

University of Montana

## ScholarWorks at University of Montana

---

Graduate Student Theses, Dissertations, &  
Professional Papers

Graduate School

---

2008

### Dynamic human relationships with wilderness: Developing a relationship model

Bob G. Dvorak  
*The University of Montana*

Follow this and additional works at: <https://scholarworks.umt.edu/etd>

**Let us know how access to this document benefits you.**

---

#### Recommended Citation

Dvorak, Bob G., "Dynamic human relationships with wilderness: Developing a relationship model" (2008).  
*Graduate Student Theses, Dissertations, & Professional Papers*. 342.  
<https://scholarworks.umt.edu/etd/342>

This Dissertation is brought to you for free and open access by the Graduate School at ScholarWorks at University of Montana. It has been accepted for inclusion in Graduate Student Theses, Dissertations, & Professional Papers by an authorized administrator of ScholarWorks at University of Montana. For more information, please contact [scholarworks@mso.umt.edu](mailto:scholarworks@mso.umt.edu).

DYNAMIC HUMAN RELATIONSHIPS WITH WILDERNESS:  
DEVELOPING A RELATIONSHIP MODEL

By

Robert Gregory Dvorak

B.S., Fisheries & Wildlife Biology, University of North Dakota, Grand Forks, ND, 2001

B.A., Anthropology, University of North Dakota, Grand Forks, ND, 2001

M.S., Recreation Management, University of Montana, Missoula, MT 2004

Dissertation

presented in partial fulfillment of the requirements  
for the degree of

Doctor of Philosophy  
in Forestry

The University of Montana  
Missoula, MT

Summer 2008

Approved by:

Dr. David A. Strobel, Dean  
Graduate School

Dr. William T. Borrie, Chair  
Department of Society and Conservation

Dr. Norma P. Nickerson  
Department of Society and Conservation

Dr. Michael E. Patterson  
Department of Society and Conservation

Dr. Douglas R. Dalenberg  
Department of Economics

Dr. Jeffrey A. Gritzner  
Department of Geography

Dynamic human relationships with wilderness: Developing a relationship model

Chair: William T. Borrie

Wilderness managers are charged with the challenging goal of balancing resource protection and experience quality across a broad, value-laden landscape. While research has provided insight into visitor motivations, psychological outcomes, and meanings, a struggle exists to implement experiential concepts within current management frameworks. A need also exists to manage wilderness for concepts outside of setting attributes. This research posits the human experience of wilderness to be an evolving, enduring relationship. Therefore, research needs can be addressed by investigating and conceptualizing an individuals' personal relationship with a wilderness area.

The overall purpose of this study was to explore the relationships with wilderness that users develop in the Boundary Waters Canoe Area Wilderness and how changes in use, users, and other external forces influence these relationships. A general predictive model was proposed for a relationship that was then utilized to investigate the internal dimensions of a relationship with wilderness.

A mail back questionnaire was distributed during the summer of 2007, which resulted in a sample of 564 respondents. Data was analyzed using structural equation modeling, confirmatory factor analysis, and multiple regression analysis. Results from testing several relationship models provided support for a multidimensional underlying structure consisting of five factors (place identity, trust, commitment, place meanings, and place dependence) with a single overarching relationship factor. Multiple regression results also demonstrated several external variables that were associated with a wilderness relationship. Ultimately, the preferred relationship model indicated that while place factors were important, they were not the sole measures of a wilderness relationship. Trust and commitment were also significant underlying factors.

This research provided the preliminary evidence for a multidimensional wilderness relationship model and built upon previous understandings of sense of place and experiences to apply a relationship metaphor to a wilderness and natural resource setting. It laid the foundation for a research agenda that may help guide future management actions to increase protection of wilderness character and facilitate quality human relationships with wilderness.

## ACKNOWLEDGEMENTS

When I began this journey, I never could have guessed how many people would deeply influence my thoughts, research, and life. First, I am extremely thankful to my committee chair Bill Borrie. He truly has been both a mentor and friend, providing guidance and encouragement to help me succeed not only as a student, but also in my academic career. Thank you also to my committee members, Norma Nickerson, Mike Patterson, Doug Dalenberg, and Jeff Gritzner. Each of you has provided great advice and helped make this research successful. I would also like to thank the many other faculty and graduate students who offered guidance and support. Specifically, I would like to thank Melissa Baker, Christine Oschell, Randy Tanner, Neil Moisey, and Jim Wilton.

I never would have accomplished my goals without the love and support of my family. My wife, Lisa, has been truly amazing in her commitment and sacrifice for my success. Your love and encouragement helped me persevere. All I have done has been for her and my son, Benjamin. To my parents, thank you for all the love, support, and prayers to help me finish the “climb”.

Finally, this project was funded by the Aldo Leopold Wilderness Research Institute and was a collaborative effort with the University of Minnesota and the Superior National Forest. Thank you to Alan Watson, Ingrid Schneider, Ann Schwaller, Erin Small, Andrea Schuweiler, and all the Forest Services staff for their enthusiasm, assistance, and passion for this research. Thanks also to the many participants who offered their insights and feelings about how the Boundary Waters Canoe Area Wilderness is a special and unique place. I will never forget my experiences in the “north woods” and will treasure the relationship I have formed with this wilderness.

## TABLE OF CONTENTS

CHAPTER ONE: INTRODUCTION.....	1
Why a Relationship?.....	5
Relationships and Place .....	8
Purpose.....	9
Research Objectives.....	12
Dissertation Organization .....	13
CHAPTER TWO: LITERATURE REVIEW.....	14
Theoretical Foundations.....	15
Social Constructivism.....	20
Wilderness as a Social Construction.....	22
What is a Relationship? .....	29
Psychology & Close Relationships.....	30
Relationships & Marketing Research .....	35
Summary of Philosophical Commitments .....	40
Proposed Relationship Model.....	42
Internal Dimensions.....	44
Relationship to Self.....	47
Relationship to Management Agency.....	50
Relationship to Place.....	54
Relationship among Dependent Variables.....	58
External Variables.....	60
Relationship with Dependent Variables.....	63
Summary .....	66
CHAPTER THREE: METHODOLOGY .....	67
Study Area .....	67
Sampling Design.....	71
Sampling Logic.....	71
Sample Population .....	72
Sampling Frame .....	74
On-Site Interview and Mailings.....	78
Sample Size.....	79
Questionnaire Design.....	81
Place Identity, Dependence, and Meanings .....	82

Life Centrality .....	85
Trust and Commitment .....	86
Resource and Social Conditions .....	88
Permits .....	89
User Fees.....	90
Ecological Events and Technology.....	91
Experience & Demographics (including DFH) .....	93
Analysis.....	93
Structural Equation Modeling.....	94
Confirmatory Factor Analysis.....	97
CHAPTER FOUR: ANALYSIS & RESULTS .....	99
Sample Statistics and Data Management.....	100
Response Rate.....	100
Nonresponse Bias.....	101
Missing Values.....	105
New Variables Calculated.....	110
Descriptive Statistics.....	113
Model Testing – Confirmatory Factor Analysis .....	117
Single Factor Model.....	121
Full Latent Factor Model .....	124
Full Model with Complete Covariance.....	126
Five Factor Relationship Model.....	129
Second Order Factor Analysis .....	134
Alternative Models.....	139
Multiple Regression for External Variables .....	143
Limitations .....	151
CHAPTER FIVE: DISCUSSION AND CONCLUSIONS .....	153
Factor Structure Interpretation.....	154
Multiple Regression Interpretation .....	157
Management Implications.....	161
A Relationship Focus.....	161
Building Trust and Commitment .....	162
Research Implications.....	164
Future Research .....	167
Concluding Remarks.....	170
REFERENCES .....	171

APPENDIX A: ON SITE CONTACT FORM .....	181
APPENDIX B: MAILBACK QUESTIONNAIRE .....	183
APPENDIX C: ADDITIONAL DESCRIPTIVE STATISTICS .....	193

## LIST OF FIGURES AND TABLES

### FIGURES

Figure 1: Diagram of Proposed Model .....	45
Figure 2: Map of the Superior National Forest, Minnesota .....	68
Figure 3: Map of Boundary Waters Canoe Area Wilderness, Minnesota .....	69
Figure 4: Frequencies of Responses for Technology Scale .....	112
Figure 5: Normal Probability Plot for Item 5s .....	120
Figure 6: Single Factor Model (Model 1) .....	122
Figure 7: Full Model with Complete Covariance (Model 3) .....	127
Figure 8: Preferred Factor Model (Model 5) .....	132
Figure 9: Single Relationship Factor Model .....	137
Figure 10: Second-Order Place Model .....	140
Figure 11: Second-Order Place-Forest Service Model .....	141
Figure 12: Relationship Factor Scores vs. Mean Scores .....	144

### TABLES

Table 1: Visitor Population Estimates for Top 17 Entry Points .....	76
Table 2: Permit Distribution Locations .....	78
Table 3: Measures of Place Identity and Dependence .....	84
Table 4: Place Meaning measures .....	85
Table 5: Life Centrality measures .....	86
Table 6: Measures of Trust and Commitment .....	87
Table 7: Attitude Towards Fee Program measures .....	92
Table 8: Response Bias of Trend Study vs. Relationship Study Respondents .....	102
Table 9: Response Bias of Respondents vs. Nonrespondents .....	104
Table 10: Descriptive Statistics of the Sample .....	114
Table 11: Comparison of Sample Reliabilities to Previous Studies .....	116
Table 12: Factor Structure of Internal Dimensions of a Relationship .....	130
Table 13: Summary of Goodness of Fit Statistics for Comparative Models .....	133
Table 14: Standardized Correlations, Error Terms, and R <sup>2</sup> values .....	135
Table 15: Summary of Comparative Multiple Regression Models .....	148
Table 16: Regression Results for Preferred Model .....	150
Table 17: Group Type for Visitor Trend Study vs. Relationship Respondents .....	193
Table 18: Descriptive Statistics of Relationship Scale Items .....	194

## CHAPTER ONE: INTRODUCTION

With the passage of the Wilderness Act in 1964, managing for the experience component of wilderness recreation became mandated along with the physical and biological components (Merigliano, 1989). Wilderness managers were charged with the challenging goal of balancing resource protection and experience quality across a broad, value-laden landscape. Part of the responsibility of social scientists is to provide managers with information that can assist them in making these difficult value-based decisions. Over the past 30 years, multiple approaches in recreation research (e.g. satisfaction, benefits-based, experience-based, meanings-based) have been developed to measure the quality of the wilderness experience (Borrie & Birzell, 2001). While these approaches have provided insight into visitor motivations, psychological outcomes, and meanings, scientists and managers are still struggling with ways to address and implement experiential concepts within current wilderness management frameworks.

This difficulty is partially due to the nature of current planning frameworks. Approaches such as the Limits of Acceptable Change (LAC)(Stankey, Cole, Lucas, Petersen, & Frissell, 1985) or Visitor Experience and Resource Protection (VERP)(National Park Service, 1997), define the type of experiences to be provided and then monitor conditions over time to assess whether acceptable conditions have been exceeded (Manning, 2000). They rely upon the development of indicators and standards of quality that are used to evaluate the physical, social, and managerial attributes of the natural setting. However, a broad array of indicators can be required to define the quality of the experience (Manning & Lime, 2000) and establishing standards for indicators of

setting attributes related to the quality of the experience (e.g. level of crowding) can be very difficult (Cole, 2001).

This difficulty exists because the link between setting attributes and the quality of experience cannot always be assumed. Visitors have preferences for setting attributes and use those preferences in the selection of recreation opportunities. However, satisfaction with setting attributes is more the matching of expectations with achieved outcomes and does not necessarily equate with the quality of or satisfaction with the recreation experience (Borrie & Birzell, 2001). For example, settings can be managed by creating zones that provision setting attributes and provide a diverse range of opportunities (see Clark & Stankey, 1979). A primitive zone may have attributes of low user density, a highly unmodified natural setting, and low levels of management presence (e.g. developed sites, backcountry staff). While such a zone provides certain opportunities, it does not necessarily yield high quality experiences. Managing these attributes does not guarantee that users will feel certain emotions or associate important meanings and values with their experiences. Thus managers are challenged to make hard value judgments about what is appropriate for a given wilderness setting and to look beyond provision and management of setting attributes to measuring, monitoring, and managing the quality of the experiences more directly.

Previous research approaches have attempted to reduce wilderness experiences down to scale items that depict setting attributes, motivations, and preferences (Manfredo, Driver, & Tarrant, 1996). However, acknowledging the diversity of values related to wilderness experiences suggests that the setting attributes across a landscape do not sum to the total of wilderness. Wilderness is a socially constructed, value-laden

landscape. Personal values, symbolism, and emergent meanings contribute greatly to the experience. Dawson, Newman, and Watson (1998) also suggest that other positive human values (e.g. challenge, inspiration, exploration) may be important for a wilderness experience. Therefore, these concepts should be part of a management strategy that provides for quality wilderness experiences. Managers have a duty to provide opportunities for these fundamental human experiences, or at the very least not to impede or restrain those experiences.

Although setting attributes are largely under management control, a need exists to move beyond strictly managing setting attributes. More specifically, less emphasis needs to be placed on setting attributes associated with biophysical resource conditions (e.g. campsite size, soil compaction, trail width/depth). Wilderness managers are losing traction with the public by continuing to justify management actions using predominantly resource-based arguments. While resource issues are central to many current management challenges, managers are still expected to incorporate a full range of values in their decision-making. Just as the public expects a multitude of values to be preserved and prioritized in the mosaic that is the National Wilderness Preservation System, the public recognizes and demands more objectives from any single wilderness area than just the protection of biodiversity and other ecological priorities. That is, the public expects more from wilderness than just environmental protection. It is a symbolic landscape and a geography of hope that reflects the aspirations and heritage of the American people. By placing more importance upon understanding these types of values and meanings that influence the quality of the wilderness experience, managers may be better equipped for addressing a broader range of values.

By attempting to find new ways to implement actions that influence experience quality, a research need arises to further investigate dynamic and emergent experiences in the context of people's lives. Experiences occur across vast landscapes and accumulate over time. They are not one-time market transactions between the visitor and the setting (Borrie & Roggenbuck, 2001). Instead, experiences are complex, dynamic engagements between people, their internal states, and the social and natural environment that fluctuate over the course of a recreation activity (Borrie & Roggenbuck, 1998; Hull, Stewart, & Yi, 1992). Strictly using setting attributes, preferences, and motivations to depict experiences is inadequate to measure experience quality. Lost in these measures is the temporal and spatial nature of the lived experience (Freimund & Cole, 2001; Stewart, 1998) and the acknowledgement that experiences are on-going constructions that are complex, personal, and embedded within our lives (Glaspell et al., 2003). The importance and form of wilderness experiences could be expected to change throughout our lives, and so consideration of any one particular wilderness experience is insufficient to fully understand the range of meanings and values that the experience represents.

