	2	3	4	DK
g. Excessive use of lawn fertilizers	1	2	3	4	DK
h. Farm drainage (e.g., ditches, tiling)	1	2	3	4	DK
i. Grass clippings and leaves entering storm drains	1	2	3	4	DK
j. Urban/suburban storm water runoff	1	2	3	4	DK
k. Natural causes (e.g., natural erosion, wildlife)	1	2	3	4	DK

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

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
a. My use of a conservation practice contributes to healthy water resources.	-2	-1	0	1	2
b. What I do on my land does not make much difference in overall water quality.	-2	-1	0	1	2
c. If I wanted to, I have the ability to change the way I use my land/property to protect water resources.	-2	-1	0	1	2
d. I have the financial resources I need to use conservation practices on my land/property.	-2	-1	0	1	2
e. I have the knowledge and skills I need to use conservation practices on my land/property.	-2	-1	0	1	2
f. I have the time to use conservation practices on my land/property.	-2	-1	0	1	2
g. My community has the ability to change the way land is currently used to protect water resources.	-2	-1	0	1	2
h. My community has the ability to change the way land will be developed in the future to protect water resources.	-2	-1	0	1	2
i. My community has the financial resources it needs to protect water resources.	-2	-1	0	1	2
j. My community has the leadership it needs to protect water resources.	-2	-1	0	1	2

IV. Conservation Practices and Community Engagement

Now, we have a few questions about your conservation practices and community engagement.

12. Please identify the extent to which you are currently engaged in the following conservation practices. *(Please circle one response for each row)*

	Not at all	In one to a few locations	In about half of the possible locations	In most possible locations	In all possible locations	Not applicable
a. I maintain a conservation buffer along streams and ditches in my property/land.	no	few	half	most	all	NA
b. I use a rain barrel on my property.	no	few	half	most	all	NA
c. I follow manufacturer's instructions and do not over-apply when fertilizing lawn or garden.	no	few	half	most	all	NA
d. I have porous (permeable) pavement to minimize runoff and allow infiltration.	no	few	half	most	all	NA
e. I plant native vegetation in my lawn or garden (e.g., rain garden).	no	few	half	most	all	NA
f. I properly maintain my septic system.	no	few	half	most	all	NA
g. I use conservation tillage practices on my farm.	no	few	half	most	all	NA
h. I follow a comprehensive nutrient management plan on my farm.	no	few	half	most	all	NA
i. I plant cover crops on my farm.	no	few	half	most	all	NA
j. I have a controlled drainage management system (conservation drainage) on my farm.	no	few	half	most	all	NA
k. I use University of MN recommendations for the timing, method, and rate of fertilizer application on my farm.	no	few	half	most	all	NA

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

In the <u>past 12 months</u> how many times have you...	Number of times				
a. Heard about a CRWP initiative (e.g., rain barrel workshop, annual watershed cleanup, newspaper column)?	0	1	2-4	5-10	>10
b. Participated in a CRWP initiative (e.g., rain barrel workshop, annual watershed cleanup)?	0	1	2-4	5-10	>10
c. Worked with community members to protect water quality (unrelated to the CRWP)?	0	1	2-4	5-10	>10
d. Talked to others about conservation practices?	0	1	2-4	5-10	>10
e. Attended a meeting, public hearing or community discussion unrelated to the CRWP about a water resource issue?	0	1	2-4	5-10	>10

Next, we would like to know your intentions to engage in the following actions.

14. Please rate your intentions to engage in the following actions in the next 12 months. *(Please circle one number for each row)*

In the next 12 months, I intend to...	Most certainly not	Probably not	Uncertain	Probably will	Most certainly will
a. Use conservation practices on my land/property.	-2	-1	0	1	2
b. Talk to others about conservation practices.	-2	-1	0	1	2
c. Learn more about water resource issues in my watershed.	-2	-1	0	1	2
d. Work with other community members to protect water quality.	-2	-1	0	1	2
e. Attend a meeting, public hearing or community discussion about a water resource issue.	-2	-1	0	1	2
f. Do whatever I can to prevent water pollution.	-2	-1	0	1	2
g. Contact the CRWP about water resource initiatives.	-2	-1	0	1	2

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

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
a. People who are important to me expect me to use conservation practices on my land/property.	-2	-1	0	1	2
b. People who are important to me use conservation practices on their land/property.	-2	-1	0	1	2
c. People who are important to me expect me to do whatever I can to prevent water pollution.	-2	-1	0	1	2
d. People who are important to me do whatever they can to prevent water pollution.	-2	-1	0	1	2
e. People who are important to me expect me to attend meetings, public hearings, or community discussions about water resource issues.	-2	-1	0	1	2
f. People who are important to me attend meetings, public hearings, or community discussions about water resource issues.	-2	-1	0	1	2
g. In general, people who are important to me influence my decisions and behavior.	-2	-1	0	1	2
h. I generally want to do what people who are important to me want me to do.	-2	-1	0	1	2

Next, we would like to know to what extent you feel a *personal obligation* to engage in the following actions.

