Losing Our Lakes: An Assessment of the Human Dimensions of Lakeshore Landowner Shoreland Management

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Dedication

I would like to dedicate this dissertation first and foremost to my wife. Without her willingness to take a chance on me and move to Minnesota, this dissertation would never have come to fruition. Her love and ongoing support kept me on the path. I also want to dedicate my dissertation to my parents. Without their emotional and financial support to pursue my dreams, they would not have become a reality. My successes do nothing but express your successes as parents. Finally throughout this journey I lost my grandparents Orpha and John Rudberg and Ruth Ahlcrona. There is not a day that goes by that I do not miss you all terribly. Grandpa, you would be happy to know the hair is cut.

Abstract

The fragility of shorelines and the impact of residential development on habitat and water quality led to the Minnesota Department of Natural Resource's interest in promoting native vegetative buffers. First, I used the Integrative Model (IM) (Fishbein & Yzer, 2003) to evaluate lakeshore homeowners' attitudes, norms and self-efficacy for restoring a native vegetative buffer. Five belief evaluations (decrease maintenance β = .05, increase water quality β = .058, be attractive β = .103, impede recreation β = .046, and create privacy β = -.028 one self-efficacy evaluation (ability to keep up with maintenance β = .23), and three normative influences (family β = -.097, friends β = .051 and Minnesota DNR β = .065) were significant predictors of intention (R^2 = .36).

Secondly, I used the Theory of Normative Social Behavior (TNSB) (Rimal and Real, 2005) as an alternate model and compared the results with the IM (Fishbein & Yzer 2003). My findings indicated that the IM (R^2 = .241) had a greater explanation of variance, when compared to the TNSB, and that a greater amount of the variance was explained by the inclusion of descriptive norms, group ID and injunctive norms (R^2 = .323).

Finally, I sought to connect risk theory with behavioral theory and propose a framework for doing so. I used a case study of Minnesota shoreland landowners with native vegetative buffers for integrating risk and behavioral theory to segment audiences. My findings showed that 22.5% of survey respondents reported having a vegetative buffer on their shoreland and 10% of respondents had removed native vegetation in the past. I did not find a significant difference between the attitudes towards buffers of those

that have removed vegetation and those that have not. However, the findings showed that having a negative attitude towards buffers increased one's odds of not having a native vegetative buffer by 2 ½ times. The analysis also showed that evaluation of buffers significantly predicted respondents' attitudes towards buffers (R^2 =.22, F[2, 11] = 8.69, p < .001). Compared to respondents without native vegetative buffers, the beliefs that buffers create an attractive shore (β = -.143, p = .019), create habitat (β = .32, p < .001), and create privacy (β = .146, p = .020) were predictive of attitude towards buffers for respondents that have buffers.

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CHAPTER 1

Introduction and Overview

Literature Review and Application of Theory

When facing environmental degradation, natural resource managers have often chosen, while not the only path, two distinct paths to curb environmental risk. One path is to educate the public in the hope that individuals will choose behaviors that are environmentally friendly. The alternative path is to create policy that dictates the environmentally conscious choice, thereby forcing behavior. Inherent flaws exist to both lines of thinking. First, education may not lead to behavioral change (Schultz, 2011). Second, universal enforcement of environmental law and policy worldwide is unlikely to occur. To decrease environmental degradation by promoting environmentally friendly behaviors, resource managers must consider the many variables that impact human behaviors.

In Minnesota, water quality and habitat loss are major environmental concerns. Natural resource managers are particularly concerned with protecting shoreland habitat due to its fragility and the impacts of land use to negatively affect habitat and water quality. Shorelands are dynamic systems where the land, water and air meet resulting in a habitat important to aquatic and terrestrial species. While shorelands are important to natural ecosystems, they are also attractive areas for residential development. Dramatic increases in development on Central Minnesota's Lakes, 600% between 1980 and 2000, catalyzed resource manager's concern for shoreland habitats, (Potts et al., 2005). Littoral residential development often leads to loss of shoreland and aquatic habitats (Radomski & Goeman, 2001). These losses are well documented in the literature (Radomski & Goeman 2001; Elias & Meyer, 2003; Jennings, Emmons, Hatzenbeler, Edwards &

Bozek, 2003). The resulting degraded habitats facilitate the settlement of non-native species (Didham et al., 2007).

In addition to habitat loss, environmental management agencies at all levels have placed attention on water quality in the United States. The Clean Water Act created much of this attention and is the policy driver for the Minnesota Pollution Control Agency's (MPCA) identification of polluted water bodies. As of 2010, the MPCA identified 1,475 impairments on 336 rivers and 510 lakes in Minnesota. Land use practices caused or exacerbated many of these impairments, including turbidity, eutrophication and biological impairments (*Minnesota's impaired waters and TMDL's*, 2010). Land use practices are considered non-point sources of pollution as they do not have an exact identifiable source such as an outflow pipe.

The Clean Water Act identifies procedures to address point sources of pollution. Permits are applied and the amount of permitted pollutant discharge is slowly curtailed. In contrast, non-point, or secondary, sources of pollution are quite difficult to address and must be evaluated from a larger, systematic perspective. Secondary sources of pollution stem largely from human behaviors that include: chemical use, yard maintenance, fertilization, and agricultural practices. These non-point sources of pollution positively correlate with residential development that increases impervious surfaces and can be offset with best management practices (Brabec, Schulte & Richards 2008). Furthermore, Wang (2001) showed the importance of incorporating land use planning and water quality management. To address these secondary sources, the Minnesota Department of Natural Resources (DNR) encourages adoption of native vegetative buffers for habitat

and water quality protection through educational outreach and grants, but prior cases demonstrate the importance of gaining input from affected parties for water resource planning (Beekman, 2002).

Previous studies have linked behavioral theory to behaviors impacting natural resources (Manfredo, Fishbein, Haas & Watson, 1990; Fishbein & Manfredo, 1992; Pate, Manfredo, Bright & Tischbein, 1996; Vaske & Donnelly, 1999; Whittaker et al., 2001). Studies have also specifically examined the human dimensions of water resource management and planning. For example Tran, Euan and Isla (2002) considered public perceptions of development's role in impacting coastal water quality. Pahl-Wostl et al. (2008) identified the importance of social learning and culture in sustainable water management. In particular, Jorgensen and Stedman (2001) and Stedman and Hammer (2006) explored the role of landowner attitudes towards their properties, development and water quality. Previous studies, however, have not specifically examined how to increase adoption of lakeshore best management practices.

Many past studies have focused on the Theory of Reasoned Action (TRA) or Theory of Planned Behavior (TPB) (Ajzen & Fishbein, 1980). While the natural resources field has largely accepted past behavioral theory work, new theoretical advancements in behavioral psychology from such fields as health communication and behavior could improve understanding of resource management issues. The large number of researchers and the financial support of campaigns for anti-smoking, condom use, and alcohol abuse have led to the continued advancement of the theoretical foundation of behavioral psychology, the influence of norms on behavior and risk communication.

Many parallels can be drawn between health behavior and environmentally friendly behaviors and therefore it is a natural progression to seek theoretical advancements in those fields. Targeted behaviors in both fields range from having societal benefits, with few or latent personal benefits, to having behaviors that may benefit individuals, but do so in the long term. Additionally, both fields deal with the difficulties of self-reported behaviors (Schwarz, 2008). The fields of healthcare communications and health behavior can contribute a great deal to research in the human dimensions of natural resource management.

Several behavioral theories that attempt to answer the question, "Why do we behave in the manner in which we do?" These theories include Fishbein and Ajzen's Theory of Reasoned Action (TRA) (Ajzen & Fishbein, 1980), the Theory of Planned Behavior (TPB) (Ajzen, 1991) and the latest iteration the Integrative Model (IM) (Fishbein & Yzer, 2003). Additionally, as researchers we consider how norms impact our behavioral choices. Building upon Cialdini's (1990, 2003) view of descriptive norms grew the Theory of Normative Social Behavior (TNSB) (Rimal & Real, 2005). Finally, what impact, if any, does risk to the environment catalyze individual behavior change? In an attempt to further understand this question, Griffin, Dunwoody and Neuwirth (1999) proposed a framework on Risk Information Seeking and Processing (RISP) integrating the Theory of Planned Behavior (TPB) (Ajzen, 1991) and the Heuristic Systematic Model (Eagly & Chaiken, 1993). For the field of natural resource management it is important to further theory, but it is equally if not more important to evaluate theory and determine those that can be adopted and integrated into our discipline.

One example of behavioral modeling advancement is the Integrative Model (IM) (Fishbein & Yzer, 2003) which builds upon the Theory of Reasoned Action (1980) and the Theory of Planned Behavior (Ajzen, 1991). The IM builds upon the TPB by explaining why behavioral intention does not always lead to behavior. The IM accounts for this discrepancy by including variables of environmental constraints and differentiates between perceived self-efficacy and the true skills to conduct a behavior (Fishbein & Yzer, 2003). Additionally, perceived behavioral control is omitted in favor of Bandura's (1989) measurement of self-efficacy.

Finally, while the TRA and the TPB inherently allow for the theoretically based construction of messages to influence behavior, the IM, through the Intention-Behavior Configuration (IBC), allows for the segmentation of one's audience based upon the accounted for discrepancy between behavioral intention and behavior. The result of the segmentation results in four distinct groups. First, those with intention, but no behavior, are barred from performing the behavior due to environmental constraints. Another group is those that have conducted the behavior in the past and intend to maintain the behavior in the future. Thirdly, there is the group that currently performs the behavior, but unlikely to maintain the behavior in the future. The final group are those that have not performed the behavior in the past nor or likely to in the future.

In conjunction with the advancement of behavioral models, concurrent research has occurred advancing normative measures. While as individuals we do not always accurately gauge the influence of others upon our behavior, Cialdini (1990) showed that highly visible public actions are indeed influenced by normative pressures and are

predictive of behaviors. Attitudinal research in the human dimensions of natural resources has shown high correlations between attitudes and behavioral intention, but less concrete evidence connecting norms to behavioral intention (Manfredo, Fishbein, Haas & Watson, 1990; Fishbein & Manfredo, 1992; Fulton, 2004). Cialdini (1990, 2005) argues that individuals underestimate normative influence in their behaviors. If then as researchers, we directly ask what influence individuals feel that others place on their behavior; we are likely to have data that inherently underestimates normative pressure. A major difference between the research of Cialdini and those in the human dimensions of natural resources field is that while Cialdini's research is largely field experimental work, human dimensions research is largely survey based. Therefore as researchers we must continue to examine additional measures of normative influence.

The TRA assesses subjective norms by asking the overall normative pressure felt with the additional variables of perception of an individual's important others' expectations of behavior matched with their motivation to comply with that important other (Fishbein and Ajzen, 1980). Cialdini (1990) expanded upon normative measurement by including injunctive norms, arguably very similar to subjective norms, that refer to what one ought to do and descriptive norms that refer to the perception of what behaviors are actually occurring. Park and Smith (2007) expanded normative measures by including subjective norms, societal and personal injunctive norms, and societal and personal descriptive norms.

Rimal and Real (2005) further expanded the evaluation of normative pressure by examining the role of descriptive norms in predicting behavioral intention. They argue

for a direct relationship between descriptive norms and behavioral intention that is moderated by outcome expectation, injunctive norms and group identification. The resulting model is the Theory of Normative Social Behavior (TNSB) (Rimal & Real, 2005). In the model, outcome expectation refers to an individual's evaluation of the outcome of that behavior and whether that outcome is positive or negative. Injunctive norms are borrowed from Cialdini (1990) and group identification refers to how closely related one sees themselves to the group performing the behavior. They have demonstrated the validity of the model through several studies (Rimal & Real, 2003; Lapinski & Rimal, 2005; Rimal & Real, 2005; Rimal & Real, 2007).

Finally, inherent to promoting conservation or environmentally friendly behaviors, we must understand why someone would seek the education or communication pieces provided by an agency. This information may be either directed at an audience with the hopes of changing behaviors to that which are environmentally friendly or to maintain current environmentally friendly behavior. Inherent to conservation behaviors is the idea that there is an impending risk to the environment. Thus an additional model that may prove important to the human dimensions of natural resources is the Risk Information Seeking and Processing (RISP) model proposed by Griffin, Dunwoody and Neuwirth (1999). The RISP model (Griffin et al., 1999) is an integration of the Theory of Planned Behavior (TPB) (Ajzen, 1991) and the Heuristic Systematic Model (Eagly & Chaiken, 1993). The variables included in the model are: information insufficiency, perceived information gathering capacity, relevant channel

beliefs, informational subjective norms and affective responses, perceived hazard characteristics and individual characteristics.

The RISP model, as compared to the TPB (Ajzen, 1991) focuses only on information seeking and processing. The information seeking portion of the model draws from the TPB whereas the processing portion of the model draws from Eagly and Chaiken (1993). Griffin et al. (1999) contend that one's evaluation of a risk and their own perceived knowledge regarding that risk will lead them to seek or not seek information regarding the risk and to process that information at a heuristic or systematic level. The model has been adapted in the fields of healthcare, industrial and natural resources and shown to be valid (Griffin, et al., 2008; Griffin, et al., 2002; Huurne, Griffin & Gutteling, 2009; Neuwirth, Dunwoody & Griffin, 2000).

Study Purpose and Methodology

The purpose of this research is to further understanding of lakeshore landowner's intention to restore or maintain shoreland buffers while evaluating the use of additional behavioral models for the human dimensions of natural resources. Specifically the goals of this study were to:

- Use the Integrative Model to predict restoration behavior.
- Evaluate different normative variables in predicting behavioral intention to restore buffers by using the TNSB and the IM.
- Understand respondents with buffers attitudes towards buffers and the possibility of risk to catalyze information seeking.

The Minnesota Institutional Review Board approved the study (Appenidix A), and I collected data collected through focus groups and a mail survey (see Appendices B through H).

CHAPTER 2

Using the Integrative Model to Predict Shoreland Restoration Behavior

Introduction

Natural resource managers are concerned with protecting shoreland habitat because it is fragile and land use decisions that negatively affect shoreland areas can directly affect habitat and water quality. In Minnesota, shoreland development dramatically increased between 1980 and 2000 resulting in a 600% increase in littoral developments in Central Minnesota (Potts et al., 2005). Littoral residential development leads to loss of shoreland and aquatic habitats (Radomski & Goeman, 2001). The loss of near shore and shoreland habitat resulting from littoral development is well documented (Radomski & Goeman, 2001; Elias & Meyer 2003; Jennings, Emmons, Hatzenbeler, Edwards & Bozek, 2003). The resulting landscapes tend to be compromised, disturbed habitats that facilitate the settlement non-native species (Didham, Tylianakis, Gemmell, Rand & Ewers, 2007).

In addition to habitat loss, shoreland development might also lead to negative impacts on water quality. Under Section 303(d) of the Clean Water Act, states are given the responsibility to identify impaired water bodies. In addition, states are given the task to develop plans that include Total Maximum Daily Limits to address these impairments. As of 2011, there were 1,475 impairments on 336 rivers and 510 lakes in Minnesota. Of these impairments, nearly 52% stem from non-point sources of (*Minnesota's impaired waters and TMDL's*, 2010).

These non-point sources of pollution include runoff, failing septic systems and runoff from agricultural, commercial and residential land uses (Dunn, 2008). Addressing point sources of pollution can be relatively simple. Permits are applied, and the amount of

pollutant discharge is slowly curtailed. In contrast, non-point, or secondary, sources of pollution are quite difficult to address and must be evaluated from a larger, systematic perspective. Secondary sources of pollution stem largely from human behaviors that include: chemical use, yard maintenance, fertilization, and agricultural practices. To address these secondary sources, the Minnesota Department of Natural Resources (DNR) encourages adoption of native vegetative buffers for habitat and water quality protection through educational outreach and grants.

The purpose of this study was to identify the variables that influence property owners' behavioral intentions to restore native vegetative buffers and to test the usefulness of the Integrative Model (IM) (Fishbein & Yzer, 2003) for understanding restoration behavior. The Integrative Model (Fishbein & Yzer, 2003) builds upon the Theory of Reasoned Action (1980) and the Theory of Planned Behavior (Ajzen, 1991). The IM accounts for environmental constraints and differentiates between perceived self-efficacy and the true skills to conduct a behavior (Ajzen & Fishbein, 1980). The IM has yet to be applied to the field of natural resources management. Results of this study will help guide future communication and outreach efforts.

Conceptual Background

The Theory of Reasoned Action and Theory of Planned Behavior (Ajzen & Fishbein, 1980; Ajzen, 1991) argue that a combination of our attitudes towards engaging in a behavior, the normative pressure we feel to act in a certain way, and our perception of how much behavioral control we have interact to influence our behavior. These

theories are commonly used to examine how attitudes and norms influence human behavior in the context of environmental and natural resource management.

The predictive utility of the attitude theory frameworks developed by Fishbein and Ajzen (1980) and Ajzen (1991) has been demonstrated in natural resources management (Manfredo, Fishbein, Haas & Watson, 1990; Fishbein & Manfredo, 1992; Pate, Manfredo, Bright & Tischbein, 1996; Vaske & Donnelly, 1999; Whittaker et al., 2001). Manfredo et al. (1990) found that support for prescribed fire polices is highly predicted by the Theory of Reasoned Action (R = .75). Campbell and MacKay (2003) showed that the Theory of Reasoned Action can be a tool to assess the acceptability of hunting as a wildlife management tool. Fulton, Skerl, Shank and Lime (2004) used the Theory of Reasoned Action to understand residents' support of lethal deer management in Cuyahoga Valley National Park, and Pate et al. (2004) showed that attitudes were highly predictive of support for wolf reintroduction in Colorado.

The fields of health communications and health behavior draw upon the Theory of Reasoned Action and the Theory of Planned Behavior, as well. Terry, Gallois, and McCamish (1993) were the first to use the Theory of Reasoned Action to address HIV preventative behaviors. Subsequent meta-analyses showed the predictive power of the of the Theory of Reasoned Action and the Theory of Planned Behavior for behaviors ranging from condom use (Albarracín, Fishbein, Johnson & Muellerleile, 2001) to physical activity (Hagger, Chatzisarantis & Biddle, 2002). In fact, many parallels can be drawn between health behavior and pro-environmental behavior. Often behaviors in both arenas show diffuse or latent positive reinforcement.

The fields of healthcare communications and health behavior can contribute a great deal to advancing applied theory and research design in the human dimensions of natural resource management. While, both healthcare communications and the human dimensions of natural resources have used behavioral theory to gain an understanding as to why people behave, there are inherent differences between the two fields. First and foremost are the differences in the size and breadth of the fields. Healthcare communications represents a larger field of professionals that generate more research than that of the human dimensions of natural resources. This difference has allowed the field of healthcare communications to advance behavioral theory at a faster rate than the natural resources. In the natural resources we are often limited to applied works that may or may not have the ability to advance theory. Therefore, as researchers in the human dimensions of natural resources, it is important that we review literature and theory in both fields.

Integrated Model

The Integrative Model (IM) is one example of an advancement of behavioral theory in the field of healthcare communication (Fishbein & Yzer, 2003) (Figure 2.1). The IM allows for the integration of Bandura's (1989) measurement of self-efficacy while also using audience segmentation to further inform a communication strategy. The Integrative Model of Behavioral Prediction, unlike the Theory of Reasoned Action (1980) or the Theory of Planned Behavior (Ajzen, 1991), accounts for environmental constraints and distinguishes between perceived self-efficacy and the true skills actually needed to conduct a behavior (Ajzen & Fishbein, 1980). In conjunction with the IM, Fishbein and

Yzer (2003) developed the Intention-Behavior Configuration (IBC) to identify groups within the IM that differ in previous behavior and behavioral intention. Group identification facilitates segmentation of meaningful audience targets (Fishbein & Yzer, 2003).

The IBC uses both past performances of the behavior as well as intention to perform the behavior in the future to create a two by two matrix that segments the audience into four groups (Figure 2.2). The IBC can direct researchers and resource managers to the appropriate theories or approaches to support behaviors. The IBC hypothesizes that individuals within a population that do not have the behavioral intention to conduct a behavior, although they may have conducted the behavior in the past, could benefit from a communication effort that focuses upon predictive behavioral, normative or self-efficacy beliefs. Individuals with behavioral intention, but no behavior, benefit from outreach efforts that focus upon removing behavioral constraints such as lack of skills, economic barriers or environmental barriers. Individuals with behavioral intention that do conduct the behavior need little or no intervention.

Fishbein and his colleagues have demonstrated the usefulness of the IM in the healthcare communications field (Fishbein, Hennessy, Yzer & Douglas, 2003; Yzer et al., 2004; Yzer, Fishbein & Hennessy, 2008). The usefulness of the IM approach to natural resources management has yet to be demonstrated. This study is the first to apply the IM framework and IBC to an applied natural resources management issue.

Within the human health fields, behavioral theory models have been used to study human behaviors ranging from smoking cessation (Lenz, 2008) to condom use (Yzer,

Siero & Buunk, 2001). In this study, I use behavioral theory to understand conservation behavior. While behavioral theory has been successfully applied to understand a range of different health behaviors, differences in health behaviors and conservation behaviors must be acknowledged in order to properly apply theory to understand conservation behavior. Shoreland restoration and maintenance behaviors are different than those of some health behaviors such as condom use or smoking cessation. Repeated condom use or smoking cessation is an ongoing process with continual maintenance and behavioral choices.

In contrast, the restoration of a shoreline is a resource intensive behavior that will likely occur only one or two times with maintenance of the shoreline occurring post restoration. Thus, shoreland management is more similar to behaviors such as being inoculated or agreeing to be an organ donor on a driver's license. Once a landowner restores a certain amount of shoreline, further restoration is unlikely. Alternatively, if a shoreline has not been altered, a restoration is unnecessary. As shoreland restoration is a single behavior requiring planning and a substantial amount of resources. Therefore it lends itself well to using the IM as it is likely a reasoned behavior rather than habit or addiction.

Methods

Data collection and sampling

I first received the approval to conduct research by the University of Minnesota's Institutional Review Board (see Appendix A for approval letter). I conducted focus groups as means to inform collecting quantitative information through social surveys. I

used focus group methodologies outlined by Krueger and Casey (2009) to elicit land owner behavioral beliefs towards native vegetative buffers and to identify sources of normative influence. The Minnesota Department of Natural Resources (DNR) assisted in identifying lake associations that represented a variety of lake types. I targeted the identified lake associations for focus groups at lakes in both suburban and rural Minnesota. In order to identify behavioral and normative beliefs, I conducted four focus groups in the spring and summer of 2008.

I recruited participants by contacting board members of the lake association. These board members invited up to ten lakeshore owners, largely through newsletters, to participate. A twenty dollar incentive provided encouragement for individuals to participate in the focus group. Focus group scripts consisted of nine questions and lasted approximately ninety minutes per focus group. These questions followed the format of opening, introductory, transition, key questions and ending questions (Krueger & Casey, 2009) (Table 2.1). Upon completion of the four focus groups, analysis showed saturation of the data. I used the compiled data to inform and shape the questions for the state wide survey.

I followed sampling procedures developed in previous studies of lakeshore home owners in Minnesota (Payton & Fulton, 2004). The Minnesota Department of Natural Resources (DNR) provided a database of Minnesota lakes, and I separated lakes into four ecotypes based upon the classification system outlined by Schupp (1992):
Ecotype 1—low productivity lakes, large and small, located in the northeast arrowhead region of the state.

Ecotype 2—large, moderately productive lakes with abundant walleye and sunfish populations generally located in the north central part of the state.