Individuals also actively construct meaning through their interactions and renegotiate the meaning of experiences in relationship to themselves. Past research investigating this "lived" experience has mainly focused on the internal experiences received by recreationists on a given trip (Borrie & Roggenbuck, 1998; Patterson, Watson, Williams, & Roggenbuck, 1998). These studies have examined how experiences are constructed and remembered, but have not answered the calls to incorporate how experience dimensions or the importance of the experience change over the life course (see Celsi, Rose, & Leigh, 1993; McCracken, 1987; Williams, 1989). What is created is a

greater attachment or investment in special places. That is, there is an accumulation of values created by the series of wilderness experiences. Therefore, a research need exists to further examine the dynamic and emergent phenomena of experiences over time. A better understanding of these concepts may provide scientists and managers with new ways to influence and facilitate quality experiences.

This researcher suggests that this need and the need to manage for concepts other than setting attributes can be addressed by investigating and conceptualizing how an individuals' personal relationship with a wilderness area exists and changes. By investigating relationships with wilderness, it may be possible to understand the different dimensions of a relationship, how they change, and how managers can implement actions that foster and facilitate these relationships.

#### Why a Relationship?

Brooks, Wallace, and Williams (2006) suggest that relationships can be used as a metaphor for understanding the quality of the visitor experience. This relationship metaphor is an alternative to the previously predominant commodity metaphor for describing recreation experiences (Williams, Patterson, Roggenbuck, & Watson, 1992). Recreation researchers have used a commodity metaphor to frame visitor experiences within a comparative standards model that evaluated the fulfillment of expectations (e.g. satisfaction) for a particular wildland setting (Brooks et al., 2006; Williams, 1989). Expectations about the experiences are considered stable and the fulfillment of expectations is measured by the extent to which setting attributes contributed to desired experiences and psychological outcomes. However, this approach does not accurately represent visitor experiences because it understates or ignores the roles of meanings and

emotions (Brooks et al., 2006; Fournier & Mick, 1999). It does not acknowledge that experiences are complex, dynamic, and transferred into our everyday lives. Thus, Brooks et al. propose a relationship-orientated framework to account for emergent experiences and subjective place meanings over time.

In general, the concept of a relationship has been predominantly explored by the field of psychology. This exploration has examined the role of close personal relationships between humans. Berscheid and Peplau (1983) believe relationships with others are part of the very core of human existence. They describe concepts such as love, trust, commitment, attachment, and significance as parts of a “close relationship”. Similarly, we would expect a strong wilderness relationship to be a powerful, highly significant bond between an individual and wilderness. Relationships also exist in a social environment. They depend upon the social, cultural, and temporal situations in which they are embedded (Hinde, 1995). As dynamic processes that exist over time, relationships continuously change in respect to these factors and various experiences. That is, the significance and meaning of relationships depend not only on the characteristics of the people involved, but also upon the social milieu and evolving cultural context in which they occur.

The notion of relationships has also been expanded upon in consumer marketing research where the concept of relationships goes beyond personal human attachments to include developing relationships between customers and businesses. Part of this redefinition has focused attention on how to distinguish short duration, isolated transactions from ongoing buyer-seller relationships (Dwyer, Schurr, & Oh, 1987; Morgan & Hunt, 1994). Through these investigations, a better understanding of

commitments to firms and products has led to the notion of brand loyalty or brand identification and a greater level of success in the provision of goods and services that play important and meaningful roles in the consumer's life.

Outdoor recreation research has also examined concepts that could be considered related to "relationships." Previous studies have been conducted to understand individual experience use histories (EUH) and how these experiences affect recreational behavior (Schreyer, Lime, & Williams, 1984). Others have investigated specialization in recreation activities and how it relates to the increased commitment and centrality of the activity to the participant's lifestyle (McFarlane, 2004; McIntyre & Pigram, 1992). More recently, the concept of public-purpose marketing has been introduced to explore the relationship individuals may have with federal land management agencies such as the US Forest Service (Watson & Borrie, 2003). This research has focused on exploring the concepts of trust, commitment, and social responsibility of recreationists. Public-purpose marketing has also begun to contextualize relationships in recreation research. It addresses the question of with whom or what do individuals maintain a relationship? As agents of natural resource management organizations, individuals represent themselves, the organization, the area being managed, and the designation and meanings (e.g. wilderness) for which the land is being managed. They represent both the organization and the designation locally to the specific area, the broader organizational unit (e.g. National Park unit, or specific National Forest), and the agency overall (NPS or USFS, etc.) Similar to above concerns for recreation experiences, the relationship to the agency is seen to be more complex than individual transactions. Rather, they too, accumulate and develop over time and contexts.

## Relationships and Place

This study is an examination of individual human relationships with wilderness, but also contextualizes this relationship in a specific place, the Boundary Waters Canoe Area Wilderness (BWCAW). Over the past 40 years, the concept of place has emerged as a prominent focus for exploring the relationship between humans and the environment (Patterson & Williams, 2005). The concept of place has been explored across multiple disciplines, including environmental psychology, human geography, sociology, and recreation research. It has been referred to as sense of place (Jorgensen & Stedman, 2001), place attachment (Williams & Vaske, 2003), topophilia (Tuan, 1974), and other concepts. The concept of place transcends the specifics of a space or location to entail meaningful connections that resonate within a person's life and being.

Greider and Garkovich (1994) describe places as symbolic environments created by conferring meaning upon nature and the environment. These intrinsic meanings create stability within a landscape. Once a landscape has been imbued with meanings, it will never revert back to a generic space (Casey, 2001). It has become something more to individuals than just a conglomeration of biophysical attributes. In essence, a person forms a relationship to the place that reflects the meanings and values they ascribe to that context. Places also play an important role in an individual's identity and their preferred recreation activities.

A relationship to place can be described as the emotional bonds individuals form with a particular place because its use has come to symbolize the user's identity (Williams & Vaske, 2003). It addresses the connections humans make with the environment and how their lives are influenced by these special places. Recent research

has investigated how relationships to place moderate attitudes towards fees and preferences for fee spending (Kyle, Absher, & Graefe, 2003), perceptions of landscape change (Davenport & Anderson, 2005), and perceptions on social and environmental conditions (Kyle, Graefe, Manning, & Bacon, 2004b). However, attempts to develop place-based management objectives for protected area management have been unsuccessful. While different techniques have been developed to measure the emotional bonds and attachments individuals form with places, these results have not been easy to translate into current planning frameworks based on indicators and standards of quality.

Therefore, current ideas regarding relationship of place have reached a barrier. Further examination of the dimensionality of measurement scales or the influence of place on user perceptions will not address the challenges for implementation. Divergent research programs regarding place also create challenges. Patterson and Williams (2005) suggest that research traditions in place span from deterministic approaches to relativistic approaches. This lack of consensus can impede the implementation of place-based principles in natural resource management.

Thus, mirroring the progression of ideas seen in the understanding of recreation experiences, of human relationships, or consumer relationships, and of attachment to place, this research posits the human experience of wilderness to be an evolving, enduring relationship.

### Purpose

The central theme of this research is the dynamic relationships individuals have with the BWCAW. Why is an understanding of relationships important? Managers continue to need to understand the constituency of users they serve. Framing questions in

the context of relationships provides managers with the ability to consider user experiences, values, and meanings longitudinally. While first-time users' experiences may be heavily influenced by outfitters, information, and staff interactions, repeat users have the ability to develop their own long-term relationship with the wilderness area itself. That is, in managing the wilderness estate the managers do more than monitor the interactions with outfitters, information and staff. Conversely, repeat users have the opportunity to be exposed to changing management practices, varying setting conditions, and a growing awareness and knowledge of wilderness values through their experiences and use history with a setting. Thus, managers can benefit from understanding how their constituency is changing and how external factors are influencing the relationship users develop with the BWCAW.

Incorporating ideas of dynamic relationships could provide managers with increased decision space for making critical decisions. Strictly utilizing setting attributes, expectations, and satisfaction limit the justifications managers can make for their decisions. However, a relationship metaphor provides an argument that may resonate differently with the public. It focuses greater attention on the temporal and dynamic aspects of the interactions individuals have with a wilderness area and represents a notion of human relationships with which individuals can relate.

A relationship framework also integrates with the responsibility of managers to preserve resources for future generations. It moves from documenting experiences as snapshots of the person to attempting to understand how these experiences are changing over time within individuals. It acknowledges that wilderness is an enduring resource with ongoing significance and provides researchers and managers with new avenues for

providing continuing recreational opportunities and for preserving overall long-term wilderness character.

Finally, it is important to recognize that the BWCAW does not exist in isolation. Managers are not just managing a static situation, but rather a wilderness located itself within a changing society. The boundary of a wilderness is a porous one, and numerous external forces transcend those boundaries to impact the status of wilderness relationships. Forces of change consist of various elements affecting the wilderness context. Ecological forces such as forest fires and climate change can have dramatic effects on the landscape. Technology is constantly changing and introducing new ways to interact with the environment and assist recreationists. Also, the community of wilderness users is aging, bringing different demands and values to natural settings. Thus, managers are faced with the challenge of managing the wilderness knowing that wilderness relationships may change due to these forces when the wilderness itself has not. They must adapt to these forces or yield to them.

Therefore, the overall purpose of this study was to explore the relationships with wilderness that users develop in the Boundary Waters Canoe Area Wilderness and how changes in use, users, and other external forces influence these relationships. It will attempt to build a general predictive model for a relationship that can be utilized to investigate the internal dimensions of a relationship with wilderness. By using this model, it may be possible to describe relationships between different variables and examine the effects they have on one another. Further refinement, and application of this model, will be useful in guiding future management actions to increase protection of wilderness character and facilitate individual relationships with the BWCAW.

## Research Objectives

To address this purpose, this study has three research objectives:

Objective 1: To develop a conceptual and analytical framework for describing a relationship with wilderness.

Objective 2: To investigate a proposed model for a relationship based on three hypothetical dimensions (relationship to self, relationship to management agency, & relationship to place) and how these dimensions manifest within the context of the BWCAW.

Objective 3: To explore how external forces operating in the BWCAW influence individual relationships and to determine whether indicators of change can be developed for current planning frameworks using these forces.

The first objective addresses the need for a framework. The development of a framework is necessary because of a lack of both conceptual and empirical clarity for the notion of a relationship with wilderness. This framework will be operationalized based on concepts used in relational marketing and psychology's study of interpersonal relationships. It will suggest that the concepts of relationship to self, relationship to management agency, and relationship to place are three theoretical dimensions that constitute a relationship with a wilderness area. This operationalization is then applied to the context of the BWCAW.

The second objective investigates the dynamics of the predictive model for a relationship with the BWCAW. It will attempt to examine the underlying structure between the internal dimensions and examine the connections they have with one another. Its goal is to achieve a relationship model that can be an accepted representation of individual wilderness relationships with the BWCAW.

The third objective proposes that relationships are influenced by external independent forces. Williams (1989) argues that through transactions with setting

attributes and personal characteristics, visitors create their experiences. Similarly, external forces of change such as aging, technology, and user fees can influence the experiences and opportunities available to users of the BWCAW. An understanding of these external forces may provide researchers and managers with the information necessary to determine whether these forces can be managed for within current planning frameworks. It may be possible to create indicators and standards for these forces that can be utilized in a LAC or VERP process.

### Dissertation Organization

The remainder of this dissertation is organized into four chapters. In chapter 2, a literature review is presented that addresses the philosophical commitments of social constructivism and the previous understandings of relationships developed in psychology and consumer marketing. A proposed model of a relationship with wilderness with three internal dimensions is also presented. Chapter 3 describes the study area, sampling design, questionnaire design, and analysis utilized to perform this study. Justification and examples are given for all measurement items utilized to test the model. Chapter 4 begins with the descriptive results and steps taken for data management. Results from the confirmatory factor analyses and multiple regression analyses are presented, along with the preferred model for a wilderness relationship model in the BWCAW. Finally, chapter 5 provides the interpretation for the results of the analyses and describes several management and research implications. Suggestions are also given for possible future research utilizing a relationship framework.

## CHAPTER TWO: LITERATURE REVIEW

The term “relationship” has rarely been explicitly defined in the discipline of protected area management. Most frequently, a relationship is accepted as implying a connection between concepts or variables. For example, Pierskala et al. (2004) use the term relationship to describe how settings and activities contribute to the production of benefit opportunities. While this research increases knowledge regarding the connections between settings, activities, experiences, and benefits, it does not address the emotional bonds and meanings conferred by human relationships. Because of this lack of conceptual clarity, it is necessary to define how the term relationship will be used in this research before it can be operationalized. This can be achieved through an understanding of how relationships have been conceptualized in other disciplines (e.g. psychology, consumer marketing). Such an understanding is central to developing a framework for investigating the relationships individuals possess with the BWCAW.

The purpose of this literature review is to develop a conceptual and analytical framework for the notion of a relationship with wilderness. Due to the multidisciplinary nature of the relationship field, collaboration and the cross-pollination of theory and techniques has been evident (Berscheid, 1994). Therefore, creating an analytical framework grounded in the relevant literature and a wilderness context is necessary before a model can be proposed for operationalizing human relationships with the BWCAW. First, the philosophical commitments of a social constructionist approach will be presented as a means to define how individuals interpret the nature of reality and knowledge in a cultural and social context. This foundation will be used to argue the position that both nature and wilderness are socially constructed. Second, the concept of a

relationship will be examined from the viewpoint of the disciplines of psychology and consumer marketing research. This will provide the rationale for applying a relationship metaphor in an outdoor recreation and wilderness context. Third, a proposed model for a relationship with wilderness will be presented along with the rationale for including each of the three hypothesized internal dimensions. These dimensions will be the basis for empirically measuring an individual's relationship with wilderness. Finally, various external forces of change present in social and cultural contexts will be identified and described as possible factors that are associated with relationships.

### Theoretical Foundations

The theoretical and philosophical commitments that drive this study are strongly influenced by critiques of past research traditions of place in natural resource management. In their investigation of the epistemological foundations of place research, Patterson and Williams (2005) present two frameworks that systematically organize place research programs on the basis of common themes and underlying assumptions. One framework focuses on the theoretical underpinnings of past place-oriented research and provides a spectrum ranging from deterministic approaches to relativistic approaches. By examining this spectrum relative to the notion of a relationship to place, it is possible to situate the theoretical commitments applicable to a framework for addressing a relationship with wilderness.

In beginning to understand the diversity of foundations in place research, it is important to understand the core theoretical concepts that are thought to underlie a particular way of understanding place. Given their prevalence, it is valuable to

differentiate between two prominent theoretical foundations from which place has been explored in the outdoor recreation literature: attitude theory and social constructivism.

An attitude theory view of place, quite simply, conceptualizing place as an attitude, a position that has been advocated most strongly by Stedman and colleagues (Jorgensen & Stedman, 2001; Stedman, 2002). Attitudes have been defined as responses to an exogenous event, object, or stimulus (Fishbein & Ajzen, 1975). These responses to attitude objects are argued to consist of cognitive, affective, and conative (behavioral) components. Jorgensen and Stedman (2001) suggest attitude theory can provide a framework for conceiving sense of place as the cognitive, affective, and conative relationships with human environments. By using the concepts of place identity, place attachment, and place dependence commonly addressed in environmental psychology, an attitude framework explores the self-identity, emotional, and behavioral components of sense of place. One should also recognize that this view internalizes attitudes within the individual. Because behavioral actions and emotions are responses to external stimuli in the environment, we must focus on the individuals themselves to understand these attitudes.