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

I feel a personal obligation to...	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
a. Use conservation practices on my land/property.	-2	-1	0	1	2
b. Talk to others about conservation practices.	-2	-1	0	1	2
c. Learn more about water resource issues in my watershed.	-2	-1	0	1	2
d. Work with other community members to protect water quality.	-2	-1	0	1	2
e. Attend a meeting, public hearing or community discussion about a water resource issue.	-2	-1	0	1	2
f. Do whatever I can to prevent water pollution.	-2	-1	0	1	2

17. To what extent do the following individuals or groups influence your decisions about conservation? *(Please circle one number for each row)*

	Not at all	Slightly	Moderately	A lot	Don't know/Not applicable
a. My family	1	2	3	4	DK/NA
b. My neighbors	1	2	3	4	DK/NA
c. Environmental advocacy organizations	1	2	3	4	DK/NA
d. My county's Soil and Water Conservation District	1	2	3	4	DK/NA
e. My financial institution (e.g., financial advisor, loan officer, mortgage lender, etc.)	1	2	3	4	DK/NA
f. The Cannon River Watershed Partnership	1	2	3	4	DK/NA
g. University researchers	1	2	3	4	DK/NA
h. The MN Department of Natural Resources	1	2	3	4	DK/NA
i. The MN Pollution Control Agency	1	2	3	4	DK/NA
j. My local MN extension agent	1	2	3	4	DK/NA
k. My county's Farm Bureau	1	2	3	4	DK/NA
l. Agricultural commodity associations	1	2	3	4	DK/NA
m. Farmer's Union	1	2	3	4	DK/NA
n. My local co-op	1	2	3	4	DK/NA
o. My agronomist	1	2	3	4	DK/NA
p. Other (please specify): _____	1	2	3	4	DK/NA

18. From the previous list (Question 17, a-p), what are your three most <u>trusted sources of information</u> regarding water quality issues and solutions? (*Please list in order of first, second, and third most trusted*)

1. _____ 2. _____ 3. _____

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

I would be more likely to adopt or continue to use conservation practices on my land/property if...	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree	
a. I knew more about the benefits of conservation practices.	-2	-1	0	1	2	
b. I knew more about how to implement and maintain conservation practices.	-2	-1	0	1	2	
c. I had help with the physical labor of implementing and maintaining conservation practices.	-2	-1	0	1	2	
d. I had access to financial resources to help me implement and maintain conservation practices.	-2	-1	0	1	2	
e I could talk to other property owners or farmers who are using conservation practices.	-2	-1	0	1	2	
f. I could attend a community workshop or field day on conservation practices.	-2	-1	0	1	2	
g. I could be enrolled in a registry program that recognizes local conservation stewards.	-2	-1	0	1	2	
h. My neighbors maintained conservation practices.	-2	-1	0	1	2	
i. There were regulations that mandated using a conservation practice.	-2	-1	0	1	2	
j. I could learn how to maintain conservation practices for wildlife benefits.	-2	-1	0	1	2	
k. I could learn how to maintain conservation practices for scenic quality.	-2	-1	0	1	2	
l. I could learn how to maintain conservation practices for soil conservation.	-2	-1	0	1	2	
m. I could learn how to maintain conservation practices for water quality.	-2	-1	0	1	2	
n. I was compensated for lost crop production because of conservation practices.	-2	-1	0	1	2	Not Applicable

V. Watershed Management in Minnesota

Next, please consider your attitudes toward potential water resource management actions in Minnesota.

20. To what extent do you support or oppose the following potential water resource management actions in Minnesota? *(Please circle one number for each row)*

	Strongly oppose	Somewhat oppose	Neither oppose nor support	Somewhat support	Strongly support
a. Conducting more water resource research and monitoring.	-2	-1	0	1	2
b. Enforcing existing land use laws and regulations.	-2	-1	0	1	2
c. Increasing regulations on businesses, corporations and industries to protect water resources.	-2	-1	0	1	2
d. Increasing regulations on private property owners to protect water resources.	-2	-1	0	1	2
e. Expanding programs that offer financial incentives to property owners/farmers for conservation practices.	-2	-1	0	1	2
f. Streamlining existing programs that offer financial incentives to property owners/farmers for conservation practices.	-2	-1	0	1	2
g. Promoting voluntary adoption of conservation practices through increased education and outreach programs.	-2	-1	0	1	2
h. Coordinating land use and water planning efforts across communities.	-2	-1	0	1	2
i. Engaging more citizens in local land use and water resource decision making.	-2	-1	0	1	2

VI. Information About You

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

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

22. Please characterize the ownership arrangement and size of your land/property. *(Please check all that apply and include acreage)*

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

23. What is your experience with programs that offer financial incentives to property owners for conservation practices?

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

24. Do you use your land/property or rent land/property for agricultural production? *(Please check yes or no)* [ ] Yes [ ] No

25. Approximately what percent of your income is dependent on your land/property? _____

26. Who makes the management decisions on your property? *(Please check one box)*

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

27. Does the land/property you own or rent touch a ditch, stream, lake, or river? *(Please check yes or no)* [ ] Yes [ ] No

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

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

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

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

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

[ ] Drinking water
[ ] Canoeing/kayaking/other boating
[ ] Fishing
[ ] Swimming
[ ] Irrigation
[ ] Picnicking and family gatherings
[ ] Observing wildlife
[ ] Experiencing scenic beauty

31. In what year were you born? _____

32. What is your gender? [ ] Male [ ] Female

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

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

34. Are you of Hispanic, Latino, or Spanish origin? (Please check yes or no) [ ] Yes [ ] No

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

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

36. Which of the following best describes your total household income from all sources in 2012 before taxes? *(Please check one box)*

[ ] Under $10,000	[ ] $50,000 - $74,999
[ ] $10,000 - $24,999	[ ] $75,000 - $99,999
[ ] $25,000 - $34,999	[ ] $100,000 - $149,999
[ ] $35,000 - $49,999	[ ] $150,000 or more

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

Thank you for your help!

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

If you have questions about the survey or project, please contact Dr. Mae Davenport, Department of Forest Resources, 115 Green Hall, 1530 Cleveland Avenue N., St. Paul, MN 55108. Phone: (612) 624-2721 or Bjorn Olson by email at olso6198@umn.edu. Cover Photo: CRWP