Ecotype 3—small productive lakes generally located from Bemidji southeast to the Twin Cities, MN.

Ecotype 4—larger productive lakes generally located from Willmar, MN north and east to Mille Lacs, MN.

Using DNR data from 2001 for house counts per lake, I removed lakes with less than 50 houses and more than 300 from the sampling frame. I assumed lakes with less than 50 houses would not provide a large enough sample and lakes with more than 300 houses would dominate in the overall sample. Additionally, I removed large lakes due to logistical constraints in circumnavigating these lakes to field validate resource conditions. I then randomly selected from the remaining lakes that fit the study criteria to obtain an initial target sample size of 1000 households in each ecotype. To do so I randomly selected 12 lakes from ecotype 1, 8 from ecotype 2, 10 from ecotype 3 and 8 from ecotype 4. I contacted county tax assessors for the selected lakes to obtain current ownership information as well as digitized geographic location and parcel description information for selected properties. For the final mailing addresses, I deleted duplicate ownership data and assigned a unique identification number to each owner and parcel. Adjusted for changes in ownership, owner deaths and undeliverable addresses, the final initial sample size was n = 3,975.

I generally mirrored Dillman's (2008) Tailored Design Method for survey implementation. I first pretested the survey with a small group of lakeshore homeowners.

Then to each participant, I mailed a personalized, signed letter that described the significance of the research and communicated the participant's integral role. In addition to the cover letter and questionnaire each packet contained a pre-addressed, postage paid return envelope. Within four weeks of the first mailing, I contacted the non-respondents with a reminder letter and replacement questionnaire with return envelope. Three to four weeks after the second round, I sent remaining non-respondents a third round of the survey packet.

Conceptual Measurement

The survey instrument attempted to measure the four major variables in the IM: attitudes, perceived norms, self-efficacy, behavioral intention and behavior. I asked resondents' attitude towards restoring buffers using five questions with seven point scales. I identified 11 behavioral beliefs from the focus group data. I associated these 11 beliefs with 11 belief outcomes. For the behavioral beliefs, I used a seven point scale ranging from 1 = "extremely unlikely" to 7 = "extremely likely". Each corresponding evaluation ranged from 1 = "extremely bad" to 7 = "extremely good". I identified seven normative sources of influence. I asked how likely it is that each source of influence thinks that the respondent should have a vegetative buffer on a 7 point scale from 1: "extremely unlikely" to 7: "extremely likely". In addition I asked if respondents generally wanted to do what the sources of normative want them to do on a 7 point scale ranging from 1: "extremely disagree" to 7: "extremely agree". Finally I identified four self-efficacy questions from the focus groups that assessed respondents' belief that they could complete specific tasks related to restoring a buffer. I determined behavioral intention by

asking respondents the likeliness of them restoring a vegetative buffer in the next five years using 7 point scale ranging from 1 = "extremely unlikely" to 7 = "extremely likely". I assessed behavior in two ways. I asked respondents whether or not they had restored a buffer in the last five years and to estimate the percentage of their shoreline that was covered by native vegetation. As it is the DNR's policy to have 75% of land 50 feet from the shore in vegetative buffer, I coded those that reported greater than or equal to 75% in native vegetation as already having a buffer.

In order to assess one's overall attitude towards shoreland restoration, I used a product of the beliefs and evaluations of outcomes as summarized in the equation:

$$A_{restoration} \approx SumBE = \sum(b_i e_i)$$

$A_{restoration}$ is the attitude towards the restoration of native vegetative buffers and is measured via a single item scale. The SumBE is the summated product of $b_i e_i$. Finally, b_i is the belief about the outcome *i* associated with restoration, and e_i is that evaluation of that outcome. Both b_i and e_i were coded using an affective coding on a range of -3 to +3. This coding gave a range in values for $b_i e_i$ from -9 to +9. A positive value indicated the belief that an outcome was positive and likely to occur or negative and unlikely to occur from the proposed ban. A negative number indicated that the outcome was negative and likely to occur or positive and unlikely to occur.

In order to assess the overall normative pressure to restore native vegetative buffers, I used a summation of the normative beliefs and the motivation to comply using the following equation:

$$N_{restoration} = \sum(b_i m_i)$$

$N_{restoration}$ is the summation of the products of each $b_i m_i$. In this equation b_i is the normative belief and m_i is the motivation to comply with what others desire. Each b_i and m_i could range from -3 to +3. The product results in an $N_{restoration}$ score ranging from a -9 to +9. A positive number indicates normative pressure that supports restoring one's shoreline and a motivation to comply with that normative pressure. A negative score indicates normative pressure not to restore a vegetative buffer and a motivation to comply with that pressure or alternatively a positive normative pressure to restore a buffer with a negative motivation to comply.

In order to determine overall self-efficacy for performing a shoreland restoration, I calculated the mean self-efficacy, if at least three of the four self-efficacy questions were answered, using the following equation:

$$E_{restoration} = (\sum f_i)/n$$

$E_{restoration}$ is the average self-efficacy felt by an individual for conducting a shoreland restoration. In this equation, f_i refers to the specific self-efficacy evaluations and n refers to the number of self-efficacy questions answered by the respondent.

From this summation I can summarize the Integrative Model into the overall equation of:

Restoration ≈ Intention to restore ≈ $[A_{restoration}]W_1 + [N_{restoration}]W_2 + [E_{restoration}]W_3$

W_1, W_2, and W_3 represent the weights given to the attitude towards restoration, the normative pressure to restore and the self-efficacy to restore measures.

Analysis

Data were entered in duplicate to minimize data entry errors. I used the Statistical Program for the Social Sciences (SPSS/PC+ 17.0) to analyze data. I conducted two stages of analysis. For the first stage, I segmented the respondents using the Intention-Behavior Configuration (IBC) proposed by Fishbein and Yzer (2003). The goal of the Minnesota DNR is to have 75% of shoreland habitat, the land 50 feet landward of the mean high water line, as a native vegetative buffer. Therefore, I removed respondents that reported greater than 75% of their shoreline as native vegetation from analysis as further restoration is unlikely. In order to conduct a behavior intention matrix, I dichotomized behavioral intention and behavior. I dichotomized behavioral intention by removing those with "neither" responses. I then grouped those that were "extremely unlikely", "quite unlikely", and "slightly unlikely" as not having behavioral intention. Respondents that indicated they were "slightly likely", "quite likely", or "extremely likely" to restore a buffer I grouped as having behavioral intention. For actual behavior, I asked respondents if they had or had not performed a restoration in the past.

The second stage of analysis followed the analytic strategy described in von Haeften and Kenski (2001) and mirrors that of the original Theory of Reasoned Action Framework (Ajzen & Fishbein, 1980) and the Integrative Model (Fishbein and Yzer, 2003). First I checked for multicollinearity of the predictive variables of behavioral intention by correlating attitude towards restoration, normative pressure to restore a buffer and respondent self-efficacy on behavioral intention to undertake a shoreland

restoration in the future against each other. I tested for multicollinearity to assess whether the data violated of the assumption of independent variables.

I used a series of multiple regressions in order to identify specific normative, efficacy, and evaluation beliefs that would be pertinent in a strategic communication. To do so, I first regressed attitude towards restoration, total normative pressure to restore a buffer and self-efficacy on behavioral intention to undertake a shoreland restoration in the future. For each variable (attitude, norms and/or self-efficacy) that was determined to be a significant predictor of behavioral intention, I conducted an additional multiple regression for each composite variable's individual component items (e.g., all the individual b*m measures used to form the normative pressure scale) on behavioral intention. Lastly, in order to determine the most significant beliefs for a communication strategy, I created a final model consisting of each significant individual belief and regressed them on behavioral intention. I then analyzed frequencies of responses to the determinant variables to see if a shift to those responses was possible. For example if the belief that increasing water quality was a likely result of restoring a buffer and was predictive of BI, then increasing that belief in the population would be important to do. But if nearly all respondents believed that to be the case, there would be little room for strengthening the belief in the population.

While using the IM is helpful to understand the variables predicting behavioral intention, the model does not assess the barriers between behavioral intention and behavior. Therefore understanding the potential barriers for respondents that already have the intention to perform a restoration but have yet to act upon this intention could prove

beneficial. Two potential barriers are economic barriers and the barrier of one's actual skills (Fishbein & Yzer, 2003). True skills are difficult to assess. Because true skills are difficult to assess, I assessed economic barriers by asking questions regarding one-time and yearly payments that would stimulate behavior. The responses to these questions were analyzed descriptively.

Results

I sent 3,975 surveys to valid addresses. Respondents returned a total of 2,543 surveys resulting in a return rate of 64%. In order to assess non-response bias, I sent a two-page questionnaire to 1,432 non-respondents. I obtained a total of 304 responses from this questionnaire resulting in a return rate of the non-response check of 21.2%. A one-way ANOVA showed no differences between respondents and non-respondents data for behavioral intention to restore a buffer, but did indicate differences for state of residence ($p < .001$), previous restoration behavior ($p = .005$), the extent to which respondents actively maintain their shoreline ($p = .034$), the extent to which respondents intend to actively maintain their shoreline in the future ($p < .001$), respondent's attitude towards buffers ($p < .001$), attitude towards restoration ($p < .001$), and gender ($p = .004$).

A chi-square statistical test was used to assess the statistical significance and relative impact of non-response on the variables of interest: restoration behavior, active maintenance of the shoreline, intention to actively maintain the shoreline in the future, attitude towards buffers, and attitude towards restoration (Table 2.2). The phi statistic revealed a weak correlation between response and past restoration behavior (phi = .071),

and stronger correlations between response and attitude towards buffers (phi = .294) and response and attitude towards restoration (phi = .282).

Because the variable of greatest interest, behavioral intention to restore a buffer, did not differ between respondents and non-respondents and the correlation of response with other variables was weak, I decided not to weight the data. While it is important to note these differences, their statistical significance is likely driven by the statistical power of the large sample size. In addition, 77.7% of non-respondents indicated their non-response was due to the survey being too long or complicated, did not apply to them or that they simply did not have time to complete.

A total of 23.9% respondents indicated that greater than 70% of their shoreland was currently native vegetation. Because these respondents meet the DNR's goal for native vegetative buffers, I removed them from that data. Another 61.3 % of respondents had no buffer and no intention to restore a buffer in the future, and 7.1% had a restored a buffer but no intention of doing so again in the future. In summary, a total of 68.4% respondents did have a behavioral intention to restore a buffer. An additional 20.1% of respondents had a behavioral intention to restore a buffer but had not completed the behavior. Finally, 10.7% of respondents had performed a restoration in the past and planned to do so in the future (Table 2.3).

The analysis multicollinearity showed that I did not violate the assumption, but the correlation of predictive variables and behavioral intention showed a high degree of correlation (Table 2.4). This was particularly true, as expected, for behavioral intention and the predictive variables of attitude ($r = .616$, $p < .01$), $\sum$BE ($r = .424$, $p < .01$) and

mean self-efficacy ($r = .400$, $p < .001$). Additionally, attitude correlated with $\sum BE$($r = .484$, $p < .01$).

For the initial IM model attitude containing attitude towards restoration, the sum of the subjective norms and mean self-efficacy together predicted behavioral intention ($R^2 = .38$, $F(1, 3) = 297.03$, $p < .001$). While attitude ($\beta = .69$, $t = 26.3$, $p < .001$) and mean self-efficacy ($\beta = .086$, $t = 3.01$, $p < .05$) were significant predictors of behavioral intention, the sum of the normative pressure was not significant (Table 2.5).

The multiple regression of belief evaluations on behavioral intention resulted in an overall $R^2 = .25$ ($F[1, 11] = 55.5$, $p < .001$). The significant individual belief evaluations included: decrease maintenance ($\beta = .05$, $t = 3.51$, $p < .001$), increase water quality ($\beta = .07$, $t = 5.58$, $p < .001$), be attractive ($\beta = .13$, $t = 11.57$, $p < .001$), create wildlife habitat ($\beta = .04$, $t = 5.58$, $p < .05$) impede recreation ($\beta = .06$, $t = 4.44$, $p < .001$), and create privacy ($\beta = -.05$, $t = -3.25$, $p < .05$) (Table 2.6).

The multiple regression of self-efficacy on behavioral intention resulted in an $R^2 = .13$ ($F[1, 4] = 74.8$, $p < .001$). Only one self-efficacy belief was a significant predictor of behavioral intention, ability to keep up with maintenance ($\beta = .41$, $t = 13.13$, $p < .001$) (Table 2.7).

As previously noted, in the original survey I did not include a single item gauging overall normative pressure. Due to this omission, I chose to also conduct a multiple regression of the individual normative items upon behavioral intention to see if any normative items were predictive of behavioral intention. The model resulted in an $R^2 = .15$ ($F[1, 7] = 50.3$ $p < .001$). The significant individual normative beliefs were: family (β

= -.13, t = -8.08, p < .001), friends (β = .08, t = 4.72, p < .001), neighbors (β = -.05, t = -2.79, p < .01), Minnesota DNR (β = .11, t = 5.18, p < .001), and users of the lake (β = -.04, t = -2.60, p < .01) (Table 2.8).

The final multiple regression of all determinant variables upon behavioral intention resulted in an R^2 = .36 (F [1, 12] = 70.3, p < .001). The individual significant predictors of behavioral intention were: decrease maintenance (β = .05, t = 3.76, p < .001), increase water quality (β = .058, t = 4.96, p < .001), be attractive (β = .10, t = 9.03, p < .001), make it difficult to recreate (β = .046, t = 3.82, p < .001), create privacy (β = -.028, t = -2.00, p < .001), family influence (β = -.097, t = -5.89, p < .001), friends influence (β = .051, t = 3.14, p < .01), Minnesota DNR's influence (β = -.065, t = 5.64, p < .001), and the efficacy belief of keeping up with maintenance (β = .23, t = 9.33, p < .001) (Table 2.9).

Response frequencies varied considerable among the belief-outcome evaluations, normative evaluations, and self-efficacy measures (Table 2.10). About 60% of respondents agreed that the DNR is "quite likely" or "extremely likely" to think respondents should restore a native vegetative buffer. In contrast only 11% of respondents believed that it was "quite likely" or "extremely likely" that their family and 9% of their friends think they should restore a native vegetative buffer. For the behavioral beliefs, 31% of respondents believed that a buffer would be "quite likely" or "extremely likely" to decrease maintenance, 34% believed that it would increase water quality, 23% believed buffers would be attractive, 28% believed buffers would impede recreation and 13% believed buffers would create privacy.

The group of respondents that indicated an intention to restore a buffer, but have yet to complete the action showed a willingness to perform the behavior if provided with financial incentives. The results of the economic incentives analysis revealed that many respondents would be willing to restore vegetative buffers for varying levels of one-time and a yearly financial support to maintain the buffer (Table 2.11). The modal response for a one-time payment was $500 followed by no incentive necessary. In addition, a yearly payment to maintain a buffer, the modal response was that no yearly incentive was necessary (28.5%) followed by a yearly payment of $100 (24.3%).

Discussion

I followed the IBC framework for the IM (Figure 2.1) to identify segments for which different behavioral intervention strategies are likely to be successful. I defined one segment (31.2%) by combining the 23.9% of the respondents who reported greater than 70% of their shoreline in native vegetation with the 7.3% who had already undertaken a restoration. Based on the tenets of the IM, messaging to this portion of the population would likely be most effective if it were to focus on maintaining current behavior. This portion of the population could be targeted to prevent future shoreland habitat loss. The remaining 68.8% of the population could be targeted for behavior change. The results of the segmentation of the remaining population indicate two distinct audiences: those that would benefit from a communication intervention (68.4% of the remaining), and those that require assistance to overcome barriers to restoring their shoreland (20.1% of the remaining).

Our analyses indicated that several normative, self-efficacy and behavioral beliefs influence behavior. Not all of the variables, however, are practical to integrate into a communication strategy. Beliefs regarding family and friends' normative influence are unlikely to be directly affected by a communication piece as personal interactions will trump that of communication pieces. While that is the case, family and friends may be the targets of communication to indirectly influence landowners. On the other hand, the DNR's normative influence can be communicated through outreach. Although nearly 60% of individuals, the largest percentage for all of the belief variables, believed that it is quite or extremely likely that the DNR thinks that they should have a native vegetative buffer, more than 1 in 3 shoreland owners, or more 40,000 statewide, do not think so.

The key behavioral beliefs that predict restoration behaviors are that buffers would: decrease maintenance, increase water quality, be attractive, and impede other recreation. Communicating that the restoration of a buffer will decrease maintenance may be problematic as it not necessarily the case for all landowners. Therefore, a communication strategy could focus upon showing the natural beauty of buffers, their potential for improving water quality and the ability to continue to recreate while having a buffer. Since less than 35% of respondents believe that these outcomes are "quite" or "extremely" likely, there is obvious room for improvement. Finally, the self-efficacy belief regarding the ability to keep up with maintenance could be addressed with a skills-based message that communicates specific steps and/or technical skills to keep up with maintenance. As only 18% of respondents believed that they could either keep up with maintenance "quite" or "very well", information that might increase this belief among

shoreland owners could lead to substantial behavioral change at the population level. The IBC matrix indicates that around 20% of respondents are in some way prevented from behaving due to either a lack of true skill in performing the task or other environmental constraints. Taking a skills-based approach could assist respondents that are prevented from action due to a lack of true skills in performing the task.

As Fishbein et al. (2003) note, it is difficult to predict why some people act and others do not act on their behavioral intention. The 20.1% of the population that does not currently have 70% of their shoreland in a buffer, but has the intention to do so might be constrained in some way from acting to restore their shoreland. This situation may stem from technical barriers, economic barriers or may simply be an issue of not enough time to take the intended action (Fishbein & Yzer 2003). An examination of the financial incentive for one time payments showed that these barriers might be overcome through financial incentives. Including those that stated no payment was necessary (20.1%), a one-time payment of $500 might be a large enough incentive to a majority of the 58% of respondents that have yet to perform the behavior. In contrast to a one-time payment, the most common response for a yearly payment was that no payment was necessary (28.5%). A total of 72.9% respondents might be encouraged to restore with a yearly payment of $100/year.

The discrepancy between the amounts identified in the one-time payment versus yearly payment suggests there might be a perception of a greater economic barrier in the initial restoration than in maintenance. This finding makes intuitive sense as money is

needed for both plants and labor. The pragmatic caveat to this finding is that grants for larger, one-time payments may be less feasible than a smaller yearly tax credit.

Implications and Conclusion

The Integrative Model provided a previously tested theoretical and methodological structure to the study, but the final model that consisted only of the critical beliefs, norms and self-efficacy measures accounted for 36% (R^2) of the variability in behavioral intention. While this level of explained variance is relatively high in social psychological behavioral models (Yzer et al 2008; Smith & McSweeney 2007), it does indicate that there are either additional variables affecting behavior that are not in the model or there is other error in the model such as conceptual measurement error. There are at least two possible explanations for this finding.

First, the behavior of buffer restoration may simply be a highly complex behavior influenced by many variables not taken into account in the IM. Buffer restoration may be a suite of behaviors rather than one behavior making assessment more complex. Buffer restoration could also be a new concept to some shoreland owners, and, therefore, they do not have well-formed attitudes, normative, or self-efficacy beliefs. In addition, previous management of one's shoreline may be more predictive of future behavior.

Secondly, as restoring a native vegetative buffer is a highly public behavior, the model may be underestimating the importance of normative pressure on behavior. Cialdini (2005) has championed the notion that as researchers, we are largely underestimating the level of normative influence upon behavior. He argues that we are poor judges at discerning the reasons behind our actions and as individuals we are largely

blind to the influence of others. If he is correct, researchers' traditional means of evaluating normative pressures may be ineffective at gauging the true influence of normative pressure. Therefore, for those behaviors largely influenced by normative pressure, we as researchers will miss some of the variability due to the lack of proper measurement of the normative component and to respondent's inability to identify the impact of normative pressure upon their behavior. Individual shoreland management is a very public action that is easily identified by neighbors, family, friends and any general users of the lake. The inability to capture the variability caused by these normative influences may explain some of this variance. .

The total variance explained by the IM in this study is typical of the TRA or TPB. I do believe that the use of the IM for future human dimensions of natural resources is quite practical. In particular, the audience segmentation that the IM provides has great potential for defining potential target audiences and directing outreach efforts. The information obtained through this research could be very helpful for resource managers' approach to outreach and communication with shoreland landowners.

This research represents a first step in the process of formulating theoretically based communication and outreach messages. Questions still remain regarding the effectiveness of implementing a communication strategy based upon the IM and the BI matrix, but these findings indicate that traditional methods of relying upon education to change behavior may not be effective. This is particularly true for those in the population that have behavioral barriers that do not stem from technical skills. Furthermore, it should be noted that those even with a strategic communication effort, a proportion of the

population still will likely not change their lakeshore management. Depending upon the goals of resource managers, those in the population with strong negative attitudes towards buffers may only change their behavior through changes in shoreland management policies.

Future research could examine the influence and effectiveness of implementing messages that draw upon the identified critical attitude, normative and self-efficacy beliefs. Additionally, depending on the results of the BI matrix, future research could examine the effectiveness of implementing a strategy to remove behavioral barriers.

Table 2.1: Focus Group Questions

Opening Question	1) What is your name and what is your favorite activity on the lake?
Introductory Questions	2) Describe how you came about living on the lake. 3) How would you describe your ideal lakeshore?
Transition Question	4) Describe any changes you have noticed in your lakeshore?
Key Questions	5) What are your impressions of native vegetation on the lakeshore? 6) What do you see as the advantages to having native vegetation on your lakeshore? 7) Now that we have identified advantages, what do you perceive as barriers to having native vegetation? 8) If the DNR sought to encourage more native vegetation on the lakeshore, how would this best occur? 9) Where do you believe is the best way to get information on managing your lakeshore?
Ending Questions	10) Is there anything I have missed?

Table 2.2: Chi-Square Analysis of Response and Variables of Interest

	N	df	χ^2	Phi
Response * Restore	4078	1	25.5	.071
Response * Active Maintenance	3756	6	39.7	.103
Response * Active Maintenance in the Future	3783	6	82.6	.148
Response * Attitude Towards Buffers	3257	18	281.2	.294
Response * Attitude Towards Restoration	3184	18	252.9	.282

*Note: all χ^2 significant at $p < .001$

Table 2.3: Behavior Intention Matrix with Valid Percentages

	Performance of the recommended behavior	
Intention to behave	No	Yes
No	1068 (61.3%) Norms, self-efficacy, outcome beliefs	137 (7.1%) Norms, self-efficacy, outcome beliefs
Yes	350 (20.1%) Help reduce or overcome barriers	187 (10.7%) No intervention or positive reinforcement

Table 2.4: Correlations of the Behavioral Determinants with Behavioral Intention

	BI	Attitude	∑BM	∑BE	Mean efficacy
BI	1	.616**	.055*	.424**	.300**
Attitude	.616**	1	.057*	.484**	.387**
∑BM	.055*	.057*	1	.199**	-.058*
∑BE	.424**	.484**	.199**	1	.227**
Mean efficacy	.300**	.387**	-.058*	.227**	1

** Correlation is significant at the p = .01 level (2-tailed).

* Correlation is significant at the .05 level (2-tailed).

Table 2.5: Results of Regression of Attitude, Mean Self-efficacy and Summative Norms on Behavioral Intention

	Unstandardized Coefficients		Standardized Coefficients	
	B	Std. Error	Beta	t
(Constant)	-.263	.136		-1.936
Attitude Restoring	.686**	.026	.589	26.301
Mean self-efficacy	.086*	.028	.067	3.009
Sum BM	.004	.003	.028	1.366
R	.62			
R^2	.38			
F	297.03			

* $p < .05$.
* $p < .001$.