Alternatively, a social constructivist view of place attempts to understand the meanings and experiences related to particular places. It argues that reality is socially defined and that meanings are created by people (Greider & Garkovich, 1994). Therefore, a constructivist view emphasizes how individual interpret the place and their experiences in a social context. Instead of a behavioral response, it is a transaction between the person, other individuals and the natural setting. For these reasons, a social constructivist view was adopted for this research and is more fully described in the following section.

Beyond the theoretical foundation of world views, it is necessary to discuss the paradigms or research logic that was adopted in this research. Paradigms represent epistemological, ontological, and axiological commitments that operate at a higher level than the theoretical foundations described above. Paradigms define the boundaries in which more specific theoretical concepts (e.g., attitudes) emerge, are tested, and are eventually validated or rejected. As with the theoretical foundations above, to illustrate the distinction it is informative to contrast two highly divergent research logics (paradigms) that have been applied to place research: psychometrics and phenomenology. The logic of psychometrics is centered on quantitative measurement. It assumes that science must have the ability to examine and ultimately quantitatively measure various social and psychological concepts. Thus, the underlying philosophical commitments of this approach require concepts with narrow and precise definitions that allow for quantitative operationalization (Patterson & Williams, 2005). It also adheres to a variety of other epistemological commitments like parsimony (all things being equal, the simpler explanation is preferable) and rigorous application of statistical standards.

Contrasting a psychometric approach is a phenomenological approach. This latter approach to place focuses on the phenomenon of consciousness and the totality of lived experiences that belong to a single person (Giorgi, 1997). Emphasis is directed towards the meanings individuals give to objects instead of attempting to define them as real or objective (Giorgi, 1997; Patterson & Williams, 2005). In this sense, phenomenology is less about quantifying concepts and more about understanding the structure of meaning and the experience. It would critique psychometrics as being overly reductionistic and has a commitment more toward developing a holistic understanding of phenomena rather

than a parsimonious one. To accomplish these goals, phenomenology typically employs a qualitative approach (e.g. personal interviews) to investigate the phenomena at hand. Such an approach does not need precise definitions or operationalizations in the same way that psychometrics does to investigate concepts.

While a phenomenological approach provides for introspection that leads to self-awareness, it does not provide precise methodological direction for how to achieve this goal (Relph, 1977). Adhering to a psychometric paradigm, Jorgensen and Stedman (2001) have been critical of the phenomenological conceptualizations of place. They suggest that many place theorists (e.g. Relph, Tuan) identify place research as phenomenological and do not use empirical methods to test their assumptions. However, this criticism is only valid if one adheres strictly to a psychometric epistemology. Phenomenologists have been equally critical of psychometric research because this research logic violates the normative commitments underlying phenomenology. These types of conflicting stances between divergent paradigms have often generated oppositional dialog in which adherents require research to adopt one stand or another as inherently better or right.

Patterson and Williams, however, suggest that adopting a pluralist world view may be more appropriate for investigating place concepts. Pluralism is the idea that different paradigms can and should coexist within a discipline (Patterson & Williams, 1998). It stands in contrast to a rationalist world view that there is only one right epistemology (research logic). Pluralism recognizes that any given paradigm has the limitations and makes assumptions about the relative significance of different threats to validity. In recognizing the inherent limitations of an given paradigm, pluralism focuses

more on the match of a paradigm's philosophical commitments to the phenomenon being studied, the kinds of research questions that are being asked about the phenomenon, and on internal consistency of methods and assumptions rather than oppositional dialog trying to establish the absolute superiority of one paradigm over another.

It is important to recognize that adopting a research topic (e.g., place) does not definitively predetermine the epistemological logic. Likewise, choosing particular paradigmatic research logic does not completely predetermine a theoretical foundation. For example, while approaches such as attitude theory have relied on psychometric, multivariate techniques to describe sense of place as a single reality, all psychometric approaches need not be based on an attitude theory.

Adopting a pluralist world view also does not necessarily imply integration of divergent paradigmatic approaches within a particular research design either (Patterson & Williams, 2005). Quite simply, paradigms should not be mixed and matched within study conceptualization, design, data collection, and analysis as seen fit by the researcher. For example, adopting a phenomenological approach to data collection and a psychometric approach to data analysis would not be internally consistent (see Williams & Patterson, 2007). Instead, a consistency should exist in how a study is conceptualized, designed, and ultimately implemented.

This study adopted a pluralist view to best address the purpose of investigating a relationship with wilderness in the sense that it accepts that there are legitimately many different ways to study such a relationship. It specifically adopted a social constructivist conceptual framework for these relationships. Although social constructivists often employ interpretive/qualitative research paradigms, this study employed a psychometric

research logic to achieve the goal of modeling a wilderness relationship and examining its existence in a real world context. This logic was the most appropriate given the desire for precise definitions and quantification of concepts within a testable model. Such an approach is not inherently contradictory to the assumptions underlying social constructivism. Additionally, because psychometric logic guided sampling, survey development, data collection, and data analysis and interpretation, the research meets the internal consistency criterion of a pluralistic world view. In following section, the social constructivist view is more fully described as it applies to the development of a conceptual and analytical relationship framework

### Social Constructivism

Social constructivism can be defined as the ideological persuasion that reality is a product of social interactions and dynamics (Soule & Lease, 1995). Based on a sociology of knowledge approach, social constructivism believes that reality is socially defined and that the meanings within this reality are created by people (Greider & Garkovich, 1994). This subjective reality is maintained via the relationship between the products of human beings (e.g. organizations, landscapes), the way these products gain a reality of their own, and how they are transformed into part of the human consciousness (Gerber, 1997). Ultimately, emphasis is placed more on the interpretations of individuals and their experiences in a social context than on the discrete characteristics of the setting. While social constructivism does acknowledge that distinct setting characteristics exist, it suggests that understanding the meanings or experiences related to those characteristics is more important.

In a social constructivist approach, the focus of control is placed upon the individual. This parallels Glacken's (1967) characterizations of humans as geographical agents, modifying the environment and transforming landscapes. However, Glacken's conceptualization of the relationship of human culture to the natural environment only begins to address the control or authorship of the construction of meaning across landscapes. This is important, especially when considering a relationship with wilderness, because understanding who controls the construction of meaning allows us to investigate how meaning changes. Social constructivism suggests individuals perceive and categorize their social and natural environment in terms of symbols and meanings (Greider & Garkovich, 1994). One way to understand a place is through navigating and confronting its symbolic and meaning-laden constructions. Thus, symbols and meanings are used to define situations and construct reality. Through interactions between individuals in a society, reality becomes co-constituted as meanings are expressed and shared. This implies that a constructivist approach is process-orientated. More attention is given to the process that develops these meanings than on the actual individual meanings themselves. By acknowledging an emergent, active process, social constructivism addresses the historical, cultural, and political processes by which humans seek out, create, and evaluate place meanings (Williams, 2000). Culture becomes a driving force in this process and can be thought of as a "map" of meanings that makes the world intelligible (Williams, 2000).

The philosophical commitments of social constructivism have important implications for the practice of social science. It reflects ontological commitments that reality changes across time, culture, and individuals and that human experience is not

wholly deterministic in nature (Patterson & Williams, 1998). This implies that producing universal laws regarding human behavior cannot, or more importantly should not, be the goal of scientific research. Therefore, science reveals less into the workings of the natural world and more of the culture and politics within which scientific knowledge is interpreted (Proctor, 1998).

A common criticism of social constructivism is that it can be perceived as relativism. With the focus of control placed upon the individual, the broader and more generalizable value of a place can appear to be lost to the idiosyncrasies of each person. More specifically, why should natural resource managers focus their attention on the various meanings of a place if these meanings are all just relative? Such an argument is not without merit. An extreme constructivist perspective can lead to extreme relativism that is intractable in the context of wilderness management. Supporters of extreme constructivism argue that critics are simply worried about losing their role over determining what counts as “truth” (Proctor, 1998). However, the debate of constructivism versus relativism fundamentally ignores the importance of process. The value of a social constructivist approach is in examining the process of how meanings are created and negotiated. By investigating the nature of this process, researchers may be able to determine the factors that are most influential in the creation of meaning.

#### Wilderness as a Social Construction

Social constructivism also has important implications related to landscapes, particularly wilderness. The notion that landscapes are socially produced suggests that their meanings are anchored in history and culture, not the objective, tangible, visible properties of nature (Williams, 2000). Acceptance of this proposition represents a shift

from the traditional goal-directed management of wilderness. That traditional approach typically employs a utilitarian language enabling meanings and values to be defined in a way analogous to extractive uses (Williams, 2000). That is, the recognition of values in a utilitarian sense only occurs so far as resources can be recognized that are directly beneficial for human use. Therefore, employing a meanings-based approach grounded in social constructivism encourages management to be more responsive to a much different set of values and meanings that various users associate with a wilderness context. It provides justification for the decision to provide diverse experience opportunities that are reflective of the multiple values and meanings different users and the general public associate with wilderness, including but not limited to those anthropocentric values of use, enjoyment and benefit.

The notion that nature and more specifically wilderness are social constructions has been met with much debate. This debate entails more than just the contested meanings of a wilderness landscape between individuals, but the idea of wilderness itself. To some, wilderness is the evolutionary and ecological processes occurring on the landscape. In this view, its value is in conserving biodiversity, water quality, and natural resources. Others view wilderness as a culturally constructed, a distinctly American idea that has developed historically through the process of human interaction with the landscape. For example, Sutter (2002) argues that the founders of the Wilderness Society felt that wilderness was as much about “wildness” and the absence of human control as it was about pristine ecological conditions. These positions suggest that wilderness is much more than the natural attributes on the ground. It is composed of personal meanings, symbolism, and values that have accumulated over time through human experience. It

resonates not just through a distant landscape but also through individual and collective imagination.

A social constructivist perspective regards the idea of wilderness as a social concept. It moves from an ontological argument about the existence of wilderness to an epistemological stance that scrutinizes the idea of wilderness (Proctor, 1998). Wilderness has been described as a profoundly human creation (Cronon, 1996). More specifically, wilderness is an *American* creation, what Nash (1982) calls a basic ingredient of American civilization. Through cultural norms, political structure, and human interactions, our civilization has created an image of what we define as wilderness. Likewise, our expectations for urban landscapes have developed in contrast to our image of wilderness, thus providing an atmosphere that motivates us to escape to nature.

Cronon (1996) argues that the meaning of wilderness has historically changed. Prior to the 19<sup>th</sup> century, a “wilderness” was considered dangerous, barren, or desolate. In the Judeo-Christian tradition, the term wilderness became synonymous with “waste” and “desert” (Nash, 1982). This perspective began to change with the settling of the American West. Early white pioneers perceived wilderness as frightening and a land of “darkness”, but something to be overcome and subdued by European settlers (Rudzitis, 1996). The wilderness now became the frontier, a land to be tamed by human ingenuity and perseverance. This idea of the frontier fostered the belief that wilderness was the last bastion of rugged individualism (Cronon, 1996) and helped forge the notion of what is our American character.

Transcendentalist writers like Emerson and Thoreau brought a certain romanticism to the wilderness idea. They viewed wilderness as essential to all people, a

place from which we all emerged and still hold primordial ties (Rudzitis, 1996). These writers also found in wilderness a counterpoint to the Old World (Nash, 1982). America was without the ancient history, art, and architecture found in Europe. As individuals search for a national identity, nature, wilderness, and the frontier became America's prized possession. Mountains and forests were seen as nature's temples and cathedrals and wilderness became a sacred American icon.

In 1890, the passage of the Yosemite Act marked a turning point for the idea of wilderness. With the guidance of John Muir, the Yosemite Act set aside the land that would later become Yosemite National Park. This legislation marked the first preserve consciously designed to protect wilderness (Nash, 1982). While much can be said about the national park system and its role in the creation and protection of wilderness, national parks and wilderness areas were not one and the same politically or aesthetically (Sutter, 2002). As America grew in the early 20<sup>th</sup> century, economic and infrastructure developments and the proliferation of automobiles provided an opportunity for a larger segment of the population to experience nature. Our relationship and interactions with wilderness changed with new meanings reflective of the changes that were occurring socially and culturally. In his book *Driven Wild*, Sutter (2002) suggests these developments in part spurred the creation of the Wilderness Society and eventually the creation of the Wilderness Act in 1964. A new constituency for wilderness had developed, bringing with them a diversity of new values attributed to the landscape, based in both culturally endowed and personally experienced values.

Based in this historical context, Cronon (1996) suggests that values associated with an uninhabited wilderness are entirely the creation of our culture. He argues that the

removal of Native Americans from the landscape to create a wilderness never inhabited in human history is a prime example of just how invented and constructed the American notion of wilderness really is. More importantly, Cronon believes we leave ourselves little hope in discovering what an ethical and sustainable human place in nature might actually look like when we remove humans and their cultural influence from the landscape.

The view of wilderness as a social construction has been met with much criticism. Willers (2001) views Cronon's argument as a postmodern attack on both wilderness and environmentalism. He argues that viewing wilderness as merely a social and cultural construct ignores that wilderness is a physical reality that truly exists with both evolutionary significance and definable biological traits. Ultimately, Willers suggests that adopting a social constructivist philosophy is to approach wilderness strictly in terms of social and utilitarian values and ignore its own independent existence.

Soulé (1995) describes social constructivism, or "deconstruction", as a covert ideological assault on nature. This assault's aim is to dethrone objectivism, which Soulé believes is the basis for science and discourse in our modern area. He also suggests that positing the concept of pristine nature as merely an idea or myth opens wilderness and other lands to exploitation. Therefore, social constructivism is essentially taking a relativistic view of nature and allows license for anything goes. From this viewpoint, the value of wild places is lost upon those individuals and institutions wishing only to gain from development of our natural resources.

In response to these criticisms, Cronon (1996) emphasizes that his point is not to trivialize our current problems or to say that our devastating effects on ecosystems should

be accepted as inevitable or “natural”. Instead, he believes progress in solving these problems is unlikely if we continue to describe wilderness as a place we ourselves cannot inhabit. Considering wilderness as a human construction does not devalue its importance in our culture or dismiss our responsibility for its protection nor even acknowledgement of the importance of biological conservation. Instead, Cronon warns that certain views of wilderness can create a dualism in which humans are viewed as entirely outside of nature. It is this dualism that can remove our responsibilities for conservation and protection of resources.

Another way to examine the social construction of wilderness debate is from an epistemological perspective. Proctor (1998) frames the social construction debate in terms of two epistemological actors: the knowing subject and the object of knowledge. The knowing subject represents the world of ideas, concepts, and values. The object of knowledge is the world of reality and existence. Social constructivism embraces the knowing subject, the conglomeration of individuals and the culture that constructs the idea, concept, and values of wilderness. While this position moves precariously close to relativism, Proctor argues this is not unique to the wilderness concept. Ideas such as “wildness” and “biodiversity” also are human concepts that carry cultural, political, and other important meanings. The power of these concepts is in their epistemological sophistication (Proctor, 1998) and the fact that the negotiation of meanings in a culture is a dynamic creation of knowledge, unlike relativism that ignores this process and allows free range of stances and equality of epistemological standpoints.

Ultimately, the debate over the social construction of wilderness demonstrates two important points. First, it is useful to examine how historically the meaning of

wilderness has changed over time. By investigating how we have moved from fear and dominance over the wild, untamed landscape, to the transcendental tenets of oneness and veneration of nature, lessons can be learned from the process of how our meanings and values have changed. Second, Cronon (1996) argues that an uninhabited view of wilderness creates a dualism where humans are outside of nature. This dualism is a stark contrast with the idea of a relationship with wilderness. From the early pioneers to writers such as John Muir, Aldo Leopold, and Edward Abbey, it is apparent that humans have interacted with the landscape and created meaning. As our identities are influenced by these meanings, we have placed ourselves within nature and become part of the larger cultural landscape that we have created to represent this idea of wilderness both directly experienced and culturally constructed.

By understanding the nature of these social constructions and their influence, one can begin to comprehend how a wilderness like the BWCAW can become a symbolic landscape with which individuals may develop long-term relationships. More specifically, examining the relationships individuals develop with the landscape is in essence beginning to understand the values, meanings, and importance individuals associate with a place. It is operationalizing a mutual wilderness definition within the individuals responsible for that definition by describing the relationships they develop. However, before such a concept can be hypothesized and eventually contextualized to the BWCAW, it is important to understand how the notion of relationship has been operationalized across other disciplines. By examining what constitutes a relationship within other social sciences, it is possible to translate previous knowledge and understanding to a wilderness and natural resource management context.

## What is a Relationship?

A variety of fields have explored a relationship metaphor as a framework to describe environmental and consumer experiences (Fournier, 1998; Manzo, 2003; Brooks et al., 2006). This study characterizes a relationship as how individuals negotiate their personal experiences and the social world around them. In this sense, a relationship is more than a singular state of mind. States can be described as straightforward, fragile, and transitory. They may shift as quickly as an individual's mood and be influenced by insignificant external stimuli. Instead, this study argues that relationships are cumulative, trait-like, more enduring and more central to a person's identity. They develop over time and evolve as individuals renegotiate meaning across landscapes. As individuals accumulate experiences across a life course, information is processed and integrated into their understanding and personal identity. Over time, individuals construct relationships that are consistent with their own goals, cognitive abilities, and social demands (Laursen & Bukowski, 1997).

To further understand this characterization of a relationship, it is beneficial to examine the roots of relationship science. While a semantic discussion of relationships could be presented across the natural and social sciences, this study suggests examining two specific fields whose traditions have served as paradigmatic foundations to much wilderness and natural resource management research: psychology and consumer marketing. In the following sections, the definition and general application of a relational concept will be discussed. Several themes will be presented that are applicable across both disciplines and will eventually form the basis for hypothesizing a relationship model in a wilderness context.

## Psychology & Close Relationships

Berscheid and Peplau (1983) describe the desire to understand close relationships as probably as old as humankind. For centuries, we have been fascinated by understanding the dynamics of husbands and wives, parent and child, and friends and neighbors. Virtually every psychological study of human happiness has shown that satisfying close relationships are what constitutes the best things in our lives (Berscheid, 1999). Also, much of the practical utility of relationship research derives from the central role that human relationships play in our happiness and physical and mental health (Berscheid, 1994). Thus, take this utility to a wilderness relationship and we might see that to look at the significance of wilderness in our lives could be predicated by the strength of our relationship to wilderness.

The science of close relationships has interdisciplinary origins and is international in scope (Berscheid, 1994). Anthropologists and sociologists have examined the influence of the social environment on human relationships. Biologists and natural scientists have looked at evolutionary origins and biological constraints of relationship development. Psychologists have explored the dynamics of marriage, sexual relations, and offspring interactions. Each of these disciplines has developed their own language of relationships, created their own terminology, concepts, and theories relative to their particular focus (Berscheid & Peplau, 1983). In psychology, a widely accepted definition of close relationships focuses on dyadic interactions with a high degree of interdependence, manifested by frequent, strong, and diverse interconnections maintained over time (Kelley et al., 1983). More succinctly, a close relationship “displays

interdependent interconnections in the form of frequent, diverse, and enduring interactions” (Laursen & Bukowski, 1997, p. 751).

Due to the various differences across disciplines, an over-arching generalization of close relationships has not developed (Hinde, 1995). Attempts have been made to identify commonalities underlying certain types of relationships and to create a knowledge base, but empirical progress has been slow (Berscheid, 1994). Therefore, it is more important to situate the concept of relationships in its given field and focus on the dimensions most applicable to the particular questions being asked. Researchers must consider the type of relationship developed, its characteristics, the individual’s history, and the culture in which they live if we are to understand relationships (Hinde, 1995).

In the field of psychology, Berscheid (1994) has examined the state of knowledge for close relationships and relationship science. She argues that psychologists usually search for laws that govern an individual’s behavior and subsequently the cause of that behavior. Berscheid believes that the greatest potential of relationship science is “to improve our understanding of human behavior” (p. 261). It seeks to determine laws that govern individuals’ interactions with each other. She also argues that relationships themselves are invisible and do not reside in the individual. Instead, a relationship exists by observing the effects of the interactions between two individuals. It is not static, but a dynamic process that is revealed only over time.

Based on these concepts and further exploration of close relationships in psychology, several themes emerge that are fundamental to conceptualizing a human relationship with wilderness. These themes address the core of close relationships and characterize the common properties of a close relationship. A central theme of the nature

of relationships is that relationships exist over time. They are not seen as fixed entities, but as dynamic processes that ebb and flow over an individual lifetime. Relationships are more variable than static, balancing changes in participants with changes in the social context that encompass the relationship (Laursen & Bukowski, 1997). Interactions between individuals may be affected by preceding ones and influenced by expectations about the future (Hinde, 1995). Therefore, to ignore variability in relationships across time overlooks the importance of temporal fluctuations in influencing relationships (Gable & Reis, 1999).

This theme is important to the conceptualization of a relationship with wilderness because it emphasizes that the interactions and experiences individuals have with wilderness are more than single transactions. They dynamically change in relation to the social context and specific individuals involved. Given time, these interactions and experiences may influence future expectations and experiences individuals have for a specific wilderness context.

A second theme is that relationships involve at least two individuals or entities. Historically, psychology has examined such personal relationships as that of parent to child, friend to friend, and romantic partner. Within these relationships, individuals are interdependent as a change in one causes changes in the other (Berscheid & Peplau, 1983). Behavior and experiences are also interdependent in a relationship. How someone behaves within a relationship affects the subjective experiences of participants and these experiences can affect future behavior (Hinde, 1995). Over time, emotional bonds can form that act as psychological tethers. These bonds provide security and hold individuals together, sometimes regardless of whether they still enjoy being together (Hazan &

Shaver, 1994). Eventually, norms, goals, and standards for the relationship are established that shape the subsequent force and direction of the relationship and the individuals in it (Laursen & Bukowski, 1997).

Thus, relationships are beyond the individuals themselves and influenced by other people (Berscheid & Peplau, 1983). Such a theme is relevant in a wilderness context because opportunities exist to interact with various other individuals and entities. Management personnel, backcountry staff, traveling partners, and other wilderness users all represent possible relational entities. With some, such as traveling partners, the amount of interpersonal experience might be significant. Conversely, interactions with backcountry staff and other users may be infrequent, but a relationship may form that is normative and applied generally to future interactions and encounters. Inherently, these relationships represent a bond that may provide for a notion of security, personal identity, or embeddedness with other individuals and entities.

A third important theme is that relationships exist in a social context. They are not independent from the social, cultural, and temporal situations. Instead, they are embedded in a larger social network made of shifting individuals and groups (Laursen & Bukowski, 1997). Social forces relate to institutional structures, personal values, social norms, and cultural stereotypes. These forces influence the creation, maintenance, and negotiation of these relationships over time and space. They become dynamically linked in a continuous process of reciprocity between individuals and social contexts (Hinde, 1995). Therefore, to predict a relationship's future, the nature of the social environment that the relationship inhabits must also be predicted (Berscheid, 1999).

Considering this study's philosophical foundation of social constructivism, acknowledging and examining the social context of a wilderness relationship is extremely important. An understanding of the cultural and social forces that may affect a wilderness area is necessary to frame an individual's relationship and hypothesize which forces will have the greatest influence over time. It may assist researchers in delineating which social and cultural forces are hindering or helping an individual's wilderness relationship.

Investigating relational behavior in terms of context, individual relationships, and time variation is central to developing a more complex and comprehensive relationship theory (Gable & Reis, 1999). However, many other characteristics can also be associated with close relationships. Relationship science has investigated numerous concepts including jealousy, love, attachment, social support, and relationship dissolution (Berscheid, 1994). Specifically the concepts of trust and commitment are believed to play a central role in shaping motivation and behavior in ongoing relationships (Wieselquist, Rusbult, Foster, & Agnew, 1999). The operationalization and utilization of both of these concepts in the hypothesized relationship model will be described later in this chapter.

Determining the interplay of these themes within a social context helps us understand the process of how close relationships are created and maintained between individuals. However, relationships can also form between objects other than two individuals. Connections to brands, companies, or other organizations can develop over time. These types of relationships have been recently examined within the field of consumer marketing. The following section describes the contributions of social, relational, and public purpose marketing to the conceptualization of a relationship with wilderness model.

## Relationships & Marketing Research

Kotler and Zaltman (1971) argue the core idea of marketing lies in the exchange process. They believe marketing does not occur unless there are at least two parties involved with something to exchange and the ability to carry out communication and distribution. The field of marketing research has branched off of this definition to examine traditional product-based marketing, social marketing focused on behavioral change and influencing social action, and relational marketing aimed at fostering buyer-seller relationships. The following section will move beyond traditional marketing approaches to further examine the idea of social marketing and more specifically relational marketing. The common themes of these approaches will be utilized to further conceptualize a wilderness relationship model.

Bright (2000) suggests the job of recreation professionals is to provide opportunities for achieving certain benefits, but also to get the word out regarding these opportunities and benefits. He believes a systematic process is necessary to plan, develop, provide, and communicate to the public the many opportunities and subsequent benefits enjoyed from recreation. Encouraging a shift in values from a more utilitarian and extractive use perspective to the recreational benefits and opportunities associated with wilderness and recreation represents a social change. The field of social marketing can provide a framework for planning and implementation of this type of social change (Kotler & Zaltman, 1971).

Social marketing was derived from the private sector as a way of “marketing” social ideas and has become established in the institutions of non-profit organizations, government agencies, and universities (Bright, 2000). Campaigns such as “Smokey the

Bear”, “Keep American Beautiful”, and “Give a Hoot” demonstrate public marketing aimed at achieving social objectives. In these campaigns, agencies such as the National Ad Council and National Forest Service act as mechanisms that enable the public to translate their values into action (Kotler & Zaltman, 1971). These agencies represent the origin or source responsible for the messaging campaign. Additionally, these programs are customer-focused, addressing the individuals who will become the beneficiaries of the social change (Bright, 2000) and seeking their endorsement, cooperation or active participation.

Social marketing demonstrates a shift from traditional product-based marketing. It typically deals with the market’s core beliefs and values (e.g. resource protection, conservation, nationalism, health, etc.) instead of the superficial preferences and opinions associated with a more business-orientated approach (Kotler & Zaltman, 1971). Arguably, social marketing represents the first step of moving beyond the idea of single transactions between consumers and sellers to a more dynamic interaction between transaction partners. The types of endorsements and cooperation that are the goal of social marketing cannot be achieved through a single transaction, but repeated communication and interactions. However, an understanding of how these dynamic types of interactions are created and fostered is better achieved through the field of relationship marketing.

The idea of relationship marketing or relational exchange is somewhat new to the field of consumer and marketing research. Quite simply, relationship marketing is putting the customer first and striving to improve the quality of the relationship between buyers and sellers (Illingworth, 1991). These relationships are about recognizing the customer’s

needs rather than strictly promoting the desirable characteristics of the goods being marketed. Berry (1995) takes credit for introducing the phrase “relationship marketing” to the literature in 1983. Previous to this, marketing research largely neglected the relationship aspect of buyer-seller behavior (Dwyer et al, 1987).

Understanding the concept of “relationship marketing” requires distinguishing between discrete transactions, which have a short duration, and relational exchanges, which are longer in duration and reflect an ongoing process (Dwyer et al., 1987; Morgan & Hunt, 1994). Relational exchanges address the issues of substitutability and switching costs. Substitutability acknowledges that customers can have many available choices in the market that fulfill their needs. To understand relational exchanges, it is necessary to understand what motivates consumers to reduce their available choices by patronizing the same marketer in subsequent situations (Sheth & Parvatiyar, 1995). Switching costs refer to the new investment for both customers and sellers to switch to new business partners. Because of the high switching costs for customers to choose new products/suppliers or for sellers to attract and acquire new customers, it is much easier to maintain existing customers and to invest in sustaining quality relationships (Dwyer et al., 1987; Morgan & Hunt, 1994; Berry, 1995). In addition, Barnes (1994) suggests that most relational marketing authors “have accepted, without question, the principle that retaining customers, rather than constantly seeking new ones, is sound business practice” (p. 562).

Therefore, relationship marketing involves all marketing activities directed towards establishing, developing, and maintaining successful relational exchanges (Morgan & Hunt, 1994). These exchanges occur over time and participants expect to derive complex, personal, noneconomic satisfactions (Dwyer et al., 1987). Engaging in a

relationship may add significant meaning to the life of the individual choosing to be a partner in the relationship (Fournier, 1998). Their choices may come to represent their personal values, identity and the social norms to which they ascribe.

For these reasons, Barnes (1994) argues that the bond between buyer and seller must be more than a barrier to exit for individuals. He believes that those who view relationships as “locking-in” the customer are simply defining the relationship as merely a series of interactions, without referencing the deeper feelings associated with other human relationships. Instead of a customer feeling trapped against their will, marketers should strive to create an atmosphere where consumers want to reduce their market choices by engaging in an ongoing loyal relationship (Sheth & Parvatiyar, 1995). This fosters a form of commitment made by consumers to only patronize certain products, services, and institutions instead of exercising all their market choices (Sheth & Parvatiyar, 1995).

Two concepts considered central to successful relationship marketing are the dimensions of trust and commitment (Morgan & Hunt, 1994). They are influenced by partners having shared values and are similar to their conceptualization as described by Berscheid and Peplau (1983) and Wieselquist et al. (1999) within the field of close personal relationships. Trust is often seen as the single most powerful relationship marketing tool available (Berry, 1995). It exists when one party has confidence in the reliability and integrity of the exchange partner (Moorman, Zaltman, & Deshpande, 1992; Morgan & Hunt, 1994). In an environment where consumers feel vulnerable, trust reduces uncertainty because they know they can rely on a trusted product or seller (Chaudhuri & Holbrook, 2001). It shows that individuals have confidence in one another

and that the interactions of the relationship will result in the desired outcomes or experiences. Therefore, feelings of reliability, safety, and honesty are all important facets of an individual's operationalization of trust (Chaudhuri & Holbrook, 2001).