Table 2.6: Results of Multiple Regression of Individual Belief Evaluations on Behavioral Intention

	Unstandardized Coefficients		Standardized Coefficients	
	B	Std. Error	Beta	t
(Constant)	3.078**	.050		61.885
Decrease maintenance	.045**	.013	.079	3.510
Be expensive	-.016	.016	-.025	-.955
Difficult to establish	.004	.018	.006	.232
Decrease geese in yard	-.020	.011	-.037	-1.791
Increase water quality	.070**	.013	.158	5.584
Be attractive	.133**	.011	.309	11.574
Create wildlife habitat	.035*	.015	.067	2.404
Impede recreation	.058**	.013	.102	4.441
Improve fishing	.009	.015	.017	.590
Create privacy	-.045*	.014	-.075	-3.252
Harm view of lake	-.012	.011	-.024	-1.053
R	.50			
R^2	.25			
F	55.45			

*p < .05
**p < .001

Table 2.7: Results of Multiple Regression of Individual Self-Efficacy Upon Behavioral Intention

	Unstandardized Coefficients		Standardized Coefficients	
	B	Std. Error	Beta	T
(Constant)	1.987*	.107		18.546
ID plants	.029	.031	.024	.935
Obtain info	-.020	.038	-.019	-.522
Buy plants	-.050	.038	-.049	-1.322
Keep up with maintenance	.406*	.031	.383	13.131
R	.35			
R^2	.13			
F	74.5			

*p < .001

Table 2.8: Results of Multiple Regression of Individual Normative Items on Behavioral Intention

	Unstandardized Coefficients		Standardized Coefficients	
	B	Std. Error	Beta	T
(Constant)	3.313**	.045		74.154
Family	-.131**	.016	-.230	-8.076
Friends	.077**	.016	.131	4.724
Neighbors	-.046*	.016	-.075	-2.786
Lake Association	.031	.016	.051	1.916
Minnesota DNR	.105**	.020	.212	5.183
Watershed District	.038	.022	.071	1.695
Users of the lake	-.041*	.016	-.066	-2.597
R	.39			
R^2	.15			
F	50.27			

* $p < .01$
** $p < .001$

Table 2.9: Final Multiple Regression of All Determinant Beliefs Upon Behavioral Intention

	Unstandardized Coefficients		Standardized Coefficients	
	B	Std. Error	Beta	T
(Constant)	-1.60***	.101		-15.91
Decrease maintenance	.050***	.013	.087	3.76
Increase water quality	.058***	.012	.130	4.96
Be attractive	.103***	.011	.243	9.03
Create habitat	-.001	.015	-.001	-.041
Difficult to recreate	.046***	.012	.084	3.82
Create privacy	-.028*	.014	-.045	-2.00
Family	-.097***	.017	-.170	-5.89
Friends	.051**	.016	.088	3.14
Neighbors	.003	.016	.005	.200
DNR	.065***	.012	.131	5.64
People that use the lake	-.022	.016	-.034	-1.37
Ability to keep up with maintenance	.225***	.024	.209	9.33
R	.60			
R^2	.36			
F	70.28			

* $p < .05$
** $p < .01$
*** $p < .001$

Table 2.10: Frequencies of Self-efficacy, Behavioral, and Normative Beliefs

Self-efficacy Beliefs	% saying quite well	% saying very well	% saying Either
Keep up with maintenance	13.6	4.8	18.4
	% saying quite likely	% saying extremely likely	% saying Either
Behavioral Beliefs			
Decrease maintenance	22.7	8.7	31.4
Increase water quality	21.3	12.5	33.8
Be attractive	15.9	6.9	22.8
Impede recreation	17.0	10.7	27.7
Create privacy	8.9	4.2	13.1
Normative Beliefs			
Family thinks I should	11.3	3.7	15.0
Friends think I should	8.8	2.3	11.1
DNR thinks I should	28.1	31.7	59.8

Table 2.11: Financial Incentives to Restore Shoreline

One Time Payment			Yearly Payment		
	Count	Percentage (%)		Count	Percentage (%)
No payment necessary	60	20.1%	No payment necessary	82	28.5%
$50	12	4.0%	$10/year	1	0.3%
$250	40	13.4%	$25/year	14	4.9%
$500	61	20.5%	$50/year	30	10.4%
$1000	46	15.4%	$75/year	13	4.5%
$1500	16	5.4%	$100/year	70	24.3%
$2500	44	14.8%	$500/year	58	20.1%
Would not restore for any of these amounts	19	6.4%	Would restore/maintain for any of these amounts	20	6.9%

Figure 2.1: The Integrative Model of Behavior Prediction: Adapted from Fishbein & Yzer (2003)

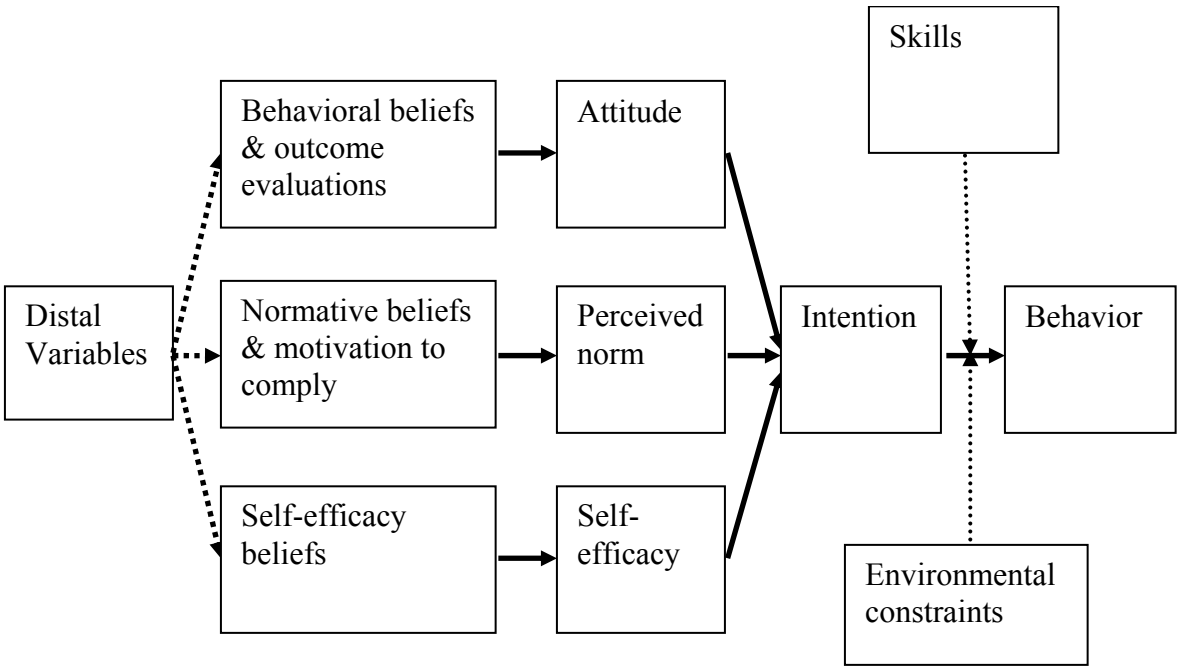


Figure 2.2: Behavior Intention Matrix : Adapted from Fishbein & Yzer (2003)

	Performance of the recommended behavior	
Intention to behave	No	Yes
No	Norms, self-efficacy, outcome beliefs	Norms, self-efficacy, outcome beliefs
Yes	Help reduce or overcome barriers	No intervention or positive reinforcement

CHAPTER 3

Understanding Normative Influence on a Public Behavior: Normative Predictors of Shoreland Buffer Use

Introduction

Shoreland land use choices are a public behavior. These choices can vary from a natural state to a highly managed state. Minnesota's central lakes have seen an unprecedented 800% increase in development in the last thirty years (Potts, et al., 2005). Littoral development is often accompanied by a loss of shoreland and aquatic habitats (Elias & Meyer, 2003; Jennings, Emmons, Hatzenbeler, Edwards & Bozek, 2003; Radomski & Goeman, 2001). When degradation of the shoreland occurs, the resulting habitats lend themselves to the incursion of invasive, non-native species and compromised ecosystems (Didham, Tylianakis, Gemmell, Rand & Ewers, 2007).

In addition to habitat impacts, water quality can be impacted by development. Minnesota's list of impaired water bodies continues to grow. Currently there are 1,090 water bodies impaired by pollutants listed with the Minnesota Pollution Control Agency. Of the total number of impairments in the state, 52%; turbidity, eutrophication and biological impairments; can be caused by or made worse through land use practices (*Minnesota's impaired waters and TMDL's*, 2010).

Due to its concern about the potential impacts of shoreland development to habitat and water quality, the Minnesota Department of Natural Resources (DNR) encourages the use of native vegetative buffers on shorelines to help protect both habitat and water quality. In addition to the preservation of current buffers, the DNR promotes shoreland restoration through educational outreach and grants. In order for these efforts to be effective, understanding landowner management of shorelines is of great importance as

interventions without sound theoretical foundations often fail (Rimal, Lapinski, Cook & Real, 2005).

The purpose of this study is to gain a better understanding of how normative pressure affects or does not affect landowners' shoreland management and decisions to have vegetative buffers and to assess the usefulness of normative behavioral models. The results of this study will help guide future communication and outreach efforts by identifying the types of normative influence that are predictors of behavioral intention and in turn guide future messaging to influence behavior. I accomplished this purpose by testing the Theory of Normative Social Behavior (TNSB) (Rimal & Real, 2005) as a model for predicting behavioral intention to restore a buffer. I then tested a second model using the Integrative Model (IM) (Fishbein & Yzer, 2003) that incorporates TNSB variables. Finally I compared the results of the two models.

Conceptual Background

Norms are a standard of behavior or rule that is supported by a group or society (Eagly & Chaiken, 1993). Social pressure or norms can be felt directly through others' reactions to our behavior or can be felt indirectly whereabouts we rely upon cues from others rather than direct experience (Rimal, 2008). In particular, normative influence is greatest when ambiguity exists regarding the appropriateness of a behavior. Ambiguity exists in cases when a behavior is new, we are in a new culture or when there is no obvious course of action (Lapinski & Rimal, 2005). When we are not able to accurately identify the attitudes held by others, our behavior is more likely to be influenced by perceived normative pressure. This situation is actually common and stems from our

inability to know with certainty another's true attitude. Because we cannot know the true attitudes of others, our social projection of other's attitudes is a more important influence on our own before than another's true attitude (Rimal & Real, 2003).

Others' reactions to our behaviors may be in the form of social sanctions. It is the fear of social sanctions that drive behavioral compliance via normative influence. Cialdini's (1990) investigation of littering behavior showed the normative influence of publicly visible behavior. In situations where behavior was highly visible (i.e. when someone was present for the subject's opportunity to litter), normative pressures influenced behaviors. Subsequently, Cialdini (2003) found that the least littering occurred when a subject saw someone litter in a clean environment. These examples illustrate that even when social sanctions may be minimal, a stranger's disapproval or disgust in a stranger's actions outside of the norm, can be a driving force for behavior.

Research in the human dimensions of natural resources has shown the ability to apply normative frameworks to a wide range of natural resource management issues. For example, Kneeshaw, Vaske, Bright and Absher (2004) applied normative frameworks towards fire management in national forests and found differences in acceptability norms for differing management practices for different fire scenarios. Kuentzel and Heberlein (1998) found social influence to influence waterfowl hunting behavior. Additionally, norms have been shown to influence recreation such as wildlife viewing (Anderson, Manning, Valliere, and Hallo, 2010; Whittaker, 1997).

Normative influence is not universal in all scenarios or for all behaviors. For example, Davenport, Nielsen and Mangun (2010) found that the level of normative

influence upon support for mountain lion (*Puma concolor*) management varied between respondents from North Dakota and Kentucky. Additionally, while behavioral modeling has shown large correlations between attitudes towards the behavior and behavioral intention (Manfredo, Fishbein, Haas & Watson, 1990; Pate, Manfredo, Bright & Tischbein, 1996; Vaske & Donnelly, 1999; Whittaker, et al., 2001), the link between normative pressure and behavioral intention, however, has not been as unequivocally demonstrated. For example, Manfredo et al. (1990) showed that normative influence ($\beta = 0.14$) was significant in predicting acceptance of prescribed fire policies, but that attitude ($\beta = 0.76$) was a stronger predictor of behavioral intention. Subsequent studies in the human dimensions of natural resources have mirrored these findings (Campbell & Mackay, 2003; Martin & Kate, 2009; Rossi & Armstrong, 1999).

Cialdini (1990, 2005) championed the notion that as individuals, we largely underestimate the level of normative influence upon our behavior. He argued that people are poor judges at discerning the reasons behind their actions and are largely blind to the influence of others. For this reason, Cialdini has advanced research on normative influence to try to identify the types and in what situations norms influence behavior. The important role of normative influence has also been recognized as theoretically important in the natural resources field. Stern, Dietz, Abel, Guagnano and Kalof (1999) expanded the traditional view of norms to include the personal norms in their Value-Belief Norm Theory. Heywood and Manning (2002) note the importance of normative research and progress in outdoor recreation. Kneeshaw et al. (2004) linked normative beliefs about fire management to differing fire scenarios. Lapinski, Rimal, DeVries, and Lin Lee (2007),

showed the interactions between descriptive norms and group orientation and behavioral intention and attitudes towards water conservation. Gilkman, Bath and Vaske's (2011) research on wolf management showed the ability to segment populations by their normative beliefs.

Lapinski et al. (2007) contend that any behavior domain can be broken down into theoretically meaningful attributes. The same can be assumed for normative influence. Ajzen and Fishbein (1980) measured normative pressure via subjective norms in the Theory of Reasoned Action. Subjective norms are the beliefs that an individual holds regarding how they believe others would want them to behave. Cialdini (1990) divided norms into two categories: injunctive and descriptive. Cialdini (1990) also noted the potential importance of cultural norms in addition to descriptive and injunctive norms. Injunctive norms refer to what one ought to do and descriptive norms refer to the perception of what behaviors are actually occurring (Cialdini, 1990). Reno, Cialdini & Kallgren's (1993) findings showed that injunctive norms can enhance positive behavior in both environments with low or high descriptive norms. While, Reno et al. (1993) also showed the importance of descriptive norms, descriptive norms were predictive of behavior only in environments where they were made focal.

I focus upon two research areas of normative influence that address additional normative variables. The first, the Theory of Normative Social Behavior (TNSB) (Rimal and Real, 2005) focuses upon the interaction of descriptive norms with injunctive norms, outcome expectations and group identification. The second area largely builds upon the Theory of Reasoned Action (TRA) (Fishbein and Ajzen, 1980) and the latest integration

of the model, the Integrative Model (Fishbein & Yzer, 2003), by adding additional normative variables and correlating them directly to behavioral intention.

Normative influence has been expanded in models derived from the TRA (Table 3.1). Von Haeften and Kenski (2001) added partner norms to their base TRA behavioral model for predicting behavioral intention of condom use and found it to be predictive. Smith and Sweeney (2007) conducted hierarchical multiple regression using standard TPB variables and with the subsequent additions of descriptive and moral norms explained an additional 6% of variance in behavior.

Lapinski and Rimal (2005) describe two levels of normative influence, societal and personal, for both descriptive and injunctive normative influences. They argue that societal level descriptive norms come from the media's portrayal of behavior and injunctive societal norms stem from policy. Park and Smith (2007) expand upon Lapinski and Rimal's (2005) framework and argue for five different discrete normative pressures. Park and Smith (2007) agreed that descriptive and injunctive norms can be split into personal and societal norms components, but also argued for the inclusion of subjective norms. The personal perceived injunctive norms are the perception of important other's approval of the behavior, whereas societal injunctive norms refer to the overall societal approval of the behavior. Personal descriptive norms refer to how a person's important others are behaving and societal descriptive norms refer to how members of a society in general are behaving.

Elek, Miller-Day and Hecht (2006) argued for the use of personal norms, internalized values and expectations for behavior that do not take into account external

reward, in addition to injunctive and descriptive norms to predict variance in substance abuse. They found that personal norms had a stronger influence on behavior than the other predictors. Putte, Yzer and Brunsting (2004) discuss the importance of explicit and behavioral verbal norms. Explicit verbal norms measure whether people in one's environment stated in the past that you should, for example, restore a buffer and explicit behavioral norms measure whether someone has offered you information regarding restoring buffers. Rimal and Real (2003) paralleled the explicit verbal norm by maintaining that without social interaction normative influence cannot exist. They further argued that communication among group member reinforce group identification. Therefore, Real and Rimal (2003, 2007) added group identification and communication variables and confirmed that extensive discussion led to greater estimates of behavioral prevalence and that this more extensive discussion resulted in descriptive norms being predictive of behavioral intention. In cases when group identity is low or when behavior is not aligned with a group, descriptive norms have higher effects on behavioral intention when self-identity is closely aligned with the enacted behavior (Lapinski & Rimal, 2005).

Rimal et al. (2005) demonstrated that if individuals do not perceive there to be benefits from a behavior, behavioral intention does not change even when descriptive norms are high. In the case when descriptive norms are high, they argued that individuals see other's behavior as negative. Alternatively, when benefits and descriptive norms are high, there is high pressure to engage in a behavior. Rimal and Real (2005) built upon these findings by constructing the Theory of Normative Social Behavior (TNSB; Figure 3.1). Rimal and Real (2005) argue that descriptive norms are predictive of behavior and

the relationship is moderated by outcome expectations, injunctive norms and group identification. Therefore, they argue, only in situations where one sees a behavioral as beneficial, acceptable and/or they have a strong group identity does the descriptive norm predict behavior.

In the model, outcome expectation refers to whether an individual thinks that the outcome of performing the behavior is positive or negative. Injunctive norm are similar to subjective norms and refer to the acceptability of the behavior. Finally, group identification refers to how similar one sees themselves to a group or their level of participation in that group. Research confirmed the explanatory power of the TNSB and showed an interaction of descriptive norms with benefits to oneself or outcome expectations and social approval (Rimal & Real, 2003; Rimal et al., 2005; Rimal & Real, 2005).

Maintaining or restoring a native vegetative buffer is a highly visible behavior. Lapinski and Rimal (2005) argued that behaviors that are exclusively in public are available for public scrutiny and interrogation and, thus, are more greatly influenced by normative influence than behaviors that are private. In addition, the concept of native vegetative buffer restoration is novel. Therefore, I assumed that accumulative normative pressures will play a significant role in predicting behavior. I used two strategies to evaluate normative pressure. First, I used the TNSB to evaluate the role of descriptive norms moderated by group involvement, injunctive norms, and outcome expectations in predicting behavioral intention (Rimal & Real, 2005). Next, I added the additional variables of descriptive and injunctive norms to the Integrative Model (Figure 3.2). In the

previous chapter I examined the IM to model restoration intention. Therefore, by evaluating the type and level of normative pressures felt by individuals, I hoped to gain a deeper understanding of the role of normative pressure and to better understand the variables predicting restoration behavior.

Methods

Data collection and sampling

Using the methods outlined by Krueger and Casey (2009), I conducted focus groups with Minnesota lakeshore landowners to obtain foundational attitudes towards native vegetative buffers and buffer restoration. I identified four lakeshore associations with the assistance of the Minnesota Department of Natural Resources (DNR) and contacted them to assist us in recruiting participants by advertising in their publications. I provided a twenty dollar incentive for participation, and recruited between nine and eleven participants per focus group. Each focus group received the same scripted nine questions and lasted approximately an hour and a half. I followed the questioning format outlined by Krueger and Casey (2009) and used opening, introductory, transition, key questions and ending questions. I then analyzed the data to assess saturation and found that saturation of the data had occurred. I used the data from the focus groups to create the written survey instrument

Sampling procedures followed Payton and Fulton (2004) to identify lakeshore homeowners. I used a database of Minnesota lakes provided by the DNR. I segmented the lakes in the database based upon Schupp's (1992) classification system:

Ecotype 1—low productivity lakes located in the northeast region of the state generally north of Lake Superior.

Ecotype 2—large, moderately productive lakes normally located in the north central part of the state.

Ecotype 3—small productive lakes normally centrally located within the state from Bemidji southeast to Minneapolis and Saint Paul.

Ecotype 4—larger productive lakes normally located from Willmar, MN, eastern Minnesota, north and east to Mille Lacs, MN.

To obtain the study households, I used lakes in each ecotype as the sampling unit and contacted all property owners around each selected lake. I used a 2001 DNR housing count database as the sampling frame. The study focus was on midsized lakes, so I removed lakes with less than 50 houses and lakes with over 300 houses. Additionally, larger lakes presented a logistical problem for an additional aspect of the research not reported here that involved circumnavigating each lake. My target sample was 1,000 households per ecotype with a total starting sample size of 4,000 households. Because the number of houses around each lake was not uniform, I selected a total of twelve lakes for ecotype 1, eight lakes for ecotype 2, ten lakes for ecotype 3, and eight lakes for ecotype 4. I obtained ownership information for the properties around each lake from the appropriate county tax assessor's office. I used tax addresses to contact property owners over physical addresses as many properties are not permanent residents. The initial total sample size was n = 4,157 (ecotype 1 n = 1,027; for ecotype 2 n = 1,009; for ecotype 3

n=1,049; ecotype 4 n = 1,072). I adjusted the final sample size due to undeliverable mail and changes in ownership to a final total sampling size of n = 3,975.

I adapted Dillman's (2008) Tailored Design Method for survey implementation. Each mailing consisted of a survey, a personalized, signed letter, and a pre-addressed postage paid envelope to return the survey. Four weeks after the initial mailing, I sent non-respondents an additional mailing urging participation. I repeated this process after another four weeks if there was still no response from participants. If after the three round of survey mailings participants still did not return a survey, an abridged non-response survey was sent to assess non-response bias.

Conceptual Measurement

For this study I used two models, the Theory of Normative Social Behavior (TNSB) (Rimal & Real, 2005) and the Integrative Model (IM) (Fishbein & Yzer, 2003) (Figures 3.1 & 3.2). For the TNSB, I focused on descriptive norms, outcome expectation, group identity and injunctive norms. Given the close similarity of the concepts, I used belief evaluation (BE) measures developed from the focus groups as a measure of outcome expectations in the TNSB. For the IM I used the variables of self-efficacy, belief evaluation, subjective norms, and descriptive norms to predict behavioral intention. I chose to use these models in order to compare the effectiveness in using descriptive norms as an additional variable to the IM or as a moderating variable to predict behavioral intention.

For both the TNSB and the IM's belief evaluation index (BE), I used the 11 behavioral beliefs and outcome expectations for buffer restoration compiled from the four

focus groups. Both behavioral beliefs and outcome expectations used a Likert type scale from 1 to 7 for which 1 = "extremely unlikely" for behavioral beliefs and extremely unlikely for outcome expectation and 7 = "extremely likely" for behavioral beliefs and extremely likely for outcome expectation. For example, a respondent could believe that buffers help improve water quality and that improving water quality is also beneficial. I coded both behavioral beliefs and belief expectations to range from -3 to 3 to capture positive and negative beliefs and evaluations. The following equation defines BE:

$\sum BE = \sum(b_i e_i)$

In this equation b_i refers to behavioral beliefs and e_i refers to outcome expectations.