Commitment reflects the strength of the bond between two relational partners. It describes the durability of the relationship over time and the investment that each partner has made in the other. This definition suggests commitment is "enduring" and reflects a "positive valuation" of a relationship (Moorman et al., 1992, p. 316). It involves psychological attachment where the self and the partner can become linked (Wieselquist et al., 1999). Sharma and Patterson (1999) also suggest that commitment is strongly linked to exchange partner's communication effectiveness. The greater the communication effectiveness, the stronger the relationship commitment and emotional bonds between partners. Therefore, through communication and high standards of conduct, commitment can be maintained over the course of a relationship.

Relationship marketing has become widely applied in the field of marketing research. One area considered most capable of informing theory regarding relationship marketing is brand loyalty (Fournier, 1998). Brand loyalty describes the relationship a consumer develops with a certain product. It is a degree of commitment in terms of some unique value associated with the particular brand (Chaudhuri & Holbrook, 2001). A relationship with a brand is valid at the level of lived experiences (Fournier, 1998). Through repeat transactions, consumers become experienced with a brand. Over time, these experiences can develop into trust and commitment with the product and can be retrieved to be using in similar situations (Sheth & Parvatiyar, 1995). This process mirrors that of a conceptualized relationship with wilderness. As users accumulate

experiences in a specific context (e.g. BWCAW), they may associate a particular wilderness area with a certain identity that is very similar to their own personal identity. In essence, the user develops loyalty to that area. This relationship may then become inseparable from the person's sense or concept of wilderness (Brooks et al., 2006).

To further operationalize a consumer-brand relationship, Fournier (1998) describes four core conditions. First, a relationship involves a reciprocal exchange between active and interdependent partners. Without these actors present, a relationship cannot exist. Second, relationships are purposive. They add structure and meaning to the individual's life. Third, relationships are complex phenomena. No two relationships are exactly the same, varying by social and cultural context, biophysical setting, and personal values. Finally, relationships are process-driven phenomena. They change and evolve over time as individuals interact with the contextual environment and actively construct spaces into meaningful landscapes.

These four core conditions described by Fournier (1998) will be utilized to hypothesize a relationship with wilderness model for the context of the BWCAW. Such a relationship can reflect a commitment made by the user to continue visiting/patronizing that particular recreation area despite other choices that exist for them (Sheth & Parvatiyar, 1995). Along with the other themes previously described in the psychology and marketing literature, these core conditions will operationalize the conceptual and analytical framework for a relationship in a wilderness context.

#### Summary of Philosophical Commitments

Based on this previous research and literature, the philosophical commitments for this study are summarized below. These philosophical commitments drive the

development of the study's methodology and will influence the subsequent analysis and interpretation of results.

This study has adopted a social constructivist approach. This approach addresses how meaning is created and constructed by individuals in a social context. Within a wilderness context, this assumes that:

- The development of meanings is process-orientated.
- Focus of control is placed upon the individual in a wilderness setting.
- The reality and construction of wilderness changes across time, culture, and individuals.

This study also utilizes the notion of a relationship as a metaphor for examining emergent experiences and place meanings in a wilderness setting. From the perspectives of close personal relationships, relationship marketing, and four core conditions proposed by Fournier (1998), this study assumes:

- A relationship with wilderness exists over time. It is more than a single transaction.
- Relationships involve at least two individuals or entities, requiring a reciprocal exchange between interdependent partners (e.g. users and the Forest Service).
- Development of a relationship is a dynamic process, changing over time and can lead to the formation of reciprocal emotional bonds between partners.
- A relationship exists in a social context, dependent upon social, cultural, and temporal situations. They are complex cultural, social, and biophysical phenomena.
- Relationships are purposive, adding structure and meaning to individual identities.
- Trust and commitment are two important dimensions of a relationship that ultimately can lead to loyalty to a particular area.

These philosophical commitments underlie the conceptual framework for a relationship with wilderness. In the following section, this study will hypothesize a predictive model consisting of the hypothetical dimensions of a relationship to self, a relationship to management agency, and a relationship to place. This model will then be applied and tested in the context of the BWCAW to determine the presence and structure of a wilderness relationship.

### Proposed Relationship Model

As previously described, a framework for a relationship with wilderness is necessary to establish both conceptual and empirical clarity. Because an over-arching generalization of relationships has not been developed, it is more important to situate the concept of relationships relative to the field of protected area management. This conceptualization should focus on the dimensions most applicable to this study's research questions and to an understanding of the BWCAW context.

Before the proposed model for a relationship with wilderness can be operationalized, two fundamental assumptions of this study must be described. First, this study assumes that a relationship can be characterized as an expression of meaning. Greider and Garkovich (1994) describe meanings as the way individuals define and categorize the social and natural environment. Meanings are the basis for constructing reality and conferring significance to a landscape. Therefore, the development of a relationship represents the dynamic process of translating experiences and creating meanings relative to the given social, biophysical, and managerial context. These meanings are subject to change over time as both external and internal forces influence the relationship. This assumption coincides with Fournier's (1998) argument that

relationships are purposive and add meaning and structure to our lives. They are part of an ongoing, dynamic process.

The second assumption of this study addresses the issue of causality in a relationship framework. Because this study utilizes a social constructivist paradigm to examine a relationship with wilderness, one may question which construction came first, the individual's relationship with wilderness or an individual's social construction of wilderness. This study assumes that there is an initial social construction of wilderness that each individual has developed. This construction acts as a baseline from which future negotiation and interpretation can occur with each individual. Social forces such as family, peers, and cultural influences develop this initial construction. As other external (e.g. technology, policy) and internal forces (e.g. aging, experience) act upon individuals over time, this initial construction may change into a semblance of an initial relationship with a particular wilderness area.

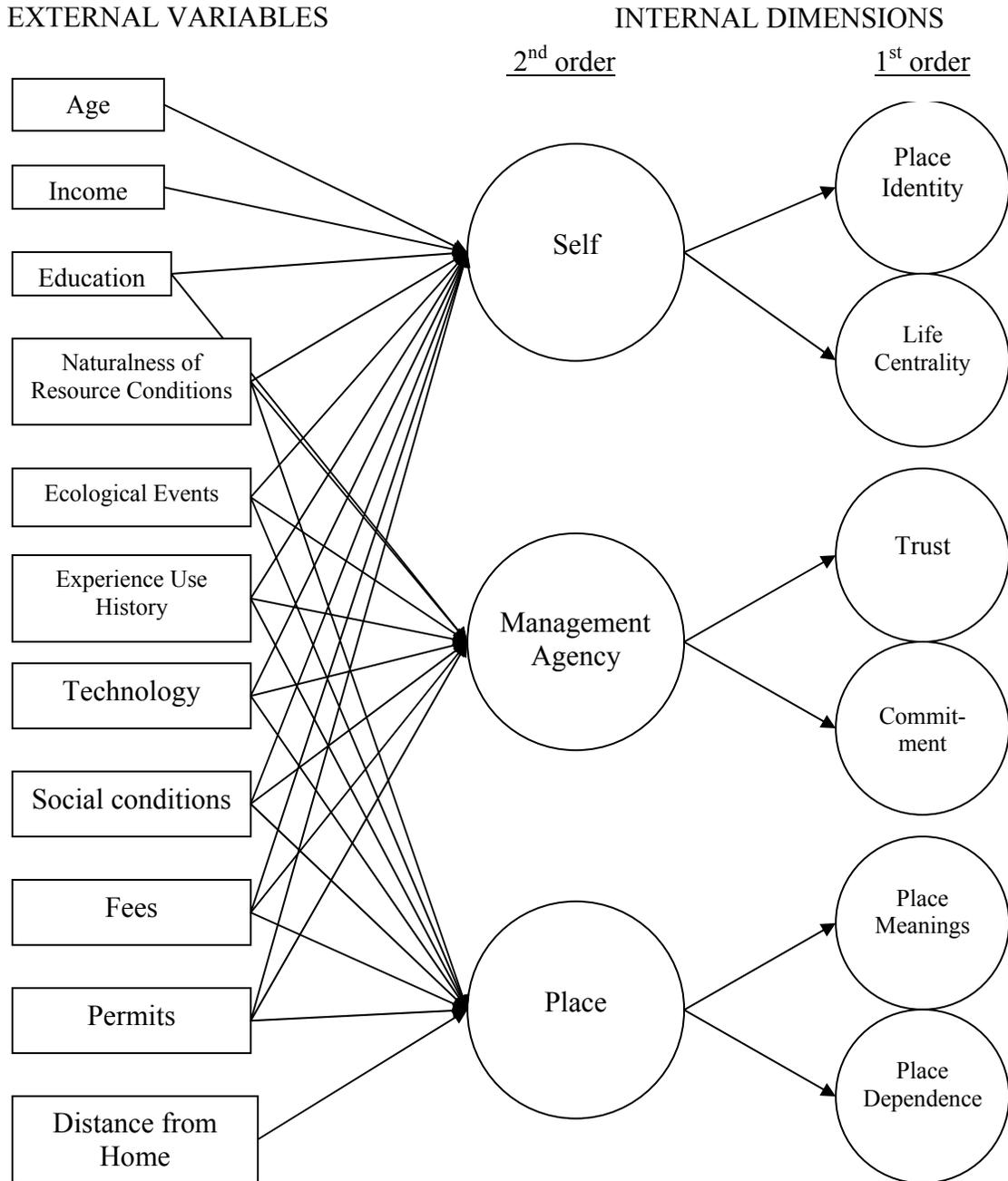
This initial relationship can continue to change as individuals are further exposed and gain more experience with a specific wilderness context. This development is a complex process (Fournier, 1998) where numerous forces can directly and indirectly influence key relationship dimensions. Focusing on these external and internal forces and their effects provides researchers with the ability to understand and investigate how relationships develop and change. No two individuals have the same upbringing, experiences, or cultural forces acting upon their relationships. Understanding how individuals renegotiate their relationships based on these forces may provide insight into relationship construction and maintenance.

These fundamental assumptions and the themes presented from psychology and relational marketing provide the conceptual basis for developing a model for a relationship with wilderness. This model is diagrammed in Figure 1. From this model, a methodological and analytical approach was developed to test the existence of wilderness relationships in the BWCAW. The following sections operationalize each of three hypothesized internal dimensions of the model. They describe why a relationship to self, management agency, and place are all necessary for constructing a relationship with wilderness. In addition, each of the external factors hypothesized to be associated with an individual's relationship will be briefly described.

### Internal Dimensions

Although the relationship concept in this study is hypothesized to be constructed of multiple dimensions, it is important to note that the diagram of the proposed model does not have a representation of an overarching relationship construct. This decision has been made for two reasons. First, analysis of the relationship model is dependent upon confirming the proposed underlying structure of the model. Each significant first-order factor is hypothesized to be constructed from some measurable component of a higher second-order factor and an overarching relationship factor. A first-order factor is a variable considered to be one level or one unidirectional arrow away from the measured variables (Byrne, 1994). A second-order factor is hypothesized to explain all variance and covariance related to the first-order factors. Therefore, incrementally establishing the structure for each of the first-order factors is a prudent first step. Second, interpretation of an overall relationship factor may be difficult and abstract. As the incremental analysis proceeds, it will be determined whether an interpretable and meaningful value for

**Figure 1: Diagram of Proposed Model**



the construct can be determined. For these reasons, a precautionary approach was taken in explicitly illustrating the overarching relationship construct until results from the study can confirm its existence and application. Such an approach also still allows for an examination of the interactions among the hypothesized internal dimensions within the relationship model and how external factors are associated with these dimensions.

It is also important to emphasize that ideally the model represents the temporal nature of a relationship. Experiences and meanings have reciprocal interactions that are simultaneously influencing each other. Over time, these interactions may change the nature of the relationship and subsequently the nature of variables that are influencing the relationship. However, to operationalize, identify, and ultimately interpret a predictive model where reciprocal effects or feedback loops are present among all internal variables and external variables is extremely difficult. Such a predictive model creates a situation where internal and external variables are both the cause and effect of each other, respectively. To avoid this issue, this study proposes a model that represents only a direct and more parsimonious pattern of interactions between variables and dimensions.

The internal dimensions hypothesized in this study to investigate the nature of a relationship with the BWCAW are best operationalized as a second order factor model. This model consists of three theoretical dimensions: relationship to self, relationship to management agency, and relationship to place. Each of these dimensions are considered endogenous or internal because their causes are predicted and represented in the model (Kline, 2005), in this case by the external variables. These dimensions are also considered to be multidimensional constructs, illustrated as second order factors in Figure 1 using structural equation modeling notation. The following sections will operationalize each of

these dimensions by specifically defining the lower order concepts predicted by each of these internal dimensions.

Relationship to Self - According to Berscheid & Peplau (1983), most people are aware that their relationships play a crucial role in shaping the character of their lives. Relationships have been described as cultural expressions that define who we were, are, and hope to be (Greider & Garkovich, 1994). Individuals construct relationships consistent with their psychological goals and cognitive abilities (Laursen & Bukowski, 1997). These relationships add meaning to our lives and change our self concept (Fournier, 1998). By addressing themes that are deeply rooted in personal history, relationships become central to the core of who we are as individuals (Fournier, 1998).

Psychology and the science of close relationships have particular interest in the role of self relative to interpersonal interactions. How participants interpret and internalize interchanges with other individuals are important processes for understanding how individuals form a representation or understanding of a relationship (Laursen & Bukowski, 1997). More specifically, Andersen and Chen (2002) suggest that self is relational and that this has implications for self-definition, self-regulation, and personality function. They believe one's sense of self may ultimately vary as a function of relationships with others. Therefore, new aspects of self are likely to develop or be enhanced on the basis of new relationships and experiences.

Beyond personal interactions, many groups socially construct landscapes as reflections of themselves and construct meanings as reflections of their self definition (Greider & Garkovich, 1994). As the meanings of landscapes change, individuals are forced to renegotiate who they are as an individual and attempt to incorporate landscape

changes into their identity. Through this process, we as humans orientate and situate ourselves in the landscape. The result is a concept commonly referred to in geography as the “geographical self” (Casey, 2001). This geographical self orientates its focus of control to create meaning within the individual and represents what their place in a given context means to them.

For these reasons, understanding and examining a relationship to self dimension as part of the wilderness relationship model is extremely important. This dimension provides the idiographic component of how a person identifies with a particular wilderness and how that place can represent who they are as a person. Knowing who we are relative to a place can provide insight into how we will react and incorporate future changes to that particular place into our identity. In the hypothesized relationship model, the relationship to self dimension is operationalized as consisting of two factors, place identity and life centrality. These factors center on what this thing that is the BWCAW means to an individual’s self identity and how it is an expression of them as a person.