In the TNSB descriptive norms directly correlate with behavioral intention and belief outcomes, injunctive norms, and group identity moderate this correlation. To assess injunctive norms in the TNSB, I used a Likert-type scale and asked how important referent groups would rate the acceptability of having a native vegetative buffer from 1 = "very unacceptable" to 7 = "very acceptable". I asked a total of six questions to gauge the injunctive normative pressure. The following equation represents mean injunctive norms:

Mean $N_{injunctive} = \sum(N_{Ii})/n$

I used participation in their lake association to assess group identity. The item was a five point scale that ranged from 1: not a member to 5: very active.

For the TNSB, I used the following equation to prediction intention to restore a native vegetative buffer:

Restoration ≈ Intention to restore ≈ $[\sum N_{descriptive}]W_1 + [\sum N_{descriptive} \text{ x } \sum N_{injunctive}]W_2 + [\sum N_{descriptive} \text{ x } \sum BE]\ W_3 + [\sum N_{descriptive} \text{ x Group Identity}]\ W_4$

In this equation W_n refers to the weights given to each variable within the equation.

In the IM I measured subjective norms (BM) by again using the focus group data and identified seven important others as sources of normative influence. Respondents were asked the level to which they believed that important others think they should restore a native vegetative buffer. Additionally, respondents were asked the level to which they were motivated to comply with the beliefs of those important others. For example, one may believe that the DNR supports buffer restoration and they may or may not be motivated to comply with those beliefs. Both the sources and motivation to comply questions were on a Likert type 7-point scales. Each scale was coded -3 to +3 to reflect negative and positive normative pressure. The resulting equation for BM was:

$$\sum BM = \sum(b_i m_i)$$

The $\sum BM$ is the summation of the products of the seven $b_i m_i$ in which b_i is the normative belief and m_i is the motivation to comply with the associated source of normative pressure.

Self-efficacy was measured through the summation of four efficacy questions that assessed respondents how sure they were at being able to complete tasks related to restoring a shoreland buffer (i.e. identify native plants or purchase native plants). The values for the self-efficacy questions ranged from 1, not well at all, to 7, very well. I calculated the self-efficacy [$E_{restoration}$] felt by an individual for conducting a shoreland restoration as the sum of the self-efficacy questions. Resulting in the following equation:

$$E_{restoration} = \sum(E_i)$$

I measured descriptive norms, $N_{descriptive}$, by asking respondents to estimate the percentage of lakeshore landowners that they think have native vegetative buffers for their neighbors, landowners on their lake, landowners in the region and generally in Minnesota. These values ranged from 0%, less than 5%, 10% and adding 10% increments up to 100% and were converted to a 12 point scale. I determined the overall mean descriptive normative pressure using the equation:

$N_{descriptive} = \sum(N_{Di})/n$

Finally, I assessed behavioral intention by asking respondents the likelihood of them restoring a vegetative buffer in the next five years using a 7-point scale ranging from 1 = extremely unlikely to 7 = extremely likely. With the addition of the supplementary normative variable the overall IM equation with weighted variables (W_n) becomes:

Restoration ≈ Intention to restore ≈ $[A_{restoration}]W_1 + [N_{restoration}]W_2 + [E_{restoration}]W_3 + [N_{descriptive}]W_4$

Analysis

Data were entered in duplicate to minimize data entry errors. I used the Statistical Program for the Social Sciences (SPSS/PC+ 17.0) to analyze data. The goal of the Minnesota DNR is to have 75% of the land 50 feet landward of the mean high water line as a native vegetative buffer. For this reason, I removed respondents that reported greater than 75% of their shoreline as native vegetation from analysis as the behavior is not necessary or is already complete. Unlike supporting resource management policies (Manfredo et al., 1990) or voting intention (Vaske & Donnelly, 1999), shoreland

restoration is a resource intensive behavior. Additionally, unlike smoking cessation (Lenz, 2008) or condom use (Yzer, Siero & Buunk, 2001) the behavior is not habituated or ongoing. Therefore, due to the behavioral characteristics of shoreland restoration, I removed respondents who had already completed a restoration or already had a buffer that met the DNR's recommended 75% of shoreland as native vegetation within 50 feet of the mean high water line.

First I assessed the variables for multicollinearity by regressing each variable within the TNSB and the IM against each other to ensure that data did not violate the assumption of independent variables. For the assessment of the addition of TNSB variables; descriptive norms, injunctive norms, and group identity; to the IM, I conducted hierarchical multiple regressions. I then obtained regression weights (β), R^2 and ΔR^2.

The TNSB assumes that the influence of descriptive norms on behavioral intention is moderated by the normative mechanisms of injunctive norms, outcome expectations and group identity. Baron and Kenny (1986) note that moderators can be either qualitative or quantitative and affect the direction or strength of association between the independent and dependent variable. As noted by Cronbach (1987), simply conducting a hierarchical multiple regression can cause issues associated with multicollinearity as an assumption of multiple regression is that independent variables are not correlated. For the TNSB, many variables could be highly correlated as descriptive norms are moderated by injunctive norms, outcome expectations and group identity.

Therefore to test the TNSB, I followed the analytical strategy conducted by Rimal and Real (2003, 2005) and used separate hierarchical multiple regressions to obtain

regression weights (β), R^2 and ΔR^2 for the moderating effects of outcome expectations, injunctive norms and group identity on descriptive norms' predictive power of behavioral intention. Additionally, as suggested by Sharma, Durand, and Gur-Arie (1981), I split the sample into sub-groups based upon the hypothesized moderators. Following Rimal (2008) in order to differentiate the sub-groups and determine the pattern of interaction, I segmented moderators and descriptive norms one standard deviation below and above the mean to create high and low descriptive normative groups and moderator groups. I then ran ANOVA's and graphically plotted the results. Finally I compared the results of the models tested.

Results

I sent 3,975 surveys of which respondents returned a total of 2,543 surveys giving a return rate of 64%. I assessed non-response bias via a two-page questionnaire and sent it to 1,432 non-respondents. A total of 304 respondents returned the questionnaire. I analyzed the non-response data via a one-way ANOVA which showed no statistical differences between response and non-response for behavioral intention to restore a buffer. Weighting the non-response data resulted in no statistically significant differences in the data. For these reasons, I did not weight the data.

A correlation of the variables to assess multicollinearity issues in the model revealed some significant correlations (Table 3.2). The highest correlations occurred between the injunctive norms and behavioral intention ($r = .453$, $p < .001$) as well as the sum of the belief evaluations and behavioral intention ($r = .424$, $p < .001$). These correlations were of little concern as both injunctive norms and belief evaluations are

predictive variables of behavioral intention. Additionally, injunctive norms was highly correlated to belief evaluation ($r = .321$, $p < .001$), self-efficacy ($r = .355$, $p < .001$), and descriptive norms ($r = .357$, $p < .001$). Potential issues with these correlations will be discussed in the models.

For the TNSB hierarchical regression model, the initial regression of descriptive norms predicting behavioral intention was significant ($\beta = .126$, $p < .001$) (Table 3.3). Each additional model with the inclusion of outcome expectation, injunctive norms and group identification resulted in a significant R^2, but, the only moderating variable that was significant was ∑BE * descriptive norms ($\beta = .092$, $p = .019$). The model containing injunctive norms resulted in an $R^2 = .204$ and a $\Delta R^2 = .188$, the model containing group ID resulted in an $R^2 = .033$ and a $\Delta R^2 = .017$, and the model containing the ∑BE resulted in an $R^2 = .214$ and a $\Delta R^2 = .198$. Mean injunctive norms had the highest correlation weight with behavioral intention ($\beta = .501$, $p < .001$).

The results showed a main effect for high and low injunctive norms ($F(1, 189) = 43.483$, $p < .001$, $R^2 = .411$) (Table 3.4, Figure 3.3), but not for descriptive norms. The results of the model containing high and low ∑BE with high and low descriptive norms showed a main effect for high and low ∑BE ($F(1, 114) = 64.92$, $p < .001$) and for high and low descriptive norms ($F(1, 114) = 11.25$, $p = .001$) with an overall $R^2 = .496$ (Table 3.5, Figure 3.4). Additionally the model with high and low group ID showed a main effect ($F(1, 246) = 4.187$, $p = .042$) as did high and low descriptive norms ($F(1, 246) = 18.63$, $p < .001$) with an overall $R^2 = .100$ (Table 3.6, Figure 3.5). Finally, as high and low ∑BE and high and low injunctive norms most highly predicted behavioral intention I

combined the two models and excluded descriptive norms (Figure 3.6) the resulting model was most predictive at ($F(1, 246) = 102.34$, $p < .001$) with an overall $R^2 = .660$ (Table 3.7)

Within the initial Integrated Model, ∑Efficacy ($\beta = .178$, $p < .001$) and ∑BE ($\beta = .409$, $p < .001$) were significant predictors of behavioral intention with an overall $R^2 = .241$. In the subsequent IM model that included TNSB variables, ∑Efficacy ($\beta = .090$, $p < .001$) , ∑BE ($\beta = .314$, $p < .001$), mean injunctive norm ($\beta = .316$, $p < .001$) and Group ID ($\beta = .061$, $p = .01$) were all significant predictors of behavioral intention (Table 3.8). The resulting model had an $R^2 = .323$ and a $\Delta R^2 = .082$. The addition of TNSB variables resulted in an 8.2% increase in explained variance of behavioral intention.

Discussion

Both the TNSB and the IM models predicted behavioral intention. While the TNSB predicted behavioral intention and showed similar results to those found by Lapinski et al (2007), explained variance was much lower than that of Rimal and Real (2005) and Real and Rimal (2007). In the TNSB model the lack of significant interactions among the predictive variables indicated no moderating effect of outcome expectations, group identity and injunctive norms on descriptive norms correlation with behavioral intention. However an addition of injunctive norms and group ID to the IM proved to explain more of the variance in the model.

There may be an explanation for this inherent in the behavior examined. Group identity depends on the feeling of connectivity with those also on the lake. The measure of group identity was participation in the lake association. This measure may not have

been adequate. Alternatively as many of these lake homes are seasonal properties, there may simply not be a strong sense of group identity felt by respondents. Secondly, while I believed that outcome expectations should be synonymous with behavioral evaluations within the IM; this assumption might be in error. If behavioral evaluation does not adequately capture outcome expectation I would have a lower than expected explanation of the variability. In addition, unlike the experimental approach used by Rimal (2008), I did not manipulate descriptive norms within the study, but relied upon respondent's own perception of the prevalence of the behavior. Additionally, the prevalence of the behavior was generally low. Therefore, there may not be enough variation in the descriptive norms in the data to adequately assess the models. Not having distinct groups of high and/or low descriptive norms may have resulted in less of a stark difference between the two groups.

Normative pressure within the IM, however, was not a significant predictor of behavioral intention. The addition of descriptive norms to the IM was not significant, but the inclusion of the injunctive norm had a strong effect, $\beta = .454$. In the TNSB's model containing the injunctive norm, the descriptive norm and the descriptive norm moderated by the injunctive, the injunctive norm significantly predicted behavioral intention. This finding was surprising as the argument can be made for strong similarities between injunctive and subjective norms. I measured subjective norms by asking to what extent respondents think that important others think that they "should" have native vegetative buffer and their motivation to comply with each referent group. The injunctive norm asked the level of "acceptability" of those same referent groups but does not ask a corresponding motivation to comply. The injunctive measurement for normative pressure

may prove to be a better measure of social pressure as I may as individuals have difficulty admitting to complying with what others wish of us.

While a moderating affect was not shown, it was interesting that the ANOVA's of the descriptive norms moderated by high and low injunctive norms and the ∑BE explained the most variability of all the models (R^2 = .411 and R^2 = .496). This finding seems to indicate that behavior intention for those at the extremes of beliefs and normative pressure are more easily modeled which might be explained by a lack of competing beliefs and norms. Further investigation of this interaction was confirmed by an additional ANOVA with high and low ∑BE and injunctive norms that resulted in a R^2 = .660 (Table 3.7) (Figure 3.6). These results indicate that ∑BE may be moderated by the injunctive norms. This finding indicates that decisions regarding shoreland management may not be made solely by the individual, but rather the intention to restore a buffer is more likely to occur when the beliefs of the individual match with those of the important referent groups.

Finally, behavioral models, such as the IM, make the assumption that behaviors are reasoned action and the manner in which we come to behavioral intention is thoughtful. Shoreland restoration may not be a behavior that can be explained through an apparent rational process. Robbins (2007) showed that lawn maintenance often defies reason as those with a knowledge and understanding of the environmental risks posed by the lawn maintenance are often the worst perpetrators of poor land use management. While Robbins (2007) looked at lawn maintenance in urban and suburban areas, these

behaviors may also be applicable to lake homes. This discrepancy between knowledge and behavior may indicate that other forces are at play such as habit.

Implications and Conclusion

Our goal in this research was to examine and compare additional methods for evaluating the normative component in behavior. Using the intention to restore shoreland buffers as a case study, I found that both the IM and the TNSB were able to explain behavioral intention to restore shoreland as well as these models has typically explained other behaviors. While this was the case, the IM showed a better ability to explain the variance in behavioral intention with the addition of TNSB variables. In particular, the injunctive norm explained the most variance of the normative measures. Overall, belief evaluation and injunctive norms were the most predictive of behavioral intention. Injunctive norms did provide a measurement tool for expanding the measurement of normative pressure.

It appears that in this case belief evaluation is moderated by the injunctive norm. Theoretically this may prove to be interesting. Behaviors may range from very public to very private as well as of high interest and low interest to important referent others and thereby substantiate Lapinski and Rimal's (2005) of societal and personal level of norms. Shoreland restoration could also range in the level to which it is a public activity confounding our evaluation of its influence. While shoreland restoration showed that respondents had a high interest in the acceptability of the behavior by important referent others. A similar level of interest in important others may not be the case for other conservation behaviors of interest. As researchers, we may want to consider more

thoroughly segmenting the behaviors we research based upon their characteristics. Evaluating behaviors based upon their characteristics could lead to a more carefully selecting the pertinent theories to apply and could lead to higher explanations of variance.

Future research should examine the role of injunctive norms and their potential as a moderator to belief evaluations. Additionally, future research should evaluate the inclusion of the TNSB variables, in particular the injunctive norm, into the IM model. In order to substantiate the use of the TNSB in applied settings, more research should also be conducted. As the behavior examined, restoration of shoreland buffers, overall had a low level of descriptive norms reported, research should examine behaviors with varying levels of adoption ranging from very high to very low in a non-manipulated setting. Additionally, similar research could be done by surveying lakes in which many restorations have been done and compare that with lakes with little or no restorations.

Our research has practical implications for resource managers. While targeting individual landowners may be effective in changing their personal beliefs regarding buffers, the intention to restore a buffer is seemingly not a decision made by an individual, but rather a decision that is taken in light of the acceptability of restoration with one's family. Therefore, if the goal of resource managers is to increase adoption of shoreland restoration, targeting both individual landowners with outreach and education along with general education of the public or outreach that is focused upon families could prove helpful in raising the acceptability of restoration. In addition, in order to increase the acceptability of restoration, resource managers could note the undesirable aspects of

restoration, i.e. impacts to recreation, while targeting a values appeal to the importance of water quality.

Table 3.1: Normative Variables

Author	Variables
Ajzen and Fishbein (1980)	Subjective norm
Cialidin (1990)	Injunctive and descriptive norm
Lapinski and Rimal (2005)	Split injunctive and descriptive norms by societal and personal levels
Park and Smith (2007)	Added subjective norms to Lapinski and Rimal's (2005) societal and personal level norms
Putte, Yzer and Brunsting (2004)	Explicit behavioral and verbal norms
Elek, Miller-Day and Hecht (2006)	Personal norms

Table 3.2: Correlations of Variables: Pearson's Correlations

	BI	∑BM	∑BE	∑Efficacy	Mean $N_{descriptive}$	Mean $N_{injunctive}$	Group ID
BI	1.00						
∑BM	.055*	1					
∑BE	.424**	.199**	1				
∑Efficacy	.302**	-.060*	.228**	1			
$N_{Descriptive}$	.126**	-.007	.080**	.181**	1		
$N_{Injunctive}$	.453**	-.047	.321**	.355**	.357**	1	.
Group ID	.132**	.052*	.077**	.163**	.012	.116**	1

*. Correlation is significant at the p < .05 level (2-tailed).

**. Correlation is significant at the p < 0.01 level (2-tailed).

Table 3.3: Hierarchical regressions of the predictive variables of the TNSB with behavioral intention as the dependent variable

		Unstandardized Coefficients		Standardized Coefficients				
Model		B	Std. Error	Beta	t	Sig.	R^2	ΔR^2
1	(Constant)	-1.011	.076		-13.323	.000	.016	-
	Mean descriptive norm	.014	.003	.126	5.132	.000		
2	(Constant)	-3.429	.208		-16.482	.000	.204	.188
	Mean descriptive norm	.005	.009	.051	.618	.536		
	Mean injunctive	.704	.051	.501	13.900	.000		
	Injunctive * descriptive	-.002	.002	-.123	-1.306	.192		
3	(Constant)	-1.376	.164		-8.370	.000	.033	.017
	Mean descriptive norm	.010	.006	.090	1.697	.090		
	Group ID	.160	.063	.103	2.533	.011		
	Group ID * descriptive	.002	.002	.047	.752	.452		
4	(Constant)	-1.097	.074		-14.840	.000	.214	.198
	Mean descriptive norm	.010	.003	.094	3.849	.000		
	∑BE	.033	.003	.366	9.491	.000		
	∑BE * descriptive	.000	.000	.092	2.350	.019		

Note: Each of the Models 2 - 4 were run separately and did not include the other components.

Table 3.4: Tests of between-subjects effects of injunctive norms and descriptive norms in predicting behavioral intention

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	304.043[a]	3	101.348	43.900	.000
Intercept	93.648	1	93.648	40.564	.000
Descriptive norms high low	1.681	1	1.681	.728	.395
Injunctive norm high low	100.385	1	100.385	43.483	.000
Descriptive norms high low * injunctive norm high low	.006	1	.006	.002	.961
Error	436.330	189	2.309		
Total	956.000	193			
Corrected Total	740.373	192			

a. $R^2 = .411$

Table 3.5: Tests of between-subjects effects for the ∑BE and descriptive norms in predicting behavioral intention

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	258.073[a]	3	86.024	36.092	.000
Intercept	94.621	1	94.621	39.699	.000
Descriptive norms high low	26.809	1	26.809	11.248	.001
∑BE high low	154.728	1	154.728	64.917	.000
Descriptive norms high low * ∑BE high low	2.517	1	2.517	1.056	.306
Error	262.181	110	2.383		
Total	567.000	114			
Corrected Total	520.254	113			

a. $R^2 = .496$

Table 3.6: Tests of between-subjects effects for group ID and descriptive norms in predicting behavioral intention

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	97.248[a]	3	32.416	9.149	.000
Intercept	132.325	1	132.325	37.345	.000
Descriptive norms high low	66.005	1	66.005	18.628	.000
Group ID high low	14.836	1	14.836	4.187	.042
Descriptive norms high low * Group ID high low	6.501	1	6.501	1.835	.177
Error	871.652	246	3.543		
Total	1137.000	250			
Corrected Total	968.900	249			

a. $R^2 = .100$

Table 3.7: Tests of between-subjects effects for the ∑BE and injunctive norms in predicting behavioral intention

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	547.938[a]	3	182.646	102.347	.000*
Intercept	156.512	1	156.512	87.703	.000*
∑BE high low	54.966	1	54.966	30.800	.000*
Injunctive norm high low	135.270	1	135.270	75.799	.000*
∑BE high low * Injunctive norm high low	59.061	1	59.061	33.095	.000*
Error	281.964	158	1.785		
Total	1000.000	162			
Corrected Total	829.901	161			

a. $R^2 = .660$
*Note: $p < .001$

Table 3.8: Hierarchical Linear Regression of the IM with the Addition of TNSB Variables

Model		Unstandardized Coefficients		Standardized Coefficients				
		B	Std. Error	Beta	t	Sig.	R^2	ΔR^2
1	(Constant)	-1.696	.131		-12.967	.000	.241	
	∑Efficacy	.057	.008	.178	7.000	.000		
	∑BM	.004	.003	.026	1.055	.292		
	∑BE	.037	.002	.409	15.798	.000		
2	(Constant)	-3.270	.181		-18.074	.000	.323	.082
	∑Efficacy	.029	.008	.090	3.539	.000		
	∑BM	.005	.003	.034	1.449	.148		
	∑BE	.029	.002	.314	12.190	.000		
	Mean descriptive norm	-.003	.003	-.029	-1.137	.256		
	Mean injunctive norm	.454	.040	.316	11.410	.000		
	Group ID	.096	.037	.061	2.585	.010		

a. Dependent Variable: Behavioral intention

Figure 3.1: The Theory of Normative Social Behavior: Adapted from Rimal and Real (2005)

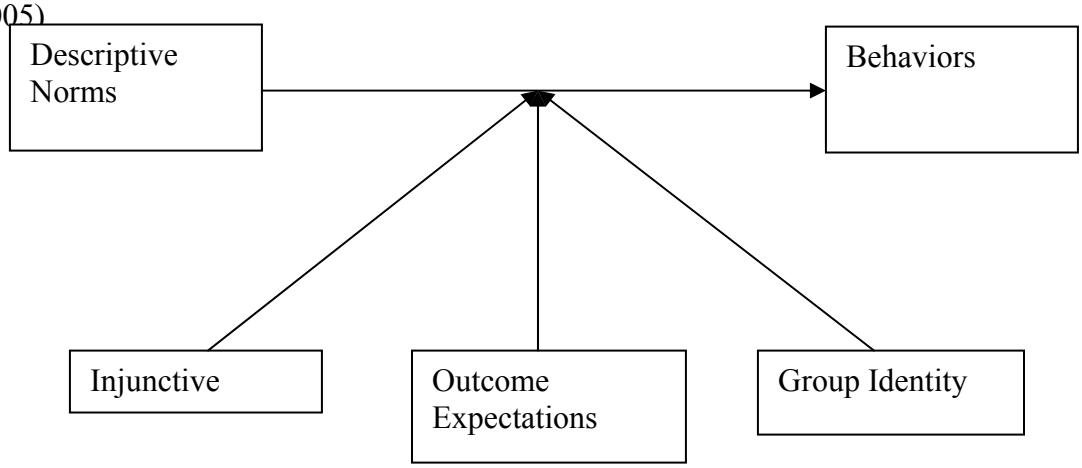


Figure 3.2: The Integrative Model of Behavior Prediction: Adapted from Fishbein & Yzer (2003)

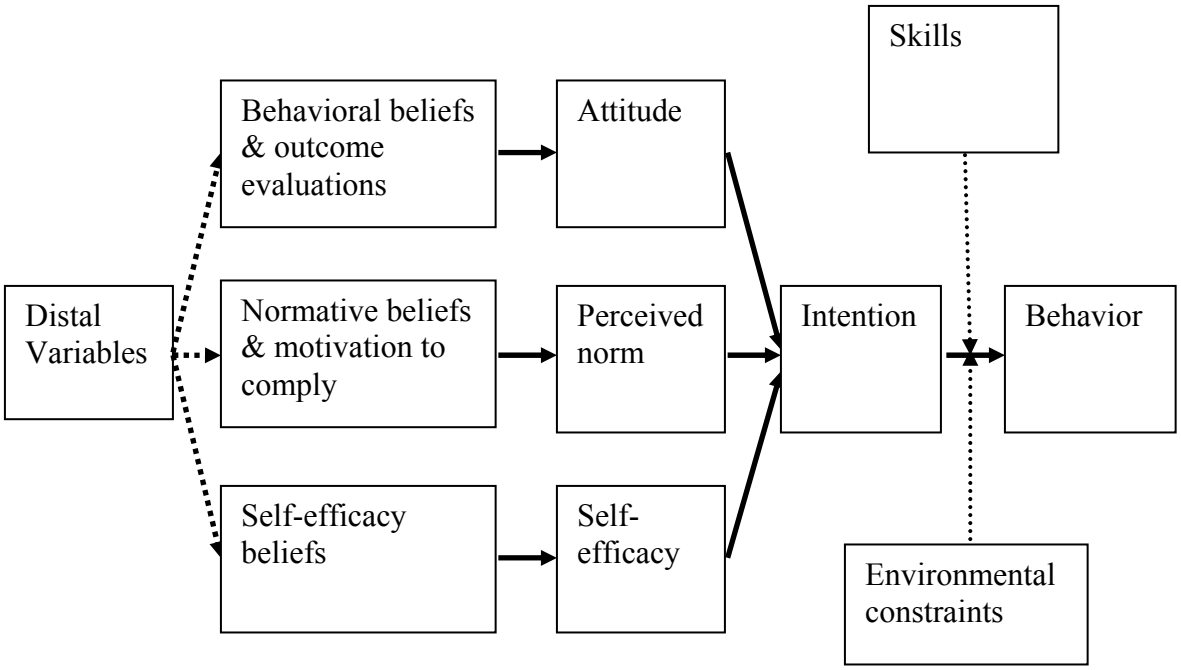


Figure 3.3: Relationship between intention to restore a buffer as a function of high (mean + 1 standard deviation) and low (mean – 1 standarde deviation) values of injunctive norms and descriptive norms

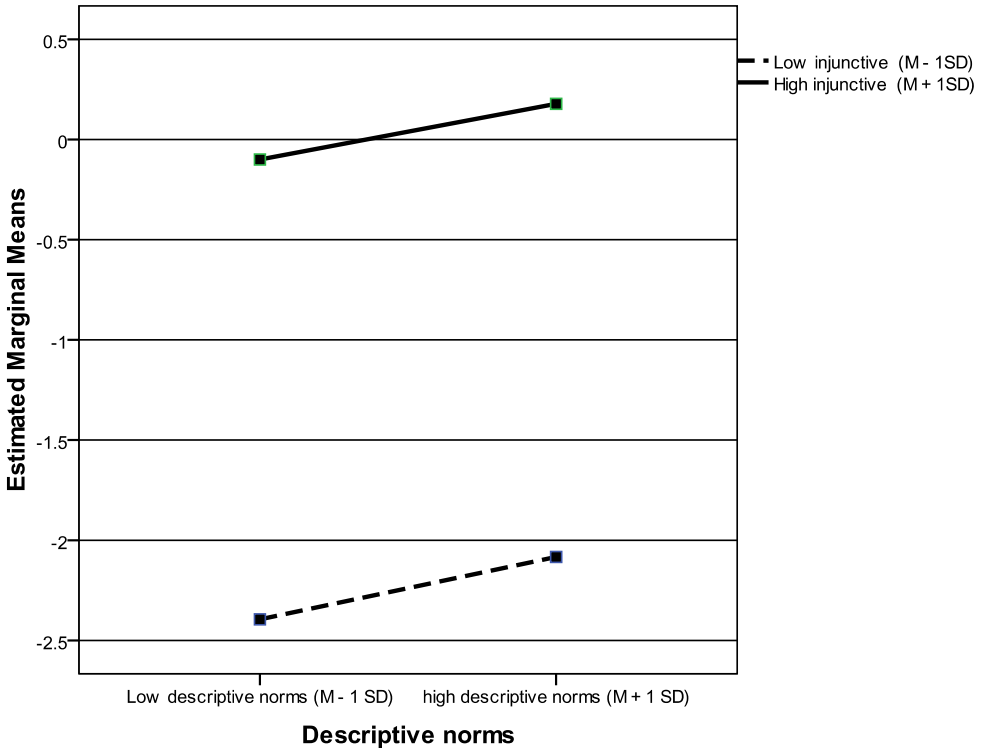


Figure 3.4: Relationship between intention to restore a buffer as a function of high (mean + 1 standard deviation) and low (mean – 1 standarde deviation) values of ∑BE and descriptive norms

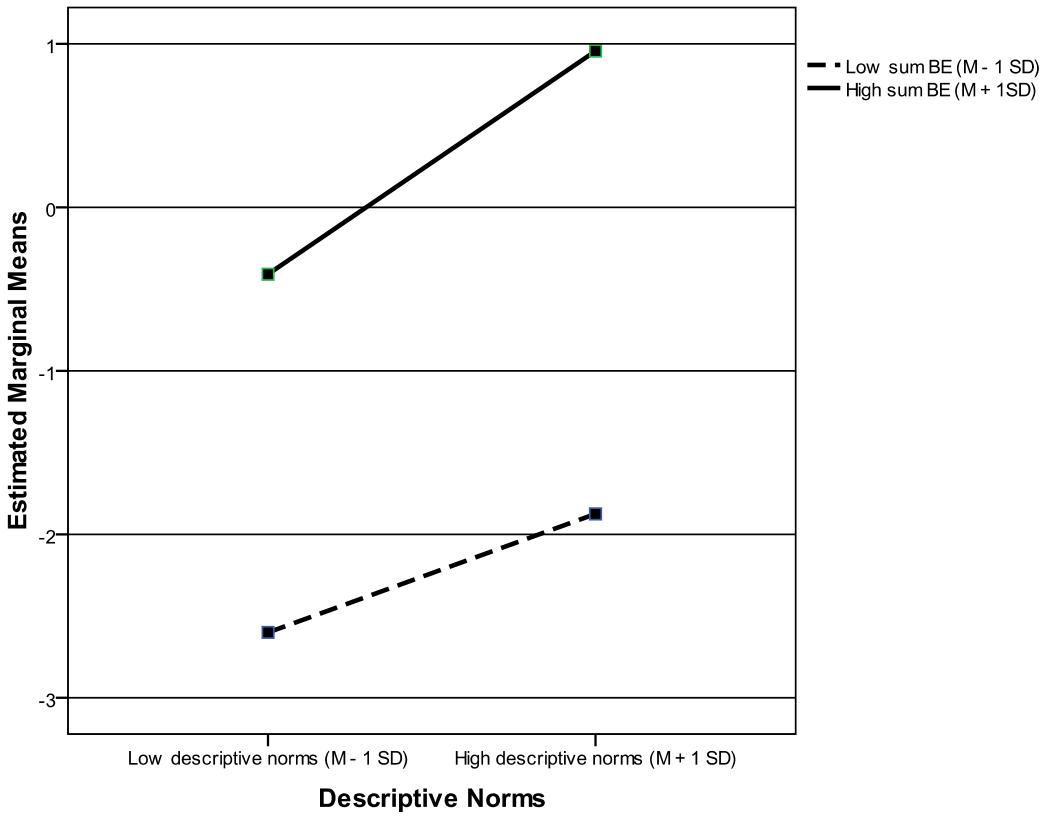


Figure 3.5: Relationship between intention to restore a buffer as a function of high (mean + 1 standard deviation) and low (mean – 1 standarde deviation) values of group ID and descriptive norms

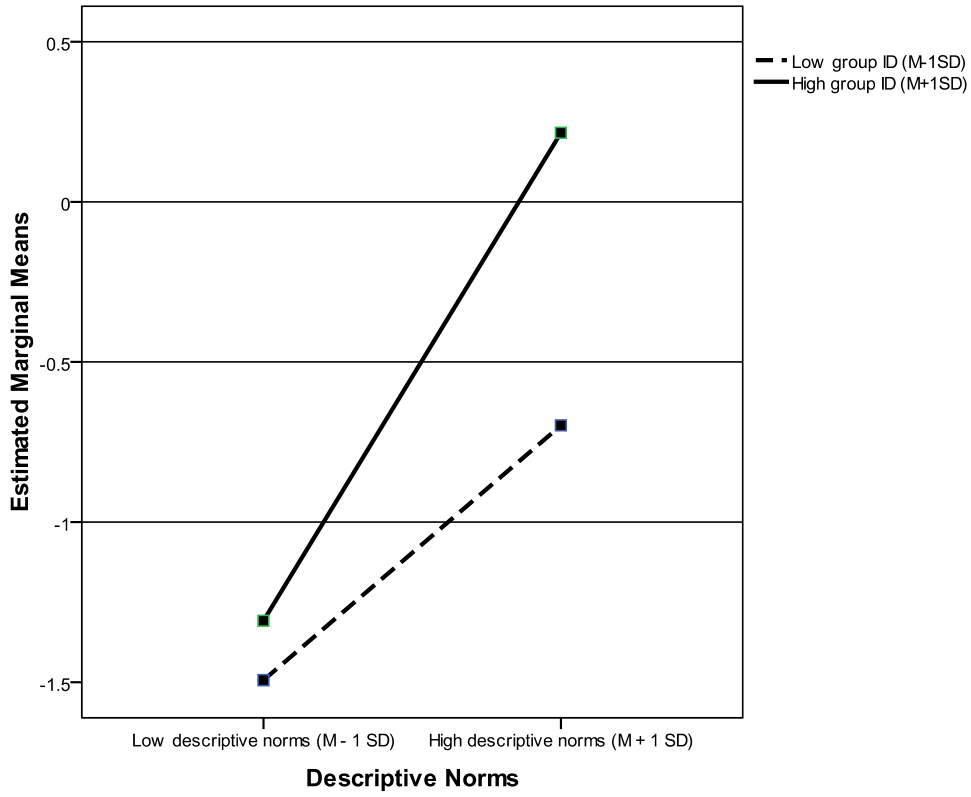
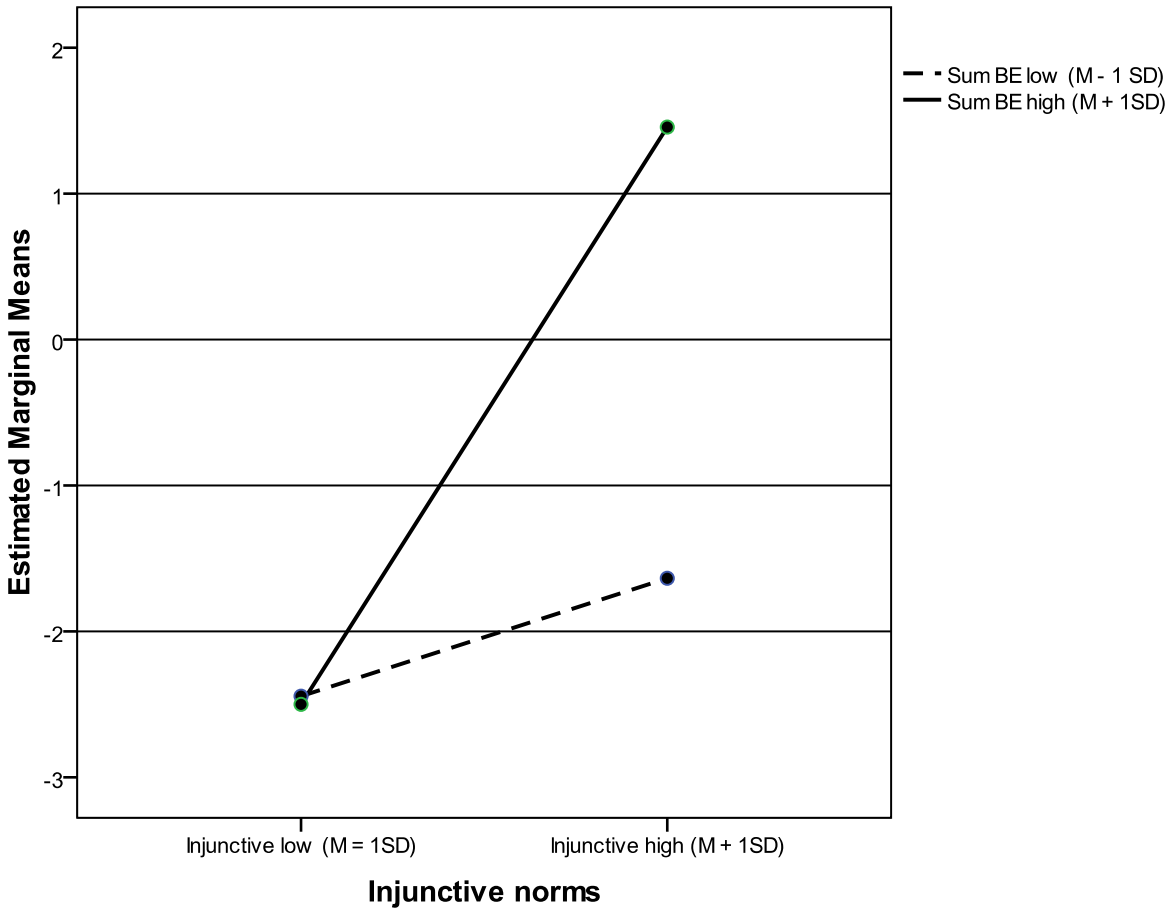


Figure 3.6: Relationship between intention to restore a buffer as a function of high (mean + 1 standard deviation) and low (mean – 1 standarde deviation) values of injunctive norms and behavioral evaluations



CHAPTER 4

Toward an Integration of Behavioral and Risk Theory: A Case Study of Shoreland Management

Introduction

In Minnesota, development of seasonal housing has radically increased by over 600% between 1980 and 2000 leading to changes to the natural landscape (Potts et al., 2005). Much of this development has occurred on lakes leading to losses of shoreland and aquatic habitats (Radomski & Goeman, 2001; Elias & Meyer, 2003; Jennings, Emmons, Hatzenbeler, Edwards & Bozek, 2003). Post development, the resulting landscapes lead to the expansion of non-native species and habitats that are sub optimal (Didham, Tylianakis, Gemmell, Rand & Ewers, 2007). In addition to habitat concerns, increased development leads to water quality concerns as 86% of aquatic impairment in Minnesota's 1,475 impairments on 336 rivers and 510 lakes stem from non-point sources of pollution including land uses (Dunn, 2008; Minnesota Pollution Control Agency, 2010).

Addressing secondary sources of pollution is difficult as they are a cumulative result of many individuals' behavior. In reaction to concerns over risks to habitat loss and water quality, the Minnesota Department of Natural Resources (DNR); through outreach, education, and grants; promotes maintaining and restoring of native vegetative buffers along lakes, rivers and streams.

Although risk to the natural environment often catalyzes organizations to seek behavioral change in individuals, theories concerning the social psychology of risk and risk communications and the social psychology of behavior have not been well-integrated within the applied human dimensions of natural resources field. By focusing on one set of literature and theory or the other when we conduct applied studies, we may be missing

opportunities to connect the two theoretical frameworks for more effective communication strategies and driving behavioral change.

Resource managers have identified the removal or absence of native vegetative buffers results in risks to water quality and to habitat. Landowners can be segmented into those with native vegetative buffers and those without. Therefore, different communication strategies are likely to occur to encourage those without buffers to restore buffers as compared to communication strategies with landowners in an effort to maintain those buffers. While this is the case, little connections have been made to connecting environmental risk in removing buffers to one's personal risk. Little is known about the attitudes of landowners with native vegetative buffers towards those buffers. Additionally, little is known regarding the attitudes of landowners that have removed native vegetation towards native vegetative buffers.

In the previous chapters, I focused on modeling the behavioral intention to restore buffers of those without a buffer in place. In those chapters I excluded respondents who had a buffer in place. I was able to identify the behavioral drivers for those without buffers to aid in communication strategies to catalyze the adoption of buffer restoration. In this chapter I hope to characterize the attitudes, beliefs, and recreational preference of those with buffers. Therefore, it is my goal to use this information to inform a strategy for resource managers to communicate with landowners with buffered properties to maintain those buffers. To do so, I will provide an overview of risk, behavioral, and communication theory relevant to communicating risk to stakeholders. I will also make a recommendation for a theoretically integrative approach using behavioral and risk theory

to better segment audiences for behavioral interventions. Finally, I will use Minnesota lakeshore landowners and their shoreland management as a case study to illustrate segmenting audiences by their behavior and how risk theory may be useful for in this case.

The management of a shoreline is a complex set of behaviors. One may or may not actively manage their shoreline. In addition, one may restore native vegetative buffers or conversely one may remove native vegetation from the shoreline. Therefore outreach to landowners that already have buffers in hopes of maintaining those buffers is likely different than communicating with landowners urging them to restore a buffer. Consequently, resource managers seek not only to understand why residents may or may not restore native vegetative buffers, but what are the characteristics of landowners who already have native vegetative buffers? Additionally, what are the characteristics of individuals that have removed native vegetative buffers? In gaining an understanding of the characteristics of landowners with native vegetative buffers, one can craft risk messages to better catalyze information seeking behavior and deter removal of a buffer already in place.

The goal of strategic communication with stakeholders is often to increase knowledge surrounding a potential environmental risk and reducing risks to the environment. Gore and Knuth (2009) argue for the integration of risk into decision making to address uncertainty and ensure that the best information is communicated by organizations. Addressing risk perceptions and risk beliefs is of the utmost importance as

risk cognitions are most commonly accessed in risk related actions (Griffin, Neuwirth, Giese & Dunwoody, 2002).

The onset of an environmental risk can catalyze a series of events in which many theories from multiple disciplines are pertinent. First, there is an onset of a type of risk. This specific type of risk may or may not be a part of the collective public conscious. Secondly, the perception of risk will be elevated in an organization(s), such as the Minnesota Department of Natural Resources, to a level of concern where action is deemed appropriate. This level of concern often results in outreach or a communication effort to stakeholders with the goal of catalyzing behavioral change. Finally, the communication or outreach information is or is not subsequently consumed by the audience and mitigative action is or is not taken at the individual level (Figure 4.1). Each stage of this proposed framework for the elevation of a risk to individual performance of a protective behavior will have accompanied pertinent theories from a variety of disciplines.

Once a risk is identified by an organization and a decision is made to disseminate information regarding the risk and preventative behavior, theories that address individual information seeking become pertinent. Griffin, Dunwoody and Neuwirth (1999) proposed a framework on Risk Information Seeking and Processing (RISP). Griffin et al. (1999) originally proposed RISP as an integration of the Theory of Planned Behavior (TPB) (Ajzen, 1991) and the Heuristic Systematic Model (Eagly & Chaiken, 1993). The variables of the model include: information insufficiency, perceived information

gathering capacity, relevant channel beliefs, informational subjective norms and affective responses, perceived hazard characteristics and individual characteristics (Figure 4.2).

Where the RISP model differs from the TPB is that the behavior is set as the processing of information. The model contends that an individual's personal characteristics lead to perceived hazard characteristics, how a person views a risk, and an affective or emotional response. The affective response in conjunction with an individual's characteristics and information subjective norms, the societal pressure upon an individual to have a level of knowledge, leads an individual to develop an internal assessment, or scale, of information (in)sufficiency. The information sufficiency scale mediates information seeking and processing of risk information that will occur in an individual. Whether an individual seeks information and processes information is moderated by perceived information gathering capacity and relevant channel beliefs, one's view of the communicator of information (Griffin, Dunwoody & Neuwirth, 1999). The model's validity in differentiating information processing as heuristic vs. systematic and routine vs. non-routine has been confirmed in a variety of disciplines including healthcare, industrial and natural resources (Griffin, et al., 2008; Griffin, et al., 2002; Huurne, Griffin & Gutteling, 2009; Neuwirth, Dunwoody & Griffin, 2000).

In order to transition from information seeking and processing to actual behavior change, I must focus more closely on behavioral theory. Fishbein and Yzer's (2003) Integrative Model (IM) address these issues by including skills and environmental constraints as moderators between behavioral intention and behavior (Fishbein & Yzer, 2003). While the IM has not been used extensively in the natural resources field, its

predecessor, the Theory of Planned Behavior by Ajzen (1991) and the Theory of Reasoned Action by Ajzen and Fishbein (1980) is widespread in the human dimensions of natural resources (Manfredo, Fishbein, Haas & Watson, 1990; Fulton, Skerl, Shank & Lime, 2004; Pate, Manfredo, Bright & Tischbein, 1996; Vaske & Donnelly, 1999; Whittaker, et al., 2001).

Solving environmental problems simply with education will likely be unsuccessful, particularly in situations with strong media coverage as attitudes have likely been formed regarding the risk (Heberlein & Stedman, 2009). Therefore an argument can be made for a more strategic approach to communicating risk if the goal is to instill behavioral change. Audience segmentation is a social marketing tool that allows for breaking down an audience based upon specific characteristics in order to more effectively communicate with them. How an organization will address communicating risk will largely depend on the inherent characteristics of the risk and in the characteristics of the audience.

Audience segmentation has been a tool used by marketing for many years. Smith (1956) argued for segmenting an audience by their product preferences. Yankelovich (1964) expanded the view of marketing segmentation to include psychological variables such as attitudes. More recently social marketing has expanded upon those ideas to market behaviors. Slater (1996) argues for segmenting the audience to increase effectiveness in one's messaging as segmented groups often have similar characteristics. These similarities can be due to demographics or based upon one's current state in Slater's (1999) behavior change continuum.

The practice of segmenting an audience for risk communication is not new and has been advocated for by Siemer, Hart, Decker & Shanahan (2009) as well as by Slater, Kelly & Thackeray (2006) and implemented in health communication efforts (Flynn, et al., 2007; Staten, Birnbaum, Jobe & Elder, 2006). Degeneffe, Kinsey, Stinson, and Ghosh (2009) segmented their audience by general values and attitudes related to food safety and risk. Kennedy, Worosz, Tood and Lapinski (2008) also segmented their audience related to food safety and risk but did so based upon consumers attitudes. While the approach taken by Degenff et al. (2009) and Kennedy et al. (2008) is informative for their specific research, systematically segmenting one's audience in a more universally applicable manner may prove useful due to the ability to more simply replicate the process and the ability to compare research across disciplines.

Slater (1999) argues that there are five stages that individuals go through before engaging in a sustained behavior. These stages include: pre-contemplation, contemplation, preparation, action and maintenance. The movement from one stage to the next requires a catalyst to move to the subsequent stage. The stages of the behavioral change continuum correlate with various communication and behavioral theory as an individual first learns of a reason to change a behavior to finally adapting a new behavior and maintaining it. The segmentation of the population falling into pre-contemplation will not have attitudes towards the behavior and have yet to engage in thoughtful processing regarding the behavior. Identifying if an audience is in the pre-contemplation stage is of great importance in attitudinal research as individuals with little experience may not have accessible attitudes towards the behavior.

Communication is the most relevant to the pre-contemplation stage because attitudes and normative pressures have likely yet to be developed surrounding the behavior, whereas behavior theory and social cognitive are most relevant to the remaining stages. The contemplation stage will consist of individuals that are aware of the behavior and are largely influenced by norms and attitudes towards the behavior. Subsequently the preparation stage includes individuals that intend to adopt the behavior. The action stage includes the population that has performed the action and finally the maintenance stage includes individuals that continue the action (Slater 1999).

While Slater's (1999) framework did not specifically identify risk communication, using segmentation to understand an audience is integral to risk communication. The RISP theory may be important for the transition from the pre-contemplation to the contemplation stage as it provides justification for seeking information on a mitigative behavior. For example, a risk that is new to the public conscious will be addressed very differently than a risk that society has dealt with on an ongoing basis. For a risk that is new, much of an audience will be more likely influenced by media as an individual likely would not have personal experience with the risk. Whereas when communicating information on a risk that is entrenched in the public conscious, individuals are more likely to have previous knowledge, interest, attitudes and behavior regarding a certain risk.