The factor of place identity has been described as the emotional component of place attachment that refers to the symbolic importance of a place (Williams & Vaske, 2003). It is also defined as “those dimensions of the self that define the individual’s personal identity in relation to the physical environment” (Proshansky, 1978, p. 155). Therefore, place identity can be considered a component of self-identity (Proshansky, 1978) and as a cognitive structure that refers to a more global self-identification (Jorgensen & Stedman, 2001). Based on this support, place identity is considered an important factor of the self dimension in the relationship model. It represents how an

individual's emotional connections to the BWCAW can be a reflection of their own identity.

The second factor of the self dimension, life centrality, also addresses the personal relevance of the BWCAW to the individual. However, instead of considering the BWCAW as a landscape full of emotions, the concept of life centrality examines the landscape as an entity important to a person's lifestyle. The more the BWCAW represents their lifestyle, the more their life may become organized around that particular place. Eventually, that place may become a central element of their self definition.

Life centrality has previously been described as a component of leisure activity involvement. Havitz and Dimanche (1997) have defined leisure involvement as how we think about our recreation and its affects on our behavior. It can refer to an individual's involvement with various activities or settings. McIntyre and Pigram (1992) have theoretically conceptualized leisure involvement as consisting of three dimensions: attraction, self expression, and centrality to lifestyle. This conceptualization of involvement was adapted in this study to consider wilderness as the object of involvement.

Together, the place identity and life centrality factors comprise the self dimension in the relationship model. They are used to evaluate how the BWCAW is part of an individual's lifestyle and to what extent it is a representation of their self-identity. However, relationships are not solely posited within the individual. As previously argued, a relationship involves at least two individuals or entities (Berscheid & Peplau, 1983; Hinde, 1995). These individuals are interdependent and part of a reciprocal exchange where changes in one causes changes in the other (Berscheid & Peplau, 1983; Fournier,

1998). Because the existence of reciprocal partners is considered a crucial element in a relationship, a specific partner or entity was identified in this study as one of the endogenous dimensions. In this case, the partner is the federal land management agency responsible for the BWCAW, the United States Forest Service.

Relationship to Management Agency - For this study, understanding the relationship between individuals and the agency managing a wilderness area is necessary for two reasons. First, it defines the parties involved that are relational partners in a reciprocal dyad. In the context of the BWCAW, these parties are represented by Forest Service employees and recreational users. Second, it illustrates how each party has the ability to influence the actions of the other. The management agency is more than an intermediary between individuals and the wilderness. Their interactions with users are important and have implications for experiences and resource management.

Federal land management agencies and resource managers are sometimes described as “faceless” bureaucrats. However, this study argues that when considering the Forest Service in the context of the BWCAW, this is not necessarily the case. Similar to Illingworth’s (1991) perception of the auto industry, as far as the consumer or visitor is concerned, the staff are the face of the company or agency. One only needs consider the symbol of the iconic forest ranger or even “Smokey the Bear” to accept that the public is provided with a spokesperson for the Forest Service.

Expectations exist among users to encounter these icons or a spokesperson in some form during their visit. Whether they interact with staff at an information station, the trailhead, or somewhere in the backcountry, the possibility of encountering “management” is very real. Conversely, if users do not see rangers or other signs of

agency presence, they may wonder how their resources are being protected and managed. Is the staff of the management agency fulfilling its duty and responsibilities to the public? Therefore, interactions with management agency staff can be very important in constructing and negotiating the meaning of a wilderness area.

The management agency is also important because research suggests that relationships are affected by sociocultural structure and institutions (Hinde, 1995). As previously described, federal agencies, such as Forest Service, can act as mechanisms for the public to translate their values into actions (Kotler & Zaltman, 1971). These mechanisms are also the most powerful for generating relationship behavior (Sheth & Parvatiyar, 1995). This is because government institutions have the ability to specify norms and rules through regulatory policies and standards. Whether it is the implementation of a user fees program or a permit system, the government institution has the ability to reduce consumer choice. Sheth and Parvatiyar (1995) argue that as long as this choice reduction is not considered capricious or against the interest of the consumer, they will be more likely to engage in relationship behavior.

It is also important to recognize that federal agencies like the Forest Service can influence the quality of the experience for users and subsequently their relationship with wilderness. These agencies can determine the level of development and spatial distribution of backcountry sites. Visitor use limits and quota systems can create the presence of both high and low use areas, altering the number and type of social encounters. Prohibiting certain types of use (e.g. motorized, horseback) and activities (e.g. campfires) can also change the type and nature of the experience. Consequently,

how federal agencies place bounds on the wilderness experience can become a key component in influencing how individuals prescribe meaning to a setting.

Therefore, the operationalization of the management agency dimension assumes that factors besides what visitors encounter on a single visit influence how the visitor evaluates management policies and reacts to the agency (Watson & Borrie, 2004). Success in exchanges is defined by the development of a relationship with the visitor instead of short-term outcomes and satisfaction (Borrie et al. 2002). An understanding of these relational exchanges between public purpose organizations and individuals is a recent adaptation of relational marketing, known as public purpose marketing (Borrie et al., 2002; Watson & Borrie, 2003). Continued work in public purpose marketing may help managers become more knowledgeable of user requirements and needs. Managers may then develop and respond to different constituencies for a wilderness instead of always having to educate and inform new users (Berry, 1995). Such a constituency would be very cognizant of the opportunities, values, and meanings associated with a wilderness. Eventually, relationships could increase public involvement and advocacy for controversial land and wilderness management policies (Bright, 2000).

Trust and commitment are proposed as the two factors that represent the relationship to management agency dimension in the hypothesized model. As previously demonstrated in the literature, trust and commitment are two concepts central to the success of such relational exchanges (Morgan & Hunt, 1994; Sharma & Patterson, 1999; Wieselquist et al., 1999). Both are considered critical in developing and implementing public policy to meet the mandates and purpose of public lands (Borrie et al., 2002; Morgan & Hunt, 1994). Trust is widely viewed as an essential component for successful

relationships (Berry, 1995; Borrie et al., 2002; Dwyer et al., 1987; Moorman et al., 1992). It exists when one party has the confidence in an exchange partner's reliability and integrity (Moorman et al., 1992; Morgan & Hunt, 1994). In the case of the Forest Service, visitors may develop trust in the agency through their interactions with staff and their evaluation of management actions over time.

Trust can be quantified in terms of the perception of shared values, direction, goals, views, actions and thoughts (Cvetkovich & Winter, 2003; Winter, Palucki, & Burkhardt, 1999). It results when individuals perceive agencies such as the Forest Service to have salient values similar to their own (Cvetkovich & Winter, 2004). Using this operationalization and measurement items developed by Winter et al. (1999), individual's general trust in the Forest Service will be measured as part of an individual's relationship with the management agency.

Commitment can be defined as an exchange partner believing that an ongoing relationship with another is important enough to warrant maximum efforts in maintaining it (Morgan & Hunt, 1994). Along with trust, it is hypothesized to be the most important part of understanding the exchange between relationship partners and the development of a continuing relationship. Similar to brand loyalty in consumer marketing, commitment to an agency reflects that individuals recognize the beneficial outcomes that come from maintaining a relationship. They have a vested interest in the actions of the agency and the consequences of management policy and implementation. Borrie et al. (2002) have analyzed commitment to federal agencies using a multidimensional approach. While a multidimensional approach could provide a richer understanding of commitment, this study will take a more general conceptualization of commitment. It will utilize measures

developed by Morgan and Hunt (1994) that broadly address the different aspects of commitment. This general conceptualization of commitment provides for greater parsimony in the model while still adequately representing one of the factors of the endogenous relationship to management agency dimensions.

As part of the operationalization of trust and commitment, it is important to acknowledge if a causal relationship exists between these factors. It can be argued that as an individual's trust to a relational partner increases in a long-term relationship, it will be accompanied by enhanced commitment (Wieselquist et al., 1999). Thus, trust may have a direct causal effect on commitment. However, Wieselquist et al. (1999) clarify that although trust is arguably a gauge of commitment, both trust and commitment are sufficiently distinct within an individual that they account for an amount of independent variance. For this reason, trust and commitment are hypothesized as distinct factors in Figure 1 without any direct effects on each other. However, the influence of these factors and the formation of an overall relationship with wilderness need to be situated within a specific place and context. The following section will operationalize the important of place and the final internal dimension of a relationship with wilderness.

Relationship to Place - As humans we live in a place-based world. Places are much more than the setting attributes of a landscape. They are symbolic environments created by humans conferring meaning to nature. Through actively engaging with places and creating meaning, people can foster relationships with places (Manzo, 2003). These relationships are life-long, transforming over time and influenced by past experiences (Manzo, 2005).

The concept of place is important because it provides a context for understanding a relationship. It represents the environment where a human connection is taking place. Different environments present different challenges and opportunities for relationships (Laursen & Bukowski, 1997). Without place, a relationship with wilderness could not be grounded in a physical reality. Without place, it would be difficult to fully examine and investigate because the relevant environmental and social forces could not be determined.

By framing the examination of relationships in a specific place, we are able to determine the internal and external forces that are operating within the place. These situational factors can be compared to determine their effect on individuals and between partners in a relationship (Gable & Reis, 1999). Historical events and cultural forces may also be examined to understand what changes have occurred during the social construction of a given landscape. Despite this importance, Berscheid (1999) finds it disconcerting that social psychologists have neglected to fully examine the impact of the environment on relationships.

Place relationships involve people and their experiences (Brooks et al., 2006). Over time these experiences accumulate into meanings associated with the place. For example, Hart (1975) emphasizes that the decisions individuals have made in traditional land uses have created the look of the land and a unique vernacular. This vernacular can explain what we know and understand about the landscape. Jackson (1997) emphasizes that meanings can be associated with places by examining lived-in landscapes. He argues that by cultivating and working the land, individuals develop a relationship that shapes the landscape and its subsequent meaning. Such a bond needs to be considered when attempting to understand the perception of place in a social context (Tuan, 1974).

Therefore, these humanistic perspectives address the question, “What does it mean to dwell or live in a place?” How do these lived experiences across landscapes create the emotional significance of a place in human identity? (Buttimer, 1993)

Ideas of relationship to place have also been extensively studied in the field of recreation through the conceptualization of place attachment. Place attachment is described as a measurement of the strength of an individual’s relationship to place. It includes the influence of place on an individual and their dependence on the place for preferred activities. While these dimensions have been used to examine characteristics of recreation behavior, research has not examined the nature of a relationship to place temporally. A temporal view allows for exploring how places hold meanings, but also how both negative and positive experiences affect these meanings over time (Manzo, 2003).

Within the hypothesized model, relationship to place is operationalized by two factors, place dependence and place meanings. These factors account for the physical and psychological attributes associated with a particular wilderness setting. The factor of place dependence is described by Williams and Vaske (2003) as a functional attachment to place. It emphasizes the necessity individuals attach to a specific place for enjoyment of a particular leisure activity or recreational pursuit (Williams et al., 1992). In this manner, individuals give value to settings based on the specificity and functionality of a place for a desired activity (Kyle et al., 2003). This makes substituting one place with another very difficult because of the unique aspects found in each context. For these reasons, the factor of place dependence is an important part of the hypothesized relationship to place dimension. It investigates the functional relationship individuals

may have with the BWCAW based on their recreation pursuits. Place dependence measures operationalized and validated by Williams and Vaske (2003) will be used to measure this dimension.

Though place dependence can be operationalized fairly clearly, the concept of place meanings is not as easily defined for the psychometric approach that underlies this dissertation. Place meanings are an empirically separable phenomena from place attachment, even though these concepts are often lumped together (Stedman, 2002). This often occurs because the meanings associated with an individual's place identity can be confused with those meanings associated with the landscape itself. Theoretically, place meanings are conceptualized differently in this study from the factor of place identity previously described. While place identity examines the relationship of the context to an individual's self-identity, place meanings reflect the nature of the setting itself. These meanings are derived from the landscape, its attributes, and the management activities that affect them (Stedman, 2003b), but they represent much more than these setting attributes. Place meanings characterize the spirit of the landscape, influenced by the history and experiences associated with the context. Stedman (2003b) suggests that place meanings can be readily measured via the level of agreement with belief statements about the nature of the setting (e.g. "this forest represents a pristine wilderness"). This study will adapt measures based on Stedman's symbolic meanings scale to investigate the place meanings individuals hold for the BWCAW.

Despite conceptualizing place meanings and place identity differently in the relationship model, concerns may arise regarding how these dimensions will correlate in the analysis. However, Bank et al. (1977) suggest that concepts with different modalities

(e.g. normative attitudes, preferential attitudes) can be considered theoretically distinct even if items are found to co-scale. Because place identity and place meanings have been conceptualized to reflect different aspects of a relationship, it is acceptable to consider them as separate dimensions.

Relationship among Dependent Variables - Together, the self, management agency, and place dimensions represent the endogenous variables in the predictive model for a relationship with the BWCAW. Because the three endogenous variables are theoretically interrelated, the following section will address several linkages between these variables that were influential in the conceptualization of the model and may assist in the subsequent interpretation of results. However, it is important to note that direct and reciprocal effects between these variables were not explicitly tested since the more important objective of this study was to analyze the overarching structure of the second order relationship model.

The relationship between the self and place dimensions are assumed to be highly correlated and have reciprocal effects. These dimensions represent an idiographic relationship centered within a particular setting with individualized meanings. As individuals renegotiate their self-identity relative to the BWCAW and the role it plays in their lifestyle, it is reasonable to assume that the meanings attributed to that setting and their dependence upon it for desired activities and outcomes would change. Likewise, changes in the nature of place can influence how it relates to an individual's self identity. As meanings are forged through experience with the setting (Stedman, 2003b), individuals construct these meanings as reflections of their self definition (Greider & Garkovich, 1994). Empirical studies have demonstrated connections applicable to these

dimensions. Stedman (2003a) has proposed a meaning-mediated model that suggests setting characteristics can alter place meanings and subsequently the basis of dimensions of attachment like place identity. Based on these findings, it is plausible that factors within the place dimension (place meanings, place dependence) could influence factors of the self dimension (place identity, life centrality) over time. However, since this research captures only a snapshot in time, these connections are not included in the model.

The dimensions of relationship to self and place are also assumed to have a direct effect on the relationship to management agency dimension. However, these direct effects on the management agency dimension are not considered to be reciprocal with the self and place dimensions. If changes occur in the nature of setting, the relationship to the place may change. If individuals attribute these changes to actions, or lack thereof, from the management agency, this could influence their level of trust in the agency, altering their relationship with the agency. Likewise, if changes in resource conditions or management actions alter what an area like the BWCAW means to an individual's self identity, it subsequently can influence their relationship with the Forest Service if they hold managers responsible.

This is not to say that changes in resource conditions, policies, or other management actions would not influence the management agency variable directly. An individual's perception of shared values, goals, direction, view, and thoughts are important in constituting trust (Winter et al., 1999) in a relationship and changes in these concepts can have an influence on the relationships with the management agency. Instead, it is speculated that changes in the management agency dimension will not influence changes in the self or place dimensions directly because these variables would

have changes occurring concurrently or prior to the changes in the management agency relationship. In effect, the dimensions of self and place mediate an individual's relationship with the management agency.