Each scenario presents its own hurdles. In a scenario in which the risk is novel you must raise awareness and attempt to mold public attitudes surrounding the risk and subsequently advocate for preventative behavior. In a scenario in which public awareness

of a risk is high the hurdles are quite different. While some of your audience may already be sustaining a preventative behavior, some of the audience is also likely to have entrenched attitudes regarding the risk that lead them to not performing the preventative behavior.

In the cases where risk preventative behaviors are present in the public the Intention-Behavior Configuration (IBC) proposed by Fishbein and Yzer (2003) can be used to segment a targeted audience (Figure 4.3). The IBC stems from the Integrative Model of Behavioral Prediction, which unlike the Theory of Reasoned Action (1980) or the Theory of Planned Behavior (Ajzen, 1991), accounts for environmental constraints and discriminates between perceived self-efficacy and the true skills to conduct a behavior (Ajzen & Fishbein, 1980). In this approach past performance of the preventative behavior and intention to perform the behavior are used to segment the audience. This approach can identify appropriate theories or approaches to support risk preventative behaviors. Most importantly the IBC helps direct communicators whether to focus upon outcome beliefs, norms and self-efficacy beliefs in outreach efforts or whether an assessment of environmental constraints and skills based communication is appropriate.

In addition to Slater's theories on audience segmentation and segmenting one's audience via the IBC, one can use risk theory to segment an audience. Rimal and Real (2003) argue for audience segmentation through risk perception and self-efficacy in the Risk Perception Attitude framework (RPA) (Rimal & Real, 2003) (Figure 4.4). The RPA segments individuals into four categories: responsive, avoidant, proactive and indifferent, based on their level of risk perception and efficacy. Responsive individuals are the most

motivated to act due to their awareness of the risk and their high sense of efficacy to deal with the risk. Those that are avoidant note the high level of risk but do not have the skill set to deal with the risk. Proactive individuals are motivated to act due to self-protection but not by the perception of risk. The final group, indifferent, does not note the risk nor do they believe that have the skills to act (Rimal and Real, 2003). The usefulness of the RPA has been supported by various studies in both work safety and in health communications and has shown differing levels of use of motivation to think about risk, utilization of information, time spent seeking information, knowledge acquisition, risk protection motivation, and behavioral intention amongst the four groups (Real, 2008; Sullivan, Beckjord, Rutten & Hesse, 2008).

The RPA segments the audience based on perceptions of risk and self-efficacy, but it does not address whether or not risk mitigating behavior is actually occurring. The IBC, on the other hand, addresses behavior intention and behavior, but does not address the external factors that impact behavioral intention and behavior. A correlation between risk and self-protective behaviors is not universal. Rimal et al.'s (2009) found a lack of correlation between high risk perception and self-protective behavior in HIV and AIDS patients, but rather noted efficacy as a strong predictor of self-protective behavior. Risk perception and efficacy, nor behavior and behavioral intention alone, do not adequately inform a communicator as to the makeup of their audience and the appropriate theories to pursue.

Risk communicators often want to provide needed information that result in the maintenance of protective behavior. Slater (1999) illustrates the hierarchical levels of

behavior from pre-contemplation to maintenance, but this hierarchy of behavior is neither static nor unidirectional. Once an individual reaches the stage of behavior maintenance the goal is to continue at this level of behavior. Continued high levels of risk perception and self-efficacy will likely result in behavior maintenance.

An integration of the IBC and the RPA may result in a more comprehensive approach to segmenting the audience in the case of risk mitigating behaviors because it allows for communicators to identify the pertinent theories to base their communication strategy upon. The segmentation can provide communicators direction in regards to using the appropriate theories such as focusing upon risk or behavioral theory because it allows for the selection of an audience based upon their particular perception of risk and behavior.

The segmentation of the audience results in four discrete groups with varying characteristics that depend on behavior and perception of risk (Figure 4.5). The segment of the audience that perceives a high risk and performs the behavior needs little or no intervention. Communicating the risk is likely to reinforce current behaviors. The segment that performs the behavior, but does not perceive there to be a high risk is likely motivated by other factors. Therefore, using the IM can help identify normative or attitudinal drivers for the behavior and communicating the risk may reinforce the behavior. For the audience that perceives a high level of risk, but does not perform the behavior, we can again focus upon behavioral theory, such as the IM, to understand behavioral barriers. Finally, those that do not conduct the behavior nor perceive a high

level of risk are likely in the pre-contemplative stage. Therefore, focusing on the RISP theory can assist in catalyzing information seeking.

While using various theories to effectively communicate risk and promote protective behaviors will likely increase the effectiveness of a communication strategy, various barriers exist to communicating specifically environmental risks. One major obstacle is an inherent optimistic bias in which individuals believe that they are less at risk than society as a whole. A stark example of this comes from Lapinski, Randall, Peterson and Klein's (2009) research showing that people living with HIV see themselves less likely at risk for health issues compared with others that are HIV positive as well as those that are HIV negative. This optimistic bias was mirrored by Morton and Duck's (2001) research where individuals perceived themselves less likely at risk for skin cancer compared to others in society.

An optimistic bias can also translate from individuals being at risk to the environment to individuals posing risk to the environment and wildlife. For example, Williams, Weston, Henry and Maguire (2009) showed that Australian beach users believed that their own unleashed dogs posed a less of a threat to wildlife than other beach users' dogs. In the presence of an optimistic bias, individuals also tend to filter the information they receive regarding risk. Lapinksi and Boster (2001) describe this process as linear starting with the message that stimulates a thought index. When information is adverse to our self-concept it triggers ego-defensive behaviors that result in message discounting, source degradation and finally a negative attitude towards the information (Lapinski & Boster, 2001). Verbeke, et al. (2008) showed that, at least for seafood

consumption, people are aware of both the positive and negative information surrounding consumption but avoid thinking about the negative to maintain their habits.

Environmental risk in particular poses hurdles to effective risk communication as many environmental and wildlife risks are impersonal or societal risks. Individual actions that increase risks to the environment and wildlife are often diffuse in their repercussions and protective behaviors are diffuse in their benefit. Neuwirth et al.'s (2000) Protection Motivation Model (PMM) can provide further explanation to understanding hurdles to environmental risk. In the PMM, Neuwirth et al. (2000) argue that threat appraisal is increased by perceived severity of the risk and perceived vulnerability whereas a threat appraisal is decreased by extrinsic and intrinsic rewards for the current behavior. On the other hand, coping appraisal is increased by response efficacy and self-efficacy and decreased by responsive barriers (Neuwirth et al., 2000).

Water quality and lakeshore habitat degradation is an example of such an environmental risk. In the case of shoreland buffers, threat appraisal is likely decreased extrinsically by social approval of shoreland with unnatural beaches, lawns and/or rip-rap. Changing one's personal shoreland management potentially has a high response barrier due to an increase in time and effort in maintaining a native vegetative buffer. Response efficacy may also be low as individual actions may be seen as having little impact upon the problem. In addition, as many lakeshore owners are unlikely to see personal vulnerability from the threat, protective action may be unlikely even if as a society we note potential water quality and habitat risks.

While the barriers to communicating environmental risk are high, they are not insurmountable. Kahlor, Dunwoody, Griffin, Neuwirth and Giese (2003) looked at impersonal risk stemming from global warming and utilized the RISP framework. The results of the study showed that environmental risk communication should appeal to one's knowledge gap, increase what an audience needs to know and show a high level of knowledge expected from informed others. In particular risk managers should focus upon worry that leads to information insufficiency as it leads to information seeking and systematic processing of information (Kahlor et al., 2003). Park, Scherer and Glynn (2001) showed that community involvement decreases the difference between personal and societal risk. Therefore, connecting a societal risk to a group or community in which one participates may be effective. Multiple mediums should be used with a simple message that encourages positive protective behaviors (Real, 2008). The message should also include the severity of the hazard, level of risk, severity of consequences, and availability of effective responses to instill greatest changes (Neuwirth, et al. 2000).

Methods

I used focus groups to inform a statewide survey. For the focus groups I followed Krueger and Casey (2009) to identify lake based recreational activities and attitudes towards native vegetative buffers. The Minnesota Department of Natural Resources (DNR) assisted in recruitment by providing contact information for four lake associations and I conducted the focus groups in the spring of 2008. I recruited participants through the lakes associations and provided a twenty dollar incentive for participation. Focus groups contained up to ten participants and consisted of nine questions. I analyzed the

data from the focus groups and obtained the attitudinal and recreational information to inform the survey development.

The DNR provided data from 2001 that contained housing counts per lake. In conjunction with the DNR, I selected criteria for lakes to include in the sample. I decided that lakes with less than 50 homes would prove too small of a sample size and lakes larger than 300 homes would be too large for an additional aspect of the research. My goal sample size was n = 4000 divided equally between Minnesota's four ecotypes. I randomized the remaining lakes by ecotype and selected 38 lakes with a goal of n = 1000 per ecotype. Through county tax information I obtained mailing addresses for lakeshore land owners. After adjusting for undeliverable surveys the final sample size was n = 3,975.

I modeled Dillman's (2008) Tailored Design survey methodologies to implement the survey. Depending upon response, participants received up to three mailing packets each separated by between three and four weeks. Each mailing packet included a signed cover letter urging their participation, a survey and a pre-paid return envelope.

Conceptual Measurement

I measured current makeup of shoreline, knowledge, past removal of buffers, past maintenance and future maintenance intention, attitude towards buffers, and beliefs about outcomes. Knowledge was measured with four questions pertaining to native shoreland plants, buffers, regulating governmental bodies of shoreland and the rules and regulations governing shoreland activities. First, in order to determine respondent's current behavior, I asked what percentage makeup of their shoreline from the water's edge to 50 feet

landward. Respondents were asked to select what percentage of this area was native vegetation, naturally occurring rock and sand, rip rap, constructed sandy beach, mowed lawn, un-mowed lawn and other. We provided a scale from < 5% to 10% with 10% increments up to 90% and finally 95+%.

To assess knowledge, respondents were asked to rate their level of knowledge from 1 “no knowledge at all” to 5 “very high level of knowledge”. Respondents were asked if they had removed native vegetation from the shoreline in the past and if so, what percentage of their shoreline. Respondents were also asked if they have actively maintained their shoreline in the past via a Likert style 7-point scale from 1 “not at all” to 7 “a great deal” and if they plan to do so in the future from “extremely unlikely” to “extremely likely”. Respondent’s attitudes towards native vegetative buffers was assessed via five questions with Likert style scales from “extremely bad” to “extremely good”, “extremely negative” to “extremely positive”, “extremely harmful” to “extremely beneficial”, “extremely foolish” to “extremely wise”, and “extremely unenjoyable” to “extremely “enjoyable”.

Finally I asked 11 questions regarding outcomes on a Likert style 7-point scale ranging from 1 “extremely bad” to 7 “extremely bad”. The questions addressed: decreasing maintenance, buffers being expensive, buffers being difficult to establish, decreasing gees in their yard, increasing the lakes water quality, creating habitat for wildlife, impeding other recreation, improving fishing, creating privacy, and harming their view of the lake.

Analysis

Data were entered in duplicate to minimize data entry errors. I used the Statistical Program for the Social Sciences (SPSS/PC+ 17.0) to analyze data. First, to evaluate those that have removed native vegetation from their shoreline, I checked for reliability of the attitude measurements. I then found the mean attitude towards buffers and dichotomized attitude towards buffers as overall either "negative" with an average attitude less than four or "positive" with an average attitude of greater than four. I removed those that were neither positive nor negative from the analysis. Past behavior for buffer removal was also dichotomized as "yes" or "no". I ran descriptive statistics on attitude towards buffers, removal of native vegetation, presence of buffers, past management activity and future management activity. I then ran a chi square analysis on the dichotomized variables.

The DNR identifies a property with a full native vegetative buffer as greater than 75% of land 50 feet landward of the mean high water line in native vegetation. For the second stage of analysis I identified respondents as having a native vegetative buffer if they self-reported having greater than 75% of their shoreland in native vegetation or naturally occurring rock and sand. As many respondents reported having combined percentages greater than 100% I labeled respondents that indicated greater than 25% of their shoreland as having rip rap, constructed beach or mowed lawn as not having a buffer. I ran descriptive statistics to understand the makeup of the population with and without buffers. I then conducted an additional chi-square analysis of attitude towards buffers and reported behavior of having or not having a buffer. For the remainder of the analysis I removed respondents without native vegetative buffers.

The manner in which a shoreland is managed may either be a passive continuation of current management behaviors or landowners may be actively managing their shoreland for wildlife and water quality benefits. This is similar to weight management in public health. An individual may be choosing healthy foods and exercising the recommended amount or simply due to genetics be maintaining a healthy weight. To understand the level of active management of respondents have taken in the past and plan to take in the future I dichotomized past and future active maintenance of the shoreline.

For past maintenance, I labeled those that reported less than four, on a scale from 1: "not all" actively maintained to 7: actively "maintained a great deal", as "not actively maintaining" their shoreline and those with greater than four "actively maintaining" their shoreline. Additionally, I dichotomized future "active maintenance" as those "slightly", "quite" or "extremely" likely to actively maintain their shoreland in the future and those "extremely", "quite" or "slightly" unlikely to actively maintain their shoreline in the future as "inactive maintenance". Finally, I combined the two variables to create four groups: those with no past and no future maintenance intention, those with past active maintenance and no future intention, those with no past active maintenance and plan on future maintenance, and those that have actively maintained their shoreline in the past and plan to do so in the future. I then ran descriptive statistics on respondents' past level of active maintenance of their shoreline as well as their reported future intention to actively maintain their shoreline.

To gain further information on landowners with buffers, I used the dichotomized attitude towards buffers. I ran a multiple regression with attitude as the dependent

variable with the 11 beliefs as the independent variables. Finally, to understand how to assist in catalyzing information seeking in respondents with buffers, I ran descriptive statistics on respondent's recreational preferences to identify ways personalize risk by connecting environmental risk to landowner recreational preference. I also ran descriptive statistics on reported knowledge to determine if there are high or low levels or reported knowledge on vegetative buffers in respondents.

Results

The measurement of the attitude towards buffer was found to be highly reliable (5 items, $\alpha = 0.95$). An analysis of the descriptive statistics showed that roughly 10% or respondents have removed native vegetation in the past. Additionally, 82% of respondents have a positive attitude towards native vegetative buffers. Finally, 77.5% report not having a full vegetative buffer with 22.5% reporting that they do have a vegetative buffer (Table 4.1).

The chi-square analysis of attitude towards buffers and vegetation removal showed no significant correlation $\chi^2(1) = .165$, $p = .684$ (Table 4.2). The chi-square analysis of attitude towards buffers and those that self-report having a buffer was significant $\chi^2(1) = 30.20$, $p < .001$ (Table 4.3) and showed that the odds that those with negative attitudes towards buffers are approximately 2 ½ times more likely to not have a buffer.

The descriptive analysis of past and future maintenance shows that 59.3% of respondents did not actively maintain their shoreline in the past. In contrast 71.2% of respondents intend to do so in the future. Combining these variables we can see that

29.8% of respondents have not actively maintained their shoreline in the past and do not intend to do so in the future and only 1.6% indicated that they have actively maintained the in the past, but do not intend to do so in the future. In contrast, 27.5% indicate that while they have not actively maintained their shoreline in the past, but they plan on doing so in the future. Finally, 41.2% indicated that they have actively maintained their shoreline in the past and plan to do so in the future.

The multiple regression with attitude as the dependent variable and evaluations as the independent variable was significant (R^2 =.22, $F(2, 11) = 8.69$, $p < .001$). I found that only an attractive shore ($\beta = -.143$, $p = .019$), creating habitat ($\beta = .32$, $p < .001$), and creating privacy ($\beta = .146$, $p = .020$) significantly predicted attitude towards buffers.

Overall respondents with buffers reported an average knowledge of buffers between "low" and "moderate" levels (mean = 2.82). They also reported wildlife viewing and scenery as the most important recreation activities between "quite" and "very" important (means = 4.27 and 4.48 respectively). Fishing, swimming and boating were on average between "moderately" and "quite" important (means = 3.73, 3.44 and 3.49). Additionally water skiing, citizen science and nature study were on average "slightly" to "moderately" important (means = 2.08, 2.74 and 2.95). Finally, jet skiing was the least important between "not at all" to "slightly" important (mean = 1.48).

Discussion

While only 10% of respondents reported to have removed native vegetation in the past several years, the continued removal of native vegetative buffers is of concern. While the data did not show a significant difference between the attitudes towards buffers

of those that have removed vegetation and those that have not, I did show that the odds of someone with a negative attitude towards buffers to be 2 ½ times more likely to not have a buffer. Therefore respondents who do have a native vegetative buffer and a negative attitude towards buffers may inherently be at risk for the removal of those buffers.

While 30% of respondents with buffers reported that they do not actively maintain their shoreland, nearly 40% responded that they have actively managed their shoreland in the past and plan to do so in the future. What could be of concern is 27.5% of respondents who did not actively manage their shoreland in the past, but plan to do so in the future. Beginning to actively manage one's shoreline may indicate a possible change how the shoreline is managed i.e. removal of buffers.

The multiple regression of outcomes and attitude showed wildlife habitat and creating privacy as the only positive predictors of attitude. On the other hand, the evaluation of an attractive shore was a negative predictor of attitude. While this seeming discrepancy may at first glance seem confusing, I believe that this may be due to a more traditional view of shoreland beauty i.e. mowed grass and created beaches.

If the goal of resource managers is to promote the maintenance of native vegetative buffers and dissuade the removal of those buffers, they will likely try to communicate with those that have buffers the risk their removal poses. As noted in the RISP model, low levels of knowledge can lead to information seeking. Based upon the respondents' reported average low levels of knowledge about buffers, one could as part of their messaging focus upon the importance of knowledge about and understanding of the role that vegetative buffers play in the ecology of the lake. In addition, to overcome

barriers of impersonal risk to the environment, resource managers could focus upon connecting the environmental risk of buffer removal to the personal important recreational activities of wildlife viewing, scenery, fishing, swimming and boating. The connection between recreational and environmental could be done by focusing upon the habitat buffers provide for wildlife viewing and fishing. In addition, resource managers could communicate the importance of buffers to water quality and erosion control and therefore swimming and boating.

Implications and Conclusion

As previously noted, risk perceptions and behavioral psychology is inherently complex. Risk perception and information seeking is only part of the overall behavioral psychological complex and may not be predictive of protective behavior. Understanding the risk, attitudinal and normative component to the behavior as well as potential barriers to the behavior will ultimately lead to a more informed communication strategy.

McCleery et al. (2006) argued for a more robust understanding of the drivers behind attitudes and behavior in wildlife sciences. I believe that a more complete understanding of connecting information seeking about risk to behavioral change can accomplish some of these goals. While risk is one of the many drivers to attitude accessibility, environmental and conservation behaviors often at their core are a level of risk to the environment or to the individual. Risk theory is inherently complicated and should be addressed with theory from multiple disciplines. In this paper I also argue for the segmentation of audiences using both risk and behavioral theory. I believe that segmenting audiences based upon their perceptions of risk and performance of the

mitigative behavior can help resource managers more directly understand how to most effectively catalyze behavioral change. While I believe this construct to be theoretically supported, the validity of this construct should be empirically tested.

Table 4.1: Descriptive Statistics of Past Removal of Vegetation and Attitude Towards Buffers

		Frequency	Valid Percent
Removed Vegetation	yes	197	9.9
	no	1794	90.1
Attitude Towards Buffer	negative	366	18.0
	positive	1666	82.0
Buffered shoreline	yes	489	22.5
	no	1685	77.5

Table 4.2: Chi-Square Test of Attitude Towards Buffers and Removal of Vegetation

	Removed Vegetation			
Attitude Towards Buffers	yes	no	X^2	P
Negative	33	301	.165	.684
Positive	137	1150		

Table 4.3: Chi-Square Analysis of Attitude Towards Buffers and Management of Shoreline

Attitude Towards Buffers	Buffered		χ^2	P
	Not buffered	Buffered		
Negative attitude	282	37	30.20	< .001
Positive attitude	1101	386		

Table 4.4: Descriptive Statistics of Respondents' Reported Past and Intention for Future Active Maintenance

		Frequency	Valid Percent
Past Maintenance	Not actively	245	59.3
	Actively	168	40.7
Future Maintenance Intention	Not Actively	127	28.8
	Actively	314	71.2
Combined	No past and no future active maintenance	115	29.8
	Past active maintenance but no future active maintenance	6	1.6
	No past active maintenance but future active maintenance	106	27.5
	Past and future active maintenance	159	41.2

Table 4.5: Multiple Regression with Attitude as Dependent Variable and Beliefs as the Independent Variables

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	.063	.126		.495	.621
Decreasing maintenance	.025	.015	.099	1.676	.095
Buffers being expensive	.025	.018	.096	1.344	.180
Buffers being difficult to establish	.005	.018	.021	.290	.772
Decreasing geese in the yard	.014	.011	.064	1.246	.214
Increasing water quality	-.003	.024	-.010	-.136	.892
An attractive shore	-.036	.015	-.143	-2.363	.019
Creating habitat	.088	.020	.320	4.366	.000
Making it difficult to do other recreation	.022	.016	.082	1.375	.170
Improving fishing on the lake	-.009	.018	-.030	-.476	.634
Creating privacy	.037	.016	.146	2.345	.020
Harming view of the lake	.008	.013	.033	.587	.557

*R^2=.22, $F(2,11) = 8.69$, $p < .001$

Table 4.6: Descriptive Statistics of Knowledge and Recreational Importance

	N	Mean	Std. Deviation
Knowledge of Buffers	483	2.82	0.93
Wildlife viewing	485	4.27	0.91
Scenery	480	4.48	0.76
Fishing	472	3.73	1.23
Swimming	476	3.43	1.34
Boating	471	3.49	1.30
Jet skiing	474	1.48	1.00
Water skiing	477	2.08	1.27
Citizens science	478	2.74	1.25
Nature study	481	2.95	1.22

Figure 4.1: Progression from risk to behavioral change

Figure 4.2: Model of Risk Information Seeking and Processing: Adapted from Griffin, Dunwoody and Neuwirth, 1999

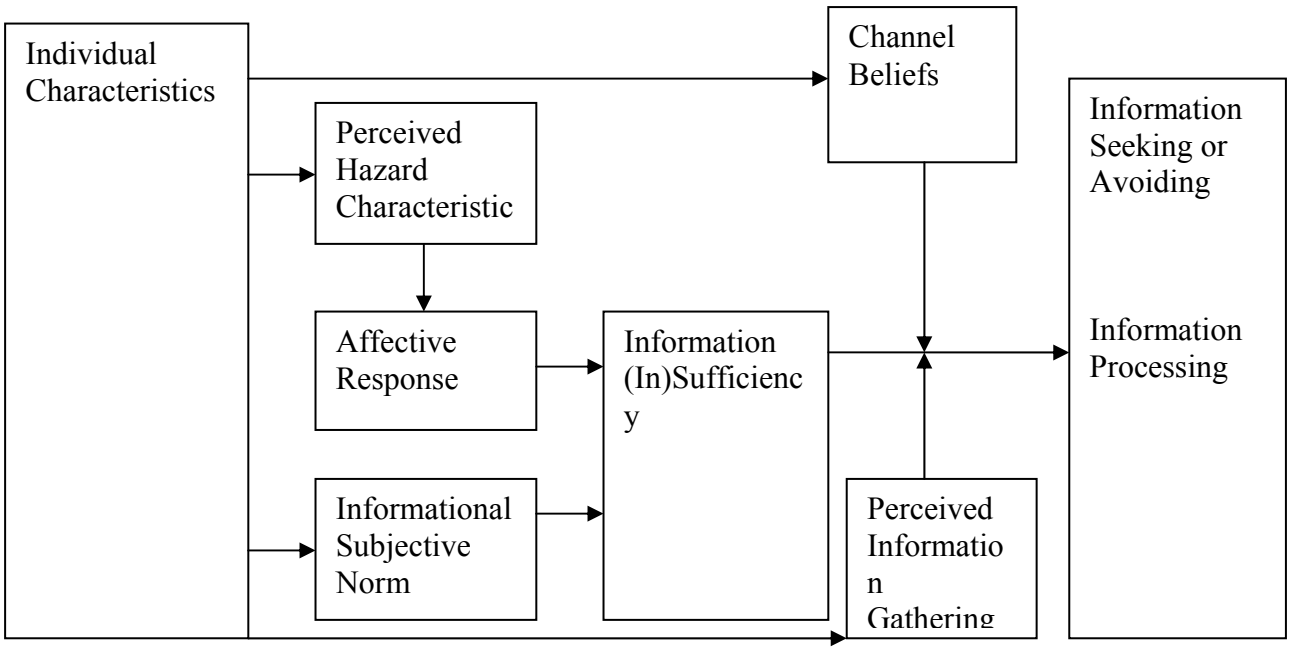


Figure 4.3: Behavior Intention Matrix: Adapted from Fishbein and Yzer (2003)

		Performance of the recommended behavior	
		No	**Yes**
Intention to perform behavior	**No**	Norms, self-efficacy, outcome beliefs	Norms, self-efficacy, outcome beliefs
	Yes	Help reduce or overcome barriers	No intervention or positive reinforcement

Figure 4.4: RPA Framework: Adapted from Rimal & Real, 2003

Risk Perception	Efficacy: **High**	Efficacy: **Low**
High	Responsive	Avoidant
Low	Proactive	Indifferent

Figure 4.5: Risk-behavior segmentation matrix

Perception of risk	Performance of the recommended behavior: No	Performance of the recommended behavior: Yes
low	Elevate risk to catalyze information seeking behavior (focus on RISP)	Behavioral driver not risk. Risk communication may reinforce behavior.
high	Evaluate behavioral barriers (focus on IM)	Little or no intervention necessary.

CHAPTER 5

Conclusions, Implications, and Future Research

Conclusions

Natural resource managers are concerned with shoreland management because shoreland habitat is fragile and land use decisions have the potential to directly affect habitat and water quality. In this study, I used the Integrative Model (Fishbein & Yzer, 2003) to segment lakeshore landowners by their behavior and behavioral intention and to assess the ability of attitudes, norms and self-efficacy variables to predict behavioral intention. Five belief evaluations (decrease maintenance $\beta = .05$, increase water quality $\beta = .058$, be attractive $\beta = .103$, impede recreation $\beta = .046$, and create privacy $\beta = -.028$), one self-efficacy evaluation (ability to keep up with maintenance $\beta = .23$), and three normative influences (family $\beta = -.097$, friends $\beta = .051$ and Minnesota DNR $\beta = .065$) were significant predictors of intention ($R^2 = .36$).

I then compared the Theory of Normative Social Behavior (Rimal and Real 2005) with the Integrative Model (Fishbein & Yzer, 2003). My findings indicate that for shoreland restoration intention, the Integrative Model's ($R^2 = .241$) explanation of variance can be increased through the inclusion of descriptive norms, group ID and injunctive norms ($R^2 = .323$). While my research did not support the moderating effects of injunctive norms, group ID, and outcome beliefs upon descriptive norms in predicting behavioral intention, this may be due to the characteristics of the behavior. In particular, injunctive norms had a strong effect, $\beta = .454$, when included into the IM.

In the natural resources resource managers often attempt to communicate information regarding risk with the intent of catalyzing behavior change. Therefore, I sought to connect risk theory with behavioral theory and propose a framework for doing

so. I used Minnesota shoreland landowners as case study for integrating risk and behavioral theory to segment audiences. I found that 22.5% of survey respondents reported having a vegetative buffer on their shoreland and 10% of respondents reported to have removed native vegetation in the past several years. While I did not show a significant difference between the attitudes towards buffers of those that have removed vegetation and those that have not, I did show that the odds of someone with a negative attitude towards buffers to be 2 ½ times more likely to not have a buffer. My analysis also showed that evaluation of buffers significantly predicted respondents' attitudes towards (R^2 =.22, $F(2,11) = 8.69$, $p < .001$). I found that only an attractive shore (β = -.143, p = .019), creating habitat (β = .32, $p < .001$), and creating privacy (β = .146, p = .020) significantly predicted attitude towards buffers.

Management and Policy Implications

Our analysis of shoreland landowners shows that nearly 70% of landowners are potential targets for an outreach or communication effort to advocate for restoring or maintaining native vegetative buffers. My results show that if it is the goal of resource managers to persuade those without buffers to restore vegetative buffers and to reinforce those with buffers to maintain them, messaging should include the benefits of buffers for water quality, show the attractiveness of vegetative buffers and show that they can be restored without impeding recreation. Those already with buffers could be communicated with slightly differently by focusing upon the benefits that the buffers provide in privacy and in creating habitat.

Fostering sustainable behavior can be catalyzed by policies and incentives. The research shows that 20% of those surveyed without native vegetative buffers have the intention to restore a buffer, but have yet to do so. These respondents may have skills barriers that could be addressed through skills based educational programming such as demonstration sites. Alternatively, these respondents could have financial barriers to restoration. My findings show that with a onetime incentive of $500, 58% of respondents were willing to restore a native vegetative buffer. Additionally, with a yearly incentive of $100, 72.9% of respondents would be willing to restore or maintain a native vegetative buffer.

Normative pressure can be a difficult influence to understand (Cialdini 1990). While the second chapter's use of the IM indicates that the DNR has an impact upon behavioral intention, the correlation was weak. The third chapter indicates however that normative influence, particularly injunctive norms, does play a role in one's behavioral intention. Therefore, while it is difficult to assess, the influence of injunctive norms indicates that if educational and outreach initiatives can increase the general population's acceptability of native vegetative buffers, this will likely have a positive impact upon behavioral intention to restore native vegetative buffers.

Finally, there are limitations to what outreach and incentives can accomplish as far as catalyzing changes in behavior. It may be easier in the case of shoreland restoration to convince those with buffers to not remove their vegetative buffer. This is an action that requires little, if any, additional resources. Persuading someone to drastically change their behavior is far more difficult. First, it may require a large amount of resources and

secondly one's beliefs and attitudes may be strongly entrenched against the behavior. For example, over 6% of respondents indicated that they would be unwilling to restore or maintain native vegetative buffers for any of the dollar amounts indicated in the survey for one-time or yearly payments. Depending on the goals of resource managers and policy makers, the level of adoption of native vegetative buffers may or may not be able to be attained through communication, education and incentives. In the case where it is not, additional policies restricting shoreland development may be considered.

Theoretical Implications

These studies have important theoretical implications. The second chapter shows the potential usefulness of the IM for human dimensions of natural resources research. The IM can assist the human dimensions of natural resources by advancing use of behavioral models to include an ability to address the disconnect between behavioral intention and behavior. In addition, the self-efficacy measure allows for examining variables that are measures of perceived ability for a specific behavior. This is an advancement over the PBC as the behavioral control assessment is generalized and not behavior specific. Finally, the IBC showed to facilitate audience segmentation in an easy, straightforward manner.

The third chapter indicates that the injunctive norm has the potential to explain additional behavioral variance. Furthermore, I found that the behavioral models explained far more variance for those with extreme beliefs and injunctive normative pressure, i.e. respondents with a standard deviation below and above the mean. While the TNSB argues for descriptive norms directly influencing behavioral intention with the

moderation of the injunctive norm, my research seems to indicate the potential for an interaction between belief evaluation and injunctive norms.

Finally, the fourth chapter outlines a way to theoretically integrate risk and behavioral theories. This allows for researchers to consider research on not only how to persuade audiences to adopt behaviors, but how to segment audiences and use risk theory to reinforce positive behaviors.

Limitations of Studies

The survey based research in my study is limited and impacted by the self-reporting of behaviors. There is a natural bias to answer questions in a manner which is seen as more acceptable to the agencies conducting the research. Additionally, as previously noted, normative pressure is difficult to assess. The variability explained in the models indicates that there are additional variables that are accounting for behavioral intention. In addition, there may be attributes of the respondents that may be unique. Therefore, these results may not be generalizable to landowner management on different water resources such as wetlands, coasts, rivers or streams. These results may not also be generalizable to lakeshore landowners in other states, regions or countries.

Future Research

There are two courses for future research. The first is future research on shoreland management. Future research could assess the impacts of a communications or educational effort based upon the findings of this research. Future research will allow for the comparison the impacts of previous outreach pieces as compared with a new outreach

piece focusing upon the water quality, buffers being attractive and downplaying buffers impeding upon recreation. While in this research I focused upon using surveys to assess normative pressure, as one's shoreland management is a public behavior, future research could examine the adjacency effects of others shoreland management. Additionally, normative influence could be manipulated through selecting experimental lakes and conducting varying levels of restorations.

The second is future theoretical research. While the results seem to indicate the usefulness in assessing norms via the injunctive norm, but future research should reexamine its use. In particular, future research should examine integrating the injunctive norm into the IM to further compare the subjective normative measure to the injunctive normative measure.

Our research began to integrate risk theory into behavioral theory. I believe that I have laid a foundation for further research into accomplishing this task. While the need to address risk in communication is apparent, doing so is inherently complicated. Much of behavioral psychology is based upon the assumption that as human beings we act rationally. This assumption often may not be valid.

Rimal, Bose, Brown, Mkandawire and Folda (2009) showed that enhanced knowledge and education does not necessarily lead to realistic perceptions of risk. In the face of risk, public perceptions are largely based upon intuition and could be viewed by researchers as irrational. Further complicating risk and risk communication is that risk perceptions include cognitive dimensions, such as a knowledge gap assessment, as well as affective dimensions, such as fear or anger (Park, Scherer & Glynn, 2001). If our goal

as researchers in the behavioral sciences is to explain a greater proportion of the variability in behavior, further integration of theories and models should occur.

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Appendices

Appendix A: Institutional Review Board Approval Letter

IRB approval has been recorded for the additional title for the study listed below:
Study Number: 0609E92806
Principal Investigator: Dorothy Anderson
Expiration Date:
Title(s):
Understanding Human Behaviors Concerning Lake Shoreline Management

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You may go to the View Completed section of eResearch Central at http://eresearch.umn.edu/ to view your additional title request submission.
This action was based on your assurance that the research is the same project as that currently approved. If this new title results in a funded project, please provide the face page of this grant application along with the methods section of your grant.
All protocol titles will have the same approval date, 09/22/2006, and continuing review schedule.
You are reminded that the addition of a title to this file does NOT reflect IRB approval for any changes in protocol or additional subjects. If any changes are planned for this research or if the new grant submission will mean an increase in the subject accrual goal, you must submit a request for a change in protocol for review.
We will be happy to notify your funding agency of approval of this title. If you would like us to do this, please send us the name and address of your contact person at the agency.
Thank you for keeping the IRB informed of the status of your research.
As principal investigator for this research you are required by federal regulations to inform the IRB of any proposed changes to your research that involve human subjects. Changes should be reviewed and approved by the IRB before they are initiated. Unanticipated problems and adverse events should be reported to the IRB as they occur. Research projects are subject to continuing review and approval.

If you have any questions, call the IRB office at 612-626-5654.

Appendix B: Focus Group Recruitment Letter

January 12, 2012

[Click **here** and type recipient's address]

Dear #####:

The University of Minnesota in conjunction with the Minnesota Department of Natural Resources is conducting research on lakeshore owners' management of their shoreline. Your lake association has been selected to be invited to participate in a focus group to learn about your specific lake's shoreline. The selection process involved the DNR's knowledge of lakeshore practices, the size of your lake and the fact that we believe the information we obtain from your lake's citizens gleaned to the state as a whole.

We are seeking 8-10 participants from different households to participate in this study and participants need not be involved with the lake association. The focus group will be conducted in close proximity to your lake and the total time commitment will be around two hours. Each participant will be compensated $40 for their time commitment. Please contact me via email rudb0004@umn.edu or by phone (952)212-6576. I will also be following up with a phone call within the next two weeks to discuss potential participants, dates and venue.

Sincerely,

Edgar A. Rudberg
Research Assistant

Appendix C: Focus Group Questions

Ed Rudberg
8/15/2008

Focus Group Questions

1) What is your name and what is your favorite activity on the lake? *5 min*
2) Describe how you came about living on the lake. *10 min*
3) How would you describe your ideal lakeshore? *10 min*
4) Describe any changes you have noticed in your lakeshore? *10 min*
5) . What are your impressions of native vegetation on the lakeshore? *10 min*
6) What do you see as the advantages to having native vegetation on your lakeshore? *10 min*
7) Now that we have identified advantages, what do you perceive as barriers to having native vegetation? *10 min*
8) If the DNR sought to encourage more native vegetation on the lakeshore, how would this best occur? *10 min*
9) Where do you believe is the best way to get information on managing your lakeshore? *10 min*
10) Is there anything I have missed? *5 min*

Appendix D: Survey Initial Contact Letter

Address
NAME
ADDRESS 1-5

ID#

Dear NAME1 NAME2,

The Minnesota Department of Natural Resources (DNR) relies on the actions and input of lakeshore owners to ensure quality programs. The DNR has contracted with the University of Minnesota to survey shoreland home owners' attitudes about native vegetative buffers.

You have been identified as someone who owns lakeshore property in Minnesota. You are one of a small sample of Minnesota land owners who have been selected to participate in this study. The quality of our results depends on responses from you and other survey recipients.

Please take the time to fill out and return the enclosed questionnaire. Your answers will provide insight into property owners' attitudes about shoreland native vegetative buffers in Minnesota, and information about owner preferences and opinions related to native vegetation. Your input will help the DNR ensure high-quality lakeshore programs and protect our Minnesota lake resources.

You may be assured of your confidentiality, and participation is completely voluntary. We use the identification number on the questionnaire for mail processing. The number enables us to check your name off the mailing list so you won't receive follow-up mailings once your survey has been returned. Your name will never be placed on the questionnaire or associated with your survey responses.

We want to hear the opinions of all types of Minnesota home owners. It is important that you complete this survey regardless of your ownership history. If you chose not to participate, please return the blank survey in the enclosed envelope and you will be removed from future mailings.

We would be happy to answer any questions you might have. Please call me or e-mail Ed Rudberg, the project manager for the study at (612) 625-5256 or rudb0004@umn.edu. Thank you in advance for taking the time to help the DNR manage our fishing resources. Your help is greatly appreciated!

Sincerely,

David C. Fulton, Ph.D.
Associate Professor

Appendix E: Second Survey Contact Letter

August, 2009 «ID»

«Address1»
«Address2»
«Address3» «Address4»

Dear «First_Name» «Last_Name»,

About three weeks ago we sent you a survey about your lakeshore. As of today, we have not received your completed questionnaire. We realize that you may not have had time to complete it. However, we would appreciate hearing from you.

If you have recently returned your survey, please disregard this letter and accept our thanks for your input.

Your response to this survey will help direct future policies and outreach initiatives related to shoreland management in Minnesota. We are writing to you again because the study's usefulness depends on our receiving a questionnaire from each respondent. Your input will help the DNR ensure high-quality programming and protect our Minnesota water resources.

Your name was drawn through a random sample of lakeshore home owners. Your participation in the survey is voluntary, and all responses will be kept confidential. However, in order for the survey to be representative home owners, it is essential that each person in the sample return his or her questionnaire.

In the event that your questionnaire has been misplaced, a replacement is enclosed. We would be happy to answer any questions you have about the study. Please e-mail the project manager Ed Rudberg, at rudb0004@umn.edu, or the project director David Fulton, at (612) 625-5256 or dcfulton@umn.edu.

Sincerely,

David C. Fulton, Ph.D.
Associate Professor

Appendix F: Third Survey Contact Letter

September, 2009 «ID»

«Address1»
«Address2»
«Address3» «Address4»

Dear «First_Name» «Last_Name»,

During the past few weeks we have contacted you twice to complete a survey about your lakeshore. As of today, we have not received your completed questionnaire. We realize that you may not have had time to complete it. However, we would appreciate hearing from you.

If you have recently returned your survey, please disregard this letter and accept our thanks for your input.

Your response to this survey will help direct future policies and outreach initiatives related to shoreland management in Minnesota. We are writing to you again because the study's usefulness depends on our receiving a questionnaire from each respondent. Your input will help the DNR ensure high-quality programming and protect our Minnesota water resources.

Your name was drawn through a random sample of lakeshore home owners. Your participation in the survey is voluntary, and all responses will be kept confidential. However, in order for the survey to be representative home owners, it is essential that each person in the sample return his or her questionnaire.

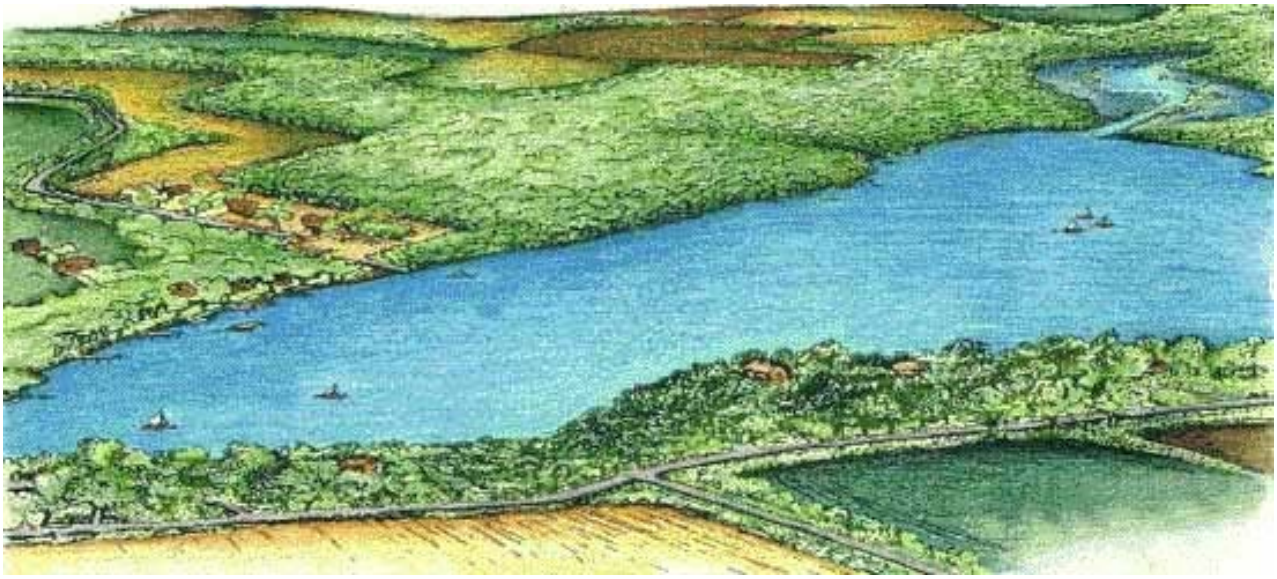
In the event that your questionnaire has been misplaced, a replacement is enclosed. We would be happy to answer any questions you have about the study. Please e-mail the project manager Ed Rudberg, at rudb0004@umn.edu, or the project director David Fulton, at (612) 625-5256 or dcfulton@umn.edu.

Sincerely,

David C. Fulton, Ph.D.
Associate Professor

Appendix G: Survey Instrument

Shoreland Management:
Minnesota Lakeshore Landowner Survey



Summer 2009

Please complete this survey and return it in the postage-paid return envelope.

Minnesota Cooperative Fish and Wildlife Research Unit
University of Minnesota
1980 Folwell Avenue
St. Paul, Minnesota 55108

In this survey we will be asking you questions about the shoreline at your lake home. Please consider the shoreline zone to be 50 feet landward of the water's edge.

Q1. What describes your lake home?

- ☐ PRIMARY RESIDENCE
- ☐ RENTAL PROPERTY
- ☐ BUSINESS PROPERTY
- ☐ SEASONAL OR RECREATIONAL RESIDENCE (SUMMER)
- ☐ SEASONAL OR RECREATIONAL PROPERTY RESIDENCE (ALL SEASONS)

Q1b. If you are a seasonal or recreational resident, where is your full time residence?

- ☐ METROPOLITAN AREA OR SUBURB
- ☐ RURAL AREA

Q2. Where is your primary residence?

- ☐ MINNESOTA
- ☐ OUT OF STATE

Q3. How did you gain ownership of your lake home? (CHECK ONE)

- ☐ I PURCHASED MY LAKE HOME AND PROPERTY

Q3a. If you bought the property, what best describes your reason for buying your lake home *(please select one)*?

- ☐ I PURCHASED MY LAKE HOME AS A PRIMARY RESIDENCE
- ☐ I PURCHASED MY LAKE HOME AS A VACATION HOME
- ☐ I PURCHASED MY LAKE HOME FOR RETIREMENT
- ☐ I PURCHASED MY LAKE HOME FOR INVESTMENT PURPOSES

- ☐ I INHERITED MY LAKE HOME AND PROPERTY FROM A FAMILY MEMBER

Q3b. If you inherited the property, how long has the lake home and property been in your family?

_____ YEARS

Q4. How long have you owned your lake home?

_____ YEAR(S)

☐ LESS THAN 1 YEAR

Q5. How many feet of shoreline do you own?

_____ FEET

☐ UNABLE TO ESTIMATE

Q6. In your household who makes the decisions about the maintenance of your shoreline (please select one)?

- ☐SELF ONLY
- ☐SPOUSE/PARTNER ONLY
- ☐SELF AND SPOUSE/PARTNER TOGETHER
- ☐SOMEONE ELSE

Q7. Who does the actual maintenance work of your shoreline (please select one)?

- ☐ MYSELF AND/OR OTHER FAMILY MEMBERS
- ☐ WE HIRE SOMEONE ELSE
- ☐ MYSELF AND/OR OTHER FAMILY MEMBERS *AND* WE HIRE SOMEONE ELSE

Q8. How would you describe your participation with your lake association (please select one)?

- ☐ I AM NOT A MEMBER
- ☐ I AM A MEMBER BUT NOT ACTIVE
- ☐ I AM OCCASIONALLY ACTIVE
- ☐ I AM MODERATELY ACTIVE

☐ I AM VERY ACTIVE

Q9. How important are the following lake based recreational activities to you? *(For each activity, circle only ONE number that best matches the importance of the activity to you).*

	Not at all important	Slightly important	Moderately important	Quite important	Very important
Wildlife viewing	1	2	3	4	5
Scenery	1	2	3	4	5
Fishing	1	2	3	4	5
Swimming	1	2	3	4	5
Recreational boating	1	2	3	4	5
Jet skiing	1	2	3	4	5
Water skiing or wake boarding	1	2	3	4	5
Helping with research on the lake (citizen science)	1	2	3	4	5
Nature study	1	2	3	4	5

Q10. We would like to know some information about you, your lake property and your lake. *(Please circle the number that best represents your answer in each row.)*

	Extremely Disagree	Quite Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Quite Agree	Extremely Agree
Everything about my lake property is a reflection of me.	1	2	3	4	5	6	7
My lake property says very little about who I am.	1	2	3	4	5	6	7
I feel that I can really be myself at my lake property.	1	2	3	4	5	6	7
I feel relaxed when I'm at my lake property.	1	2	3	4	5	6	7
I feel happiest when I'm at my lake property.	1	2	3	4	5	6	7
Being near the water is the best thing about my lake property.	1	2	3	4	5	6	7
My property would still mean a lot to me even if it were not near the lake.	1	2	3	4	5	6	7
My lake property is my favorite place to be.	1	2	3	4	5	6	7

Q10 Continued.