These three endogenous dimensions represent the conceptualization of a relationship with the BWCAW. However, it is further hypothesized that relationships are also associated with external independent forces. By understanding the importance of these changing forces, it may be possible to develop indicators of quality to guide management of wilderness experiences and relationships.

### External Variables

Where the endogenous dimensions represent the dependent variables of the model, the exogenous components represent the independent variables. These variables are the external factors that influence the internal dimensions of the relationship model. These factors have been conceptualized and operationalized relative to the changing social, environmental, and managerial conditions that can influence use and user characteristics in the BWCAW. They represent the social and cultural context within which individual relationships with wilderness are situated.

There is potential in this study to examine numerous external forces. For example, natural disturbances (e.g. lightning-ignited fires, storm blowdowns) have had a direct effect on the character of the BWCAW landscape. Policy changes such as reducing group size limits, requiring reservations, and introducing user fees have also changed how individuals access and use the area. Advances in technology have introduced satellite phones, GPS systems, and other equipment to aid and assist users. Finally, demographics of users are changing as the population ages and their priorities change.

While some of these variables are under direct management control (e.g. price of fees, availability of permits), others represent trends in use and user characteristics (e.g. average age, level of education). This distinction will be important when attempting to put forth recommendations to management regarding which variables may be developed into indicators and standards of quality for current planning frameworks. In developing such indicators of quality within a Limits of Acceptable Change process, it will be important to remember that indicators should be developed for outputs (e.g. resource & social impacts), instead of inputs (e.g. number of users) (Cole & McCool, 1997). In the context of this study, the outputs from independent variables (e.g. willingness to pay fees, influence of technology) are suggested to have a measurable effect on an individual's relationship with the BWCAW. Therefore, each of the independent variables selected to be utilized in the hypothesized model were operationalized relative to its ability to indicate a desired output of management action. It had to be applicable to the BWCAW context and within the current Forest Service managerial environment.

Despite this development of this framework, creating indicators of quality for the BWCAW require a series of conceptual leaps to be made. Not only are assumptions made about the dimensions of a relationship, but it is also assumed that these dimensions are influenced by a variety of external factors that can be influenced through management action. While these theoretical assumptions are grounded in previous research and the underlying logic of the LAC planning framework, one must consider the alternative that such a relationship model cannot be incorporated into current planning frameworks as conceptualized. External factors may prove not to have significant or meaningful effects on the relationship. Realistic indicators and standards may not be possible given the

resulting analysis of the model. While such outcomes may be undesirable given the objectives of the research, valuable information can still be gained from this research. It conceptualizes the notion of place and experiences in a new way that will potentially open new avenues to research and management application.

These challenges inherent in developing indicators of an individual's relationship are not unique to this study. Such psychological concepts continued to be difficult to adapt into traditional synoptic planning. However, the development of indicators of quality and the tracking of changing user trends can give managers an understanding of how these factors are functioning in the BWCAW. Ultimately, understanding how these variables influence relationships can assist managers in developing strategies that protect wilderness character and foster ongoing relationships.

The independent variables to be utilized in this study are represented by eleven variables in Figure 1. These variables consist of: age, income, education, perceived naturalness of resource conditions, ecological events, experience use history (EUH), technology, evaluation of social conditions, fees, permits, and distance from home. Variables such as age, income, and distance from home represent individual measurement variables. Others such as fees, permits, and naturalness of resource conditions, represent latent variables that will be comprised of scale items that will be combined as composite scores in the analysis. Each independent variable will be more explicitly operationalized in Chapter 3.

Some of the independent variables, such as the influence of the 1999 storm blowdown on visitor experiences, are extremely unique to the BWCAW context. Others variables, such as EUH (adapted from Schreyer et al., 1984), have traditionally been a

part of wilderness and outdoor recreation research. However, the EUH variable is one particularly important independent variable in this study. Experiences are believed to play an important role in how relationships with wilderness develop and the meanings attributed to wilderness. The experience use history of an individual can posit the individual and their identity in the wilderness context based on previous interactions. Therefore, it is useful to understand user experiences and how they have and are changing within the BWCAW context.

Relationship with Dependent Variables - Although the dependent variables are operationalized in the structure of a second order factor model, this does not preclude the independent variables from being simultaneously analyzed as part of a structural regression model. However, for this option to be available after validating the proposed endogenous factor structure, it is empirically necessary to delineate the relationships between the independent and dependent variables to address the issues of identification in the model. Identification is a mathematical problem associated with simultaneous equation systems (Kennedy, 2003). When simultaneous equations include and exclude the same variables in each equation, it is impossible to determine from which equation the estimated parameter is derived. One way to address this issue is by varying the included and excluded variables in each of the equations to produce a system of equations that can then estimate the structural parameters. The hypothesized model constitutes a system of three equations; one for each internal dimensions. For these reasons, several independent variables need to be differentiated among the equations to identify the model hypothesized in Figure 1. These include the demographic variables of age, income, and education and the distance from home (DFH) variable.

According to Williams and Vaske (2003), there is little theoretical reason to predict that most demographic variables would be correlated with measures of place. Variables such as age, income, and education should not influence your dependence upon a place or the meanings that have been attributed to it. Place meanings and place dependence are more closely tied to the nature of setting and should not be predicted by these demographic factors. However, age, income, and education variables could relate to an individual's stage in life and therefore influence how a context like the BWCAW plays into their life centrality and self identity. For these reasons, the independent demographic variables of age, income and education were not examined relative to the relationship with place dimension in the model.

Additionally, the model illustrates that the age and income demographic variables should not influence the relationship to management agency dimension. Theoretically, as users get older and their income varies, their trust or commitment to the agency should not change. Older individuals may have more experience with the Forest Service or another agency, but the influence of this experience is being captured by the EUH independent variable in the model. Therefore, these two demographic variables have been removed from the relationship to management agency equation to help identify the model.

Finally, the DFH variable asks how far users must travel to visit the BWCAW. It is assumed that the nature of place and its meanings can be influenced by its relative proximity to users. This also addresses the fact that a majority of BWCAW users are from Minnesota and/or the Twin Cities area (Watson, 1995). To these users, the BWCAW may be considered their "own private wilderness." It may also be the closest

and best place to provide the opportunities that fit their expectations and motivations. For these users and those living near the BWCAW, the nature and meaning of the place is strongly influenced by how close to home this landscape is for them.

While the DFH variable applies to the relationship to place component, theoretically it should not apply to the management agency or self components directly. The proximity of users to the BWCAW should not affect their relationship with the Forest Service in a general sense or their personal identity. Individuals living close to the BWCAW may have different levels of trust in the agency than individuals living further away, but this should not be a factor of DFH. Also, some could argue that how the place affects your personal identity could be influenced by proximity, but this would arguably be an indirect effect.

These proposed connections are summarized in Figure 1 and are as follows:

- The relationship to self dimension is predicted by all exogenous variables except DFH.
- The relationship to management agency dimension is influenced by all exogenous variables except AGE, INCOME, and DFH.
- The relationship to place variable is influence by all exogenous variables except AGE, INCOME, and EDUCATION.

While connections may also exist between various independent variables, it is not within the scope of this model or research to fully examine these interactions. Instead, the goal of this study is to better understand how the endogenous variables in the model are directly or indirectly affects by the various exogenous variables. Not only does this allow for a more parsimonious model, but also the ability to more clearly interpret the results

from the analysis. Future research may then choose to examine a broader range of interactions.

### Summary

This chapter has developed a conceptual and analytical framework for investigating relationships with wilderness. It has drawn upon the disciplines of psychology, relational marketing, and outdoor recreation research to hypothesize a predictive wilderness relationship model. This model consists of three internal dimensions (relationship to self, relationship to agency, relationship to place) which each uniquely contribute to the formation of a relationship. As individuals renegotiate the meaning of these dimensions, they effectively create an expression of their relationship.

This operationalization specifies a model that is intended to represent the context of the BWCAW. However, MacCallum and Austin (2000) argue that all models are wrong to some degree and “the best one can hope for is to identify a parsimonious, substantively meaningful model that fits observed data adequately well” (p. 218). Therefore, the goal of modeling relationships in this study was not to determine what is correct, but what is plausible given the context. By conducting a thorough literature review and by incorporating the knowledge of local managers and stakeholders, this study has made the best efforts to create a plausible relationship model. Through further analysis in the following chapters, the model will be refined to most accurately represent relationships with the BWCAW as they are expressed on the ground.

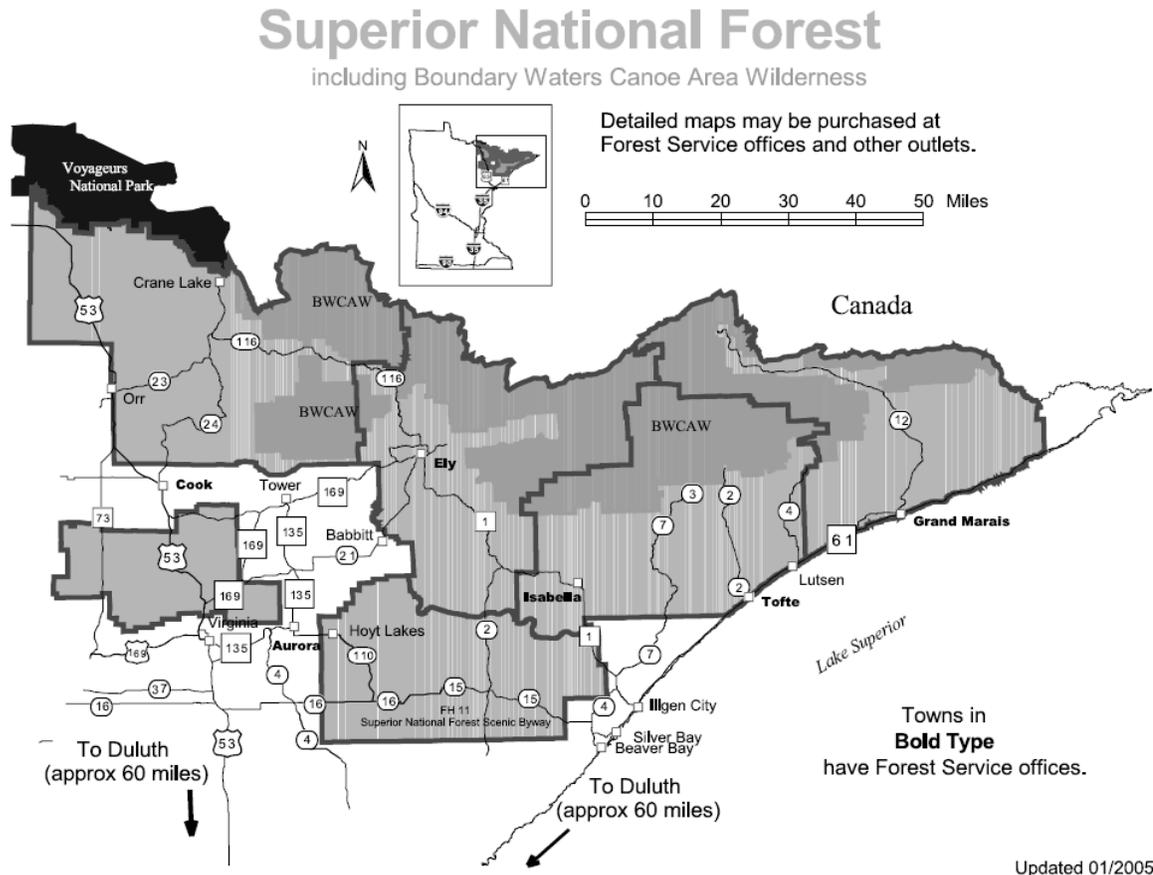
## CHAPTER THREE: METHODOLOGY

To further investigate the hypothesized model for a relationship with wilderness, it is necessary to outline the analytical research approach adopted for this study and the specific context where this study takes place. A quantitative approach grounded in structural equation modeling, confirmatory factor analysis, and multiple regression was utilized in this study to test the hypothesized model and association with external variables. This chapter will describe the Boundary Waters Canoe Area Wilderness as the context for this investigation. It will describe the characteristics of this wilderness area and provide a rationale for why the BWCAW is an appropriate context for examining individual relationships with wilderness. This chapter also will describe the sampling logic and sampling frame utilized for data collection. Questionnaire design and examples of item measures of different aspects of a relationship will also be presented. Finally, this chapter will describe why structural equation modeling, confirmatory factor analysis and multiple regression were appropriate analytical tools for examining and interpreting the collected data.

### Study Area

The Boundary Waters Canoe Area Wilderness is a 1,086,914-acre wilderness located in the Superior National Forest of northern Minnesota. Over three million acres of land, water, and rock, the Superior National Forest spans 140 miles along the United States-Canadian Border and contains over 445,000 acres of surface water (Figure 2)(US Forest Service, 2004). It is a northern forest community of pine, fir, and spruce trees and is home to numerous wildlife including deer, moose, gray wolves, and black bear (US Forest Service, 2004).

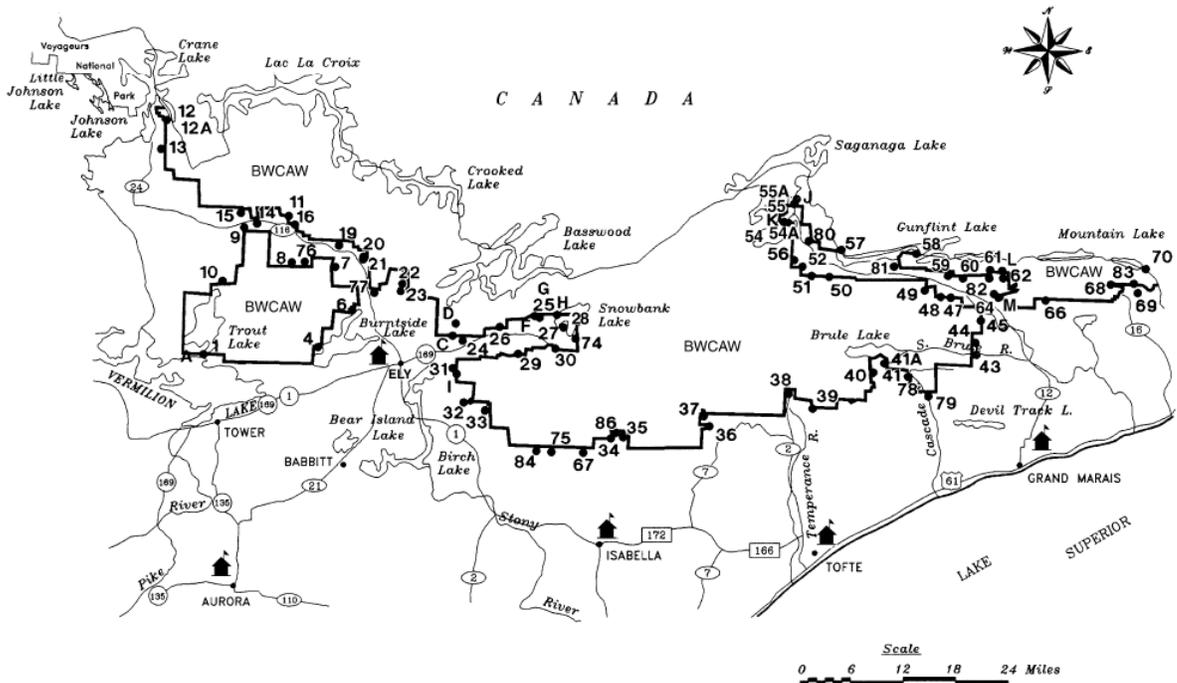
**Figure 2: Map of the Superior National Forest, Minnesota**



NOTE: Retrieved June 17, 2008 from [http://www.fs.fed.us/r9/forests/superior/maps/forest\\_map.pdf](http://www.fs.fed.us/r9/forests/superior/maps/forest_map.pdf)

With the passage of the Wilderness Act in 1964, the BWCAW was official designated as part of the National Wilderness Preservation System. It is the largest designated wilderness area east of the Mississippi River (Figure 3). In 1978, the Boundary Waters Canoe Area Wilderness Act added additional acreage to the forest, prohibited logging and mining, and eliminated much of the motorized watercraft use (US Forest Service, 2004). Through this legislation, the Forest Service was also directed to establish quotas for motorboat use and to essentially eliminate snowmobiling. It is to be managed to retain its enduring value as wilderness and provide activities compatible with wilderness character (US Forest Service, 2004).