	Extremely Disagree	Quite Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Quite Disagree	Extremely Agree
I really miss my lake property when I'm away from it for too long.	1	2	3	4	5	6	7
My lake property is the best place for doing the things that I enjoy most.	1	2	3	4	5	6	7
For doing the things that I enjoy most, no other place can compare to my lake property.	1	2	3	4	5	6	7
My lake property is not a good place to do the things I most like to do.	1	2	3	4	5	6	7

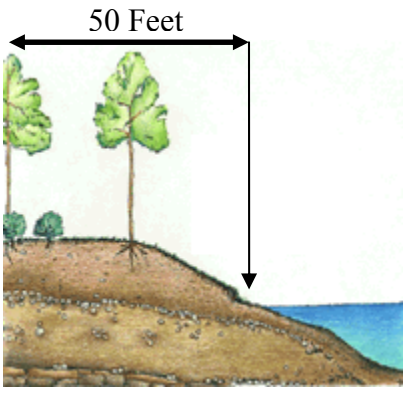
As far as I am concerned, there are better places to be than at my lake property.	1	2	3	4	5	6	7
Too many houses on the lakeshore will harm wildlife habitat.	1	2	3	4	5	6	7
Too many houses on the lakeshore will harm the natural character of the lake.	1	2	3	4	5	6	7
Too many houses on the lakeshore will decrease the quality of the water in the lake.	1	2	3	4	5	6	7
Too many houses on the lakeshore will make the lake less scenic.	1	2	3	4	5	6	7
I like to keep my property as natural as possible.	1	2	3	4	5	6	7
I don't like to disturb the natural vegetation on my lake property.	1	2	3	4	5	6	7
I like to have a lot of natural vegetation on my lake property.	1	2	3	4	5	6	7
The lake is the most important reason for being at my property.	1	2	3	4	5	6	7

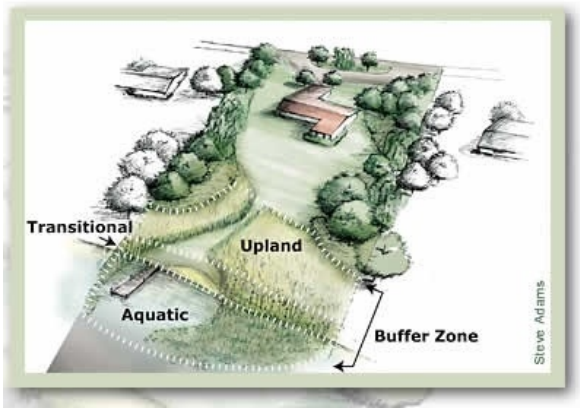
Q11. Please rate your knowledge of the following. *(Please circle the number that best represents your answer).*

Generally speaking, the level of knowledge I feel with…	**No Knowledge at All**	**Low Level of Knowledge**	**Moderate Level of Knowledge**	**High Level of Knowledge**	**Very High Level of Knowledge**
…native shoreland plants.	1	2	3	4	5
… native vegetative buffers.	1	2	3	4	5
…governmental bodies regulating shoreland activities.	1	2	3	4	5
…rules and regulations governing shoreland activities.	1	2	3	4	5

In the next section we are going to ask you a few questions about the shoreline area of your property from the water's edge upland to 50 feet from the water as illustrated in the picture below.

We will also be asking questions about **native vegetative buffers.** Native vegetative buffers are areas of the shoreline (to 50 feet) that have native grasses, trees, bushes, flowers, and other wild plants. Native vegetative buffers DO NOT include areas of mowed grass.





Q12. How would you describe the percentage make up of your shoreline. By shoreline we mean the land area from the water's edge upland to 50 feet from the water's edge *(Please circle the percentage that best represents your answer in each row.)*

Native vegetation	**<5%**	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**	**95+%**
Naturally occurring rock and sand	**<5%**	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**	**95+%**
Rip rap (rocks or concrete that did not naturally occur on the site)	**<5%**	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**	**95+%**
Sandy beach (constructed)	**<5%**	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**	**95+%**
Mowed lawn	**<5%**	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**	**95+%**
Un-mowed lawn	**<5%**	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**	**95+%**
Other	**<5%**	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**	**95+%**

Q12b. If you have rip rap on your shoreline, what length of your shoreline has rip rap? _____ feet

Q13. Over the past several years, have you restored an area of your shoreline to native vegetation (please circle one)?

1 YES → If YES, what percentage of your shoreline _____%
2 NO

Q14. Over the past several years, have you removed an area of native vegetation (please circle one)?

1 YES → If YES, what percentage of your shoreline _____%
2 NO

Q15. To what degree have you actively maintained the makeup of your shoreline in the past? (*Place an "X" in the space that best expresses what you believe*)

Not at all_____:_____:_____:_____:_____:_____:_____ **A great deal**
1 2 3 4 5 6 7

Q16. To what degree are you likely take an active role in managing your shoreline in the future? (*Place an "X" in the space that best expresses what you believe*)

Unlikely_____:_____:_____:_____:_____:_____:_____ **Likely**
extremely quite slightly neither slightly quite extremely

Q17. Having a native vegetative buffer on your shoreline is: (*Place an "X" in the space that best expresses what you believe*)

Bad _____:_____:_____:_____:_____:_____:_____ **Good**
extremely quite slightly neither slightly quite extremely

Negative_____:_____:_____:_____:_____:_____:_____ **Positive**
extremely quite slightly neither slightly quite extremely

Harmful_____:_____:_____:_____:_____:_____:_____ **Beneficial**
Extremely quite slightly neither slightly quite extremely

Foolish_____:_____:_____:_____:_____:_____:_____ **Wise**
extremely quite slightly neither slightly quite extremely

Unenjoyable_____:_____:_____:_____:_____:_____:_____**Enjoyable**
extremely quite slightly neither slightly quite extremely

Q18. Restoring a native vegetative buffer on your shoreline is: (*Place an "X" in the space that best expresses what you believe*)

Bad_____:_____:_____:_____:_____:_____:_____ **Good**
extremely quite slightly neither slightly quite extremely

Negative_____:_____:_____:_____:_____:_____:_____ **Positive**
extremely quite slightly neither slightly quite extremely

Harmful_____:_____:_____:_____:_____:_____:_____ **Beneficial**
extremely quite slightly neither slightly quite extremely

Foolish_____:_____:_____:_____:_____:_____:_____ **Wise**
extremely quite slightly neither slightly quite extremely

Unenjoyable_____:_____:_____:_____:_____:_____:_____**Enjoyable**
extremely quite slightly neither slightly quite extremely

Q19. How likely are you to restore or increase the areas of native vegetative buffer(s) on your shoreline in the next three to five years? *Place an "X" in the space that best expresses your intentions (Note: if you do not have any area to restore do not answer).*

Unlikely_____:_____:_____:_____:_____:_____:_____ **Likely**
extremely quite slightly neither slightly quite extremely

Q20. How likely or unlikely do you believe the following outcomes would be if you restored a buffer of native plants along the lakeshore of your property. *(Please circle the ONE number that best represents your answer in each row.)*

For me, having a buffer of native plants…	**Extremely Unlikely**	**Quite Unlikely**	**Slightly Unlikely**	**Neutral**	**Slightly Likely**	**Quite Likely**	**Extremely Likely**
would decrease the amount of maintenance I have to do on my shore.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
would be expensive for me.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
would be difficult for me to establish.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
would decrease the geese in my yard.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
would increase water quality in my lake.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
would be attractive for me to see.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
would create habitat for wildlife.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
would make it difficult for me to do other recreation activities.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
would improve the fishing on my lake.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
would create privacy for me.	**1**	**2**	**3**	**4**	**5**	**6**	**7**

would harm my view of the lake.	**1**	**2**	**3**	**4**	**5**	**6**	**7**

Q21. How good or bad do you think the following outcomes are. *(Please circle the number that best represents your answer in each row.)*

	Extremely Bad	**Quite Bad**	**Slightly Bad**	**Neutral**	**Slightly Good**	**Quite Good**	**Extremely Good**
Decreasing the amount of maintenance of my shoreline is…	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Buffers being expensive is…	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Buffers being difficult to establish is…	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Decreasing geese in my yard is…	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Increasing water quality on my lake is…	**1**	**2**	**3**	**4**	**5**	**6**	**7**
An attractive shore is…	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Creating habitat for wildlife is…	**1**	**2**	**3**	**4**	**5**	**6**	**7**

Q21. continued

	Extremely Bad	**Quite Bad**	**Slightly Bad**	**Neutral**	**Slightly Good**	**Quite Good**	**Extremely Good**
Making it difficult for me to do other recreational activities is…	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Improving fishing on my lake is…	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Creating privacy is…	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Harming my view of the lake is…	**1**	**2**	**3**	**4**	**5**	**6**	**7**

Q22. Next we would like to know how likely it is other people you know would support you having a native vegetative buffer on your shoreline. *(Please circle the number that best represents your answer in each row.)*

How likely is it that…	**Extremely Unlikely**	**Quite Unlikely**	**Slightly Unlikely**	**Neutral**	**Slightly Likely**	**Quite Likely**	**Extremely Likely**
Most of my family thinks that I SHOULD have a native vegetative buffer on my shoreline.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Most of my friends think that I SHOULD have a native vegetative buffer on my shoreline.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Most of my neighbors think that I SHOULD have a native vegetative buffer on my shoreline.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
My lake association thinks that I SHOULD have a native vegetative buffer on my shoreline.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
The Minnesota DNR thinks that I SHOULD have a native vegetative buffer on my shoreline.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
My watershed district thinks that I SHOULD have a native vegetative buffer on my shoreline	**1**	**2**	**3**	**4**	**5**	**6**	**7**
The people who swim, fish and boat in my lake think that I SHOULD have a native vegetative buffer on my shoreline	**1**	**2**	**3**	**4**	**5**	**6**	**7**

Q23. Next we would like to know how likely you are to do what those people or groups would most want you to do. *(Please circle the number that best represents your answer in each row)*

Generally speaking I want to do what…	Extremely Disagree	Strongly Disagree	Slightly Disagree	Neither	Slightly Agree	Strongly Agree	Extremely Agree
Most of my friends think I should do.	1	2	3	4	5	6	7
My family thinks I should do.	1	2	3	4	5	6	7

Q23. continued

Generally speaking I want to do what…	Extremely Disagree	Strongly Disagree	Slightly Disagree	Neither	Slightly Agree	Strongly Agree	Extremely Agree
My neighbors think I should do.	1	2	3	4	5	6	7
My lake association thinks I should do.	1	2	3	4	5	6	7
The Minnesota DNR thinks that I should do.	1	2	3	4	5	6	7
My watershed district thinks I should do.	1	2	3	4	5	6	7
The people who swim, fish and boat in my lake think that I SHOULD do.	1	2	3	4	5	6	7

Q24. Next we would like to know how many other people in Minnesota you think have vegetative buffers on their shoreline *(Please circle the number that best represents your answer in each row)*

	No One					Half					All
How many of your nearby neighbors do you think have native vegetative buffers?	0%	5% Or less	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
How many of the people on your lake do you think have native vegetative buffers?	0%	5% Or less	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
How many of the people on surrounding lakes do you think have native vegetative buffers?	0%	5% Or less	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
How many people that live on Minnesota lakes in general do you think have native vegetative buffers?	0%	5% Or less	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Q25. We would also like to know how do these different groups of people perceive vegetative buffers *(Please circle the number that best represents your answer in each row):*

	Very Unacceptable	Moderately Unacceptable	Slightly Unacceptable	Neither	Slightly Acceptable	Moderately Acceptable	Very Acceptable
How acceptable are native vegetative buffers to your family?	1	2	3	4	5	6	7
How acceptable are native vegetative buffers to your friends?	1	2	3	4	5	6	7
How acceptable are native vegetative buffers to your neighbors?	1	2	3	4	5	6	7

How acceptable are native vegetative buffers to the residents of your lake?	**1**	**2**	**3**	**4**	**5**	**6**	**7**

Q25. continued

	Very Unacceptable	Moderately Unacceptable	Slightly Unacceptable	Neither	Slightly Acceptable	Moderately Acceptable	Very Acceptable
How acceptable are native vegetative buffers to the people who use your lake for recreation such as swimming, fishing or boating?	**1**	**2**	**3**	**4**	**5**	**6**	**7**
How acceptable are native vegetative buffers to people in general?	**1**	**2**	**3**	**4**	**5**	**6**	**7**

Q26. The next set of questions relates to how comfortable/confident you are with the following *(Please circle the number that best represents your answer in each row)*:

If you wanted to restore or maintain a native vegetative buffer, how sure are you that you could…	Not well at all	Not very Well	Slightly Well	Somewhat Well	Moderately Well	Quite Well	Very Well
…identify native plants?	**1**	**2**	**3**	**4**	**5**	**6**	**7**
…obtain information about native vegetative buffers?	**1**	**2**	**3**	**4**	**5**	**6**	**7**
… buy or locate appropriate native plants?	**1**	**2**	**3**	**4**	**5**	**6**	**7**
…keep up with maintenance?	**1**	**2**	**3**	**4**	**5**	**6**	**7**

Q27. Restoring or maintaining a shoreland buffer is? (*Place an "X" in the space that best expresses what you believe*)

Difficult_____:_____:_____:_____:_____:_____:_____ **Easy**
1 2 3 4 5 6 7

Not up to me_____:_____:_____:_____:_____:_____:_____ **Up to me**
1 2 3 4 5 6 7

Not under my control_____:_____:_____:_____:_____:_____:_____ **Under my control**
1 2 3 4 5 6 7

Q28. For the following questions please indicate how much you rely on and trust information about shoreland management *(Please circle the number that best represents your answer in each row)*:

	Not at all	Seldom	Occasionally	Frequently	Always
Shoreland restoration demonstration sites at public access points	**1**	**2**	**3**	**4**	**5**
Signage at shoreland restoration demonstration sites	**1**	**2**	**3**	**4**	**5**
County extension services	**1**	**2**	**3**	**4**	**5**
Minnesota DNR	**1**	**2**	**3**	**4**	**5**
Local watershed district	**1**	**2**	**3**	**4**	**5**
Mass media: newspaper, web pages	**1**	**2**	**3**	**4**	**5**
Lake association mailings or meetings	**1**	**2**	**3**	**4**	
Realtors during home purchase	**1**	**2**	**3**	**4**	

Friends, family and neighbors	**1**	**2**	**3**	**4**
Private nurseries and landscapers	**1**	**2**	**3**	**4**

Q29. In your opinion, if the DNR sought to encourage using native vegetative buffers, how likely would each of the following approaches be to succeed? (*Please circle the ONE number that best matches your response.)*

	Extremely Unlikely	**Quite Unlikely**	**Slightly Unlikely**	**Neutral**	**Slightly Likely**	**Quite Likely**	**Extremely Likely**
Use tax incentives to relieve the cost	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Use signage to promote restorations that have occurred or are in progress	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Change grants to be more flexible depending on peoples' shorelines	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Simplify the grant application process	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Increase grant dollars for restorations	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Increase on the ground assistance for people that want help with a vegetative buffer	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Use education to increase knowledge of the importance of vegetative buffers	**1**	**2**	**3**	**4**	**5**	**6**	**7**

Q30. What is the maximum amount of money you would be willing to personally spend to restore a native vegetative buffer on your lake shore property?

$_____

Q31. If an economic incentive was offered to promote the use of native vegetative buffers on your property, what is the minimum amount of money you would need to receive as: A) a one time payment and B) a yearly payment in order to maintain or restore a buffer? (Please check ONE response for each column below—PLEASE PROVIDE AN ANSWER FOR BOTH).

A) One time payment

- ☐ $0--No payment is necessary
- ☐ $50
- ☐ $250
- ☐ $500
- ☐ $1000
- ☐ $1500
- ☐ $2500
- ☐ I would not maintain/restore for any of these amounts

B) Yearly Payment

- ☐ $0—No payment is necessary
- ☐ $10/year
- ☐ $25/year
- ☐ $50/year
- ☐ $75/year
- ☐ $100/year
- ☐ $500/year
- ☐ I would not maintain/restore for any of these amounts

Q32. The DNR's Shoreland Management Program recommends having 75% of the lake frontage, back 25 feet from the shoreline, for native vegetative buffers. How acceptable is this to you? (Place an "X" in the space that best represents your response).

Not at all_____:_____:_____:_____:_____:_____:_____ **Totally acceptable**

1 2 3 4 5 6 7

Q33. How far back is your home from the shore?

_____ feet

Q34. What percentage of your shoreline frontage would you consider having as a native vegetative buffer? (circle one)

0%	5% Or less	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Q35. How far back from shore would you consider having a native vegetative buffer?

_____ feet

Q36. What year were you born? _____

Q37. What is your gender? (check one)

- ☐ MALE
- ☐ FEMALE

Q38. What is the highest level of education you have completed? (check one)

- ☐ ELEMENTARY SCHOOL
- ☐ HIGH SCHOOL
- ☐ TECHNICAL SCHOOL OR SOME COLLEGE
- ☐ COMPLETED COLLEGE DEGREE
- ☐ GRADUATE OR PROFESSIONAL SCHOOL

Please make any additional comments below and thank you for your time.

Please return the completed questionnaire in the enclosed self-addressed, stamped envelope.

Appendix H: Non-Response Contact Letter

October, 2009 ID

Address 1
Address 2

Dear NAME,

I am writing you to request your assistance with our survey. During the past summer we have contacted you regarding a survey about your lakeshore. As of today, we have not received your completed questionnaire. We realize that you may not have had time to complete it. We are accompanying an abridged copy of the survey that may be more convenient to you.

If you have recently returned the original survey, please disregard this letter and accept our thanks for your input.

Many people around the state have entered their input. We want to make certain that everyone has a voice in our research. Your response to this survey and the data collected will help direct future policies and outreach initiatives related to shoreland management in Minnesota. Your input will help the DNR ensure high-quality programming and protect our Minnesota water resources.

Your participation in the survey is voluntary, and all responses will be kept confidential. You will note a barcode and identification number. This helps us ensure your confidentiality. If you would prefer not to participate, please let us know by returning a blank copy of the survey in the enclosed stamped envelope.

We would be happy to answer any questions you have about the study. Please e-mail the project manager Ed Rudberg, at rudb0004@umn.edu, or the project director David Fulton, at (612) 625-5256 or dcfulton@umn.edu.

Thank you very much for your assistance with this study.

Sincerely,

David C. Fulton, Ph.D.
Associate Professor

Appendix I: Non-Response Survey Instrument

Shoreland Management: Minnesota Lakeshore Landowner Survey
Please complete this survey and return it in the postage-paid return envelope.

In this survey we will be asking you questions about the shoreline at your lake home. Please consider the shoreline zone to be 50 feet landward of the water's edge. We will also be asking questions about **native vegetative buffers.** Native vegetative buffers are areas of the shoreline (to 50 feet) that have native grasses, trees, bushes, flowers, and other wild plants. Native vegetative buffers DO NOT include areas of mowed grass. There will be area to comment at the end of the survey.

Q1. What describes your lake home (Please check one)?

- ☐ PRIMARY RESIDENCE
- ☐ RENTAL PROPERTY
- ☐ BUSINESS PROPERTY
- ☐ SEASONAL OR RECREATIONAL RESIDENCE (SUMMER)
- ☐ SEASONAL OR RECREATIONAL PROPERTY RESIDENCE (ALL SEASONS)
- ☐ I DO NOT OWN SHORELAND PROPERTY → THANK YOU THE SURVEY IS COMPLETE

→ Q1b. If you are a seasonal or recreational resident, where is your full time residence?

- ☐ METROPOLITAN AREA OR SUBURB
- ☐ RURAL AREA

Q2. How long have you owned your lake home?

_____ YEARS

☐ LESS THAN 1 YEAR

Q3. Over the past several years, have you restored an area of your shoreline to native vegetation (please circle one)?

1 YES → If YES, what percentage of your shoreline _____%
2 NO

Q4. Over the past several years, have you removed an area of native vegetation (please circle one)?

1 YES → If YES, what percentage of your shoreline _____%
2 NO

Q5. To what degree have you actively maintained the makeup of your shoreline in the past? (*Place an "X" in the space that best expresses what you believe*)

Not at all_____:_____:_____:_____:_____:_____:_____ **A great deal**
1 2 3 4 5 6 7

Q6. To what degree are you likely take an active role in managing your shoreline in the future? (*Place an "X" in the space that best expresses what you believe*)

Unlikely_____:_____:_____:_____:_____:_____:_____ **Likely**
Extremely quite slightly neither slightly quite extremely

Q7. How likely are you to restore or increase the areas of native vegetative buffer(s) on your shoreline in the next three to five years? *Place an "X" in the space that best expresses your intentions (Note: if you do not have any area to restore do not answer).*

Unlikely_____:_____:_____:_____:_____:_____:_____ **Likely**
extremely quite slightly neither slightly quite extremely

Q8. In your opinion, how would you view having a native vegetative buffer on your shoreline is? (*Place an "X" in the space that best expresses what you believe*)

Bad _____:_____:_____:_____:_____:_____:_____ **Good**
extremely quite slightly neither slightly quite extremely

Negative_____:_____:_____:_____:_____:_____:_____ **Positive**
extremely quite slightly neither slightly quite extremely

Harmful_____:_____:_____:_____:_____:_____:_____ **Beneficial**
extremely quite slightly neither slightly quite extremely

Q9. In your opinion, how would you view restoring a native vegetative buffer on your shoreline is: (*Place an "X" in the space that best expresses what you believe*)

Bad_____:_____:_____:_____:_____:_____:_____ **Good**
extremely quite slightly neither slightly quite extremely

Negative_____:_____:_____:_____:_____:_____:_____ **Positive**
Extremely quite slightly neither slightly quite extremely

Harmful_____:_____:_____:_____:_____:_____:_____ **Beneficial**
extremely quite slightly neither slightly quite extremely

Q10. How likely are you to restore or increase the areas of native vegetative buffer(s) on your shoreline in the next three to five years? *Place an "X" in the space that best expresses your intentions (Note: if you do not have any area to restore do not answer).*

Unlikely_____:_____:_____:_____:_____:_____:_____ **Likely**
extremely quite slightly neither slightly quite extremely

Q11. We have previously sent you surveys regarding shoreland management and had not received a reply. What best describes your reasoning for not filling out the original survey (please select all that apply)?

☐ THE SURVEY WAS TOO LONG/COMPLICATED
☐ I AM TOO BUSY TO COMPLETE THE SURVEY
☐ THE SURVEY DOES NOT APPLY TO ME

☐ I DO NOT BELIEVE THAT SHORELAND BUFFERS ARE AN IMPORTANT ISSUE
☐ THE SURVEY INTRUDES UPON MY PERSONAL CHOICES
☐ I BELIEVE SHORELAND BUFFERS ARE UNECESSARY GOVERNMENTAL INTERVENTION
☐ OTHER (PLEASE SPECIFY):_____

Q12. What year were you born? _____

Q13. What is your gender? (check one)

☐ MALE
☐ FEMALE

Please make any additional comments below and thank you for your time.

`

Please return the completed questionnaire in the enclosed self-addressed, stamped envelope.