**Figure 3: Map of Boundary Waters Canoe Area Wilderness, Minnesota**



NOTE: Retrieved June 17, 2008 from <http://www.fs.fed.us/r9/forests/superior/bwcaw/documents/EPMap.pdf>

Because of its iconic appeal and pristine beauty, the BWCAW has become a popular destination. Total visitation per year is estimated at over 200,000 visits, making it the most heavily used wilderness area in the entire country. For these visitors, paddle canoes are the most common type of use in the BWCAW. Motorized canoes represent a smaller, but important proportion of users and hikers account for only about 1% of use (Watson, 1995). The majority of visitors come from the state of Minnesota, with a significant portion of visitors coming from the Minneapolis/St. Paul area (Watson, 1995). The largest portion of use occurs in the peak season of May 1<sup>st</sup> to September 30<sup>th</sup> of each year. During this period, an entry point quota system is in place for all overnight visitors and day use motorists at the 74 designated entry points to the wilderness. In the off-peak season, all visitors are required to have self-issue use permits. Group size and number of

watercraft limits are also in place year round, with a maximum of 9 people and 4 watercraft per group.

Many different recreation and resource management studies have been conducted in the BWCAW, not to mention numerous doctoral dissertations. These studies have included visitor impact on newly developed campsites (Merriam & Smith, 1974), investigations of perceptions of wilderness conditions related to previous experience (Watson & Cronn, 1994) and opportunities for solitude (Watson, 1995). This current study is being performed in conjunction with the Aldo Leopold Wilderness Research Institute, the University of Montana, and the University of Minnesota. It is a portion of a larger wilderness visitor trend study modeled after two previous visitor trends studies in 1969 and 1991. These studies examined trends in sociodemographic characteristics, wilderness experiences, visit characteristics, and visitor preferences (Cole, Watson, & Roggenbuck, 1995). These results have been used to create a profile of the BWCAW user population from the last 45 years.

BWCAW users are an ideal population for investigating dynamic relationships with wilderness. With trend data on users and use characteristics from the last 45 years, it is feasible to investigate the internal and external factors that may be affecting user experiences and relationships. In addition, nearly 70% of users are repeat visitors to the BWCAW according to the 1991 study. These individuals have had an opportunity to witness changes in the wilderness landscape and management policies and actively interpret these changes within their individual relationships. Some have formed a relationship with the BWCAW landscape even before it was designated as wilderness in 1964. Therefore, a diversity of relationships exists, ranging from preliminary

developments to long-standing histories. Finally, the BWCAW has not been a static environment. In 1999, a major storm caused a massive tree blowdown across large portions of the wilderness. This resulted in blocked portages, destroyed campsites, and limited access. In 2006, lightning-ignited fires burned the eastern part of the wilderness area along the Gunflint Trail. In addition, group size limits have been decreased, recreation user fees have been instituted, and a permit reservation system has been implemented. All of these changes represent major forces that may impact relationships with wilderness. They drive a dynamic process where meanings and relationships are continually renegotiated by users. For these reasons, the BWCAW is an ideal location to investigate dynamic relationship with wilderness.

### Sampling Design

The following section provides the details of the sampling design employed for this study and the larger wilderness visitor trend study conducted by the Aldo Leopold Wilderness Research Institute, the University of Montana, and the University of Minnesota in 2007. This design was informed by the previous BWCAW studies conducted in 1969 and 1991 (Cole et al., 1995) as well as by current knowledge about distribution of recreation use in the BWCAW, state-of-the-art methods, and input from Superior National Forest wilderness staff.

### Sampling Logic

A central concern of any sampling design is representativeness. Babbie (2004) suggests a sample is representative of the population if “the aggregate characteristics of the sample closely approximate those same aggregate characteristics of the population” (p. 189). However, he further claims that samples only need to be representative to those

characteristics that are relevant to the substantive interests of the study. This may be a question of obtaining results that are statistically generalizable or obtaining an unbiased estimator of the population.

In regards to this current study, representativeness is conceived as the question of whether the data has provided the ability to statistically test the relationship model and report unbiased estimates for the numerous factors in the model. It is not the goal to produce a “relationship” construct that is generalizable to all types of BWCAW users, but to test the model of a wilderness relationship given the situational factors of the given context.

### Sample Population

The population of interest for this study was current adult visitors (> 15 years old) to the BWCAW during the peak season of May 1<sup>st</sup> to September 30<sup>th</sup> 2007.<sup>1</sup> Visitors who were 16 or 17 years of age were considered eligible for two reasons. First, these ages were included as part of the general population of users in the 1969 and 1991 studies. Second, the BWCAW does not restrict the age for which individuals can be considered trip leaders or for the reservation of permits. Therefore, both 16 and 17 year olds were allowed to participant in the study. While these users are not considered a substantial portion of the population, they were included to allow for future comparisons across the 1969 and 1991 study results.

Total visitation per year is estimated at over 200,000 visits, while modeling of the permit data suggests that at least 130,000 day and multi-day visits occur during the peak period. The population of interest in 1969 and 1991 included only overnight visitors

---

<sup>1</sup> The range of the sampling period was extended from May 12<sup>th</sup> to May 1<sup>st</sup> due to suggestions from National Forest Staff that sampling should coincide with the opening of fishing season in Minnesota.

during the peak season, while the current study initially attempted to include all permitted recreation visitors, both day use and overnight. However, on site logistics and difficulties did not make this possible. Originally, the sample of visitors was to be sub-divided according to the type of trip they were on when contacted for this study (either day use or overnight use), and a separate survey instrument was created for each of these trip types. Unfortunately, a sufficiently large enough sample of day users to allocate across this study and a separate day use study was not achieved. Instead of having a disproportionately high amount of overnight users to day users in the study's sample, it was decided that only overnight, permitted users would be sampled. This decision was also made to eliminate any unknown bias in results and their interpretation due to differences between overnight and day users.

Sampling past visitors from permit data was also considered for this study, but this creates the issue of having two different populations to compare. Permits are reserved in a trip leader's name, with only their contact information provided. A sample of this population would reflect any bias associated with only contacting the trip leader. Selecting the criteria for inclusion in the study would also be challenging. Gender, age, number of visits, type of use, and various other factors could be possible criteria and determining the appropriate variation of these factors would be difficult. In addition, a different sampling frame and methodology would be necessary to target previous users who no longer visit the BWCAW. Finally, sampling past visitors from permit data would be extremely inefficient and cost prohibitive due to a high proportion of invalid contact information and undeliverable mailings. Due to the challenges and discrepancies these differences would create, only current visitors were sampled.

## Sampling Frame

In the 1969 study, visitors were contacted on-site as they finished their BWCAW trip and asked to either complete a questionnaire at that time or provide contact information for later mailing of a questionnaire. In the 1991 study, approximately 400 visitors were contacted on-site at the busiest entry points as they began their trip, and low use sites were targeted through the central distribution locations. They were asked to complete a short on-site interview to collect the information on a front-end form for later mailing of a questionnaire. The sampling was partitioned by sample day, with a different location chosen for each sample day. Thirty-six sampling days were selected according to how they were distributed in the 1969 study – 18 weekdays and 18 weekends distributed during specific weeks across the peak season. The entry point locations were distributed across sampling days to roughly correspond with their estimated distribution of use. This intercept method in the 1991 study obtained a 74% response rate.

The sampling frame for this current study was developed as part of the concurrent 2007 visitor trend study. It was informed by the example laid out in 1991 and allocated permit data by entry point provided by Forest Service managers. Examination of this allocated permit data from 2006 suggested a difference in permits based on both month and entry point. Subsequent statistical testing confirmed (Pearson's  $\chi^2=361.309$ ,  $df=64$ ,  $p<.001$ ) that a significant relationship exists between month and entry point. That is, permits were not uniformly issued month by month to the different entry points, and thus sampling only by entry point could potentially lead to oversampling of particular entry points at a time in the season when few visitors were utilizing those entry points. To

account for this relationship, sampling days were re-stratified across both entry points and months during the peak season.

This process began by estimating the current visitor population. Estimates by month, entry point, and type of use (overnight paddle, day use paddle, overnight motorized, day use motorized) were made using self-issue permit data from 2004 and allocated permit data from 2006. This estimated model of the population distribution was then used to develop a sampling schedule that allocated sample days by month according to the proportion of use. A total of 76 sample days were selected which accounted for 50% of the days during the 142-day peak season. The allocation of sample days by month was as follows:

May	= 10 days
June	= 18 days
July	= 21 days
August	= 18 days
September	= <u>9 days</u>
Total	76 days

Visitor population estimates were also used to determine the proportion of day and overnight use across all entry points. Day use was estimated using 2004 self-issue permit data for day use paddlers<sup>2</sup> and 2006 allocated permit data for day use motorized. Overnight use was estimated only using 2006 allocated permit data. Based on these estimates, overnight use was estimated to account for 60% of total use, while day use accounts for 40%. These proportions were later used to weight the primary sampling points.

Because sampling at each of the 74 entry points was logistically and practically impossible, the sampling schedule was developed to include interviews with visitors at

---

<sup>2</sup> Self-issue permit data for 2005-2006 was not yet available.

the busiest 17 entry/exit points. These points account for 73% of the total use by the population of interest during the peak season. Table 1 shows the 17 entry points that were sampled along with estimates of their types and levels of use during the peak season. Numbers preceding entry point names (e.g. 25-Moose Lake) represent their location on the map in Figure 3.

Due to the significant relationship between month of use and entry point, a separate sampling calendar was necessary for each month. Before sampling locations were assigned to the allocated sample days, all 17 entry points were weighted according to their proportion of day/overnight use and the overall proportion of day/overnight use across the population. For example:

$$\begin{aligned} \mathbf{25- Moose Lake} &= 29.16\% \text{ (percentage of day use)} * .4 \text{ (proportion of overall day use)} \\ &+ 14.28\% \text{ (percentage overnight use in May)} * .6 \text{ (proportion of} \\ &\text{overall overnight use)} = 0.20231697 \text{ (total weight)} \end{aligned}$$

**Table 1: Visitor Population Estimates for Top 17 Entry Points**

Entry Point	Over-night Use 2006	Day Use Motor 2006	Day Use paddle 2004	Day Use Hike 2004	Total People	% of total visits	Cum %
25-Moose Lake	9,196	8,300	3,263		20,759	16%	16%
24-Fall Lake	3,938	5,895	1,027		10,860	9%	25%
55-Saganaga Lake	3,722	5,344	454	22	9,543	8%	33%
30-Lake One	8,200		1,085		9,285	7%	40%
38-Sawbill Lake	4,831		1,584		6,415	5%	45%
27-Snowbank Lake	3,151	401	376		3,928	3%	48%
01-Trout Lake	2,143	1,710	18		3,872	3%	51%
54-Seagull Lake	2,215	143	808		3,166	3%	54%
79-Eagle Mountain	32		0	2,972	3,004	2%	56%
16-Moose/RiverPortage	2,916		76		2,992	2%	58%
60-Duncan Lake	1,112		994	884	2,990	2%	61%
37-Kawishiwi Lake	2,576		275		2,851	2%	63%
23-Mudro Lake	2,530		267		2,797	2%	65%
41-Brule Lake	2,323		372	12	2,707	2%	67%
14-L. Indian Sioux N.	2,495		198		2,693	2%	69%
77-South Hegman	567		1,873	71	2,511	2%	71%
31-From Farm Lake	1,042		1,184	47	2,273	2%	73%

This weight was then multiplied by the allocated days for a given month (May = 10) to determine the number of sample days for that location (2.023 days). This process began with the month of May. If an entry point did not account for an entire sample day, a coin flip was used to determine if it would be sampled in the given month. If selected, portions from subsequent months were 'borrowed' to achieve a full sample day. If not selected, this portion was 'saved' until the subsequent month where another coin flip was conducted. This process was utilized across all entry points and months. Slight adjustments were made to ensure that lower use entry points were not over sampled or only sampled in the first few months of the peak season.

To assign days and entry point locations to the calendar once they had been allocated within each month, half of the month's allocated days (e.g. 5 of May's 10 sample days) were randomly chosen with the day before or the day after alternately added to form sampling blocks of at least two days. Slight adjustments were made to sample days to account for the proportion of weekends and weekdays within that month. Each of these days was then randomly assigned to one of the primary sampling locations available for that month based on the previously conducted weighting scheme.

Sampling at entry points was for half days, alternating between entry hours (7:30-11:30am) and exit hours of the day (3-7pm). The other half day was used to sample visitors prior to entry at permit distribution centers, alternating between opening (7-11am) and closing business hours (1-5pm). This method of visitor contact may have been less ideal than on-site contacts, but it was deemed a more efficient use of time for reaching visitors utilizing low use entry points. Four centralized communities, each having both Forest Service and private concessionaire permit distribution points, were

used for centralized sampling. The centralized location closest to the primary sampling point for that day were used during the alternate half days. Table 2 shows the central locations and their respective Superior National Forest ranger districts.

**Table 2: Permit Distribution Locations**

Town	Ranger District
Cook, MN	La Croix
Ely, MN	Kawishiwi
Tofte, MN	Tofte
Grand Marais, MN	Gunflint

A specific site plan was needed for each of the 17 entry points. In most cases, entry is limited to one or two specific launch points or trail heads and that is where on-site sampling occurred. However, a few of the points had numerous entry locations that differed by type of use. These were identified and randomly chosen for on-site sampling. These specific plans accounted for any cooperators in close proximity to the entry point that may distribute permits. Allocated permits may be picked up by group leaders or their designees on the day before or the day of the trip. Therefore, sampling was effective throughout the day at these locations.

#### On-Site Interview and Mailings

Intercepted groups were asked to complete a front-end form (Appendix A). The front-end form represented the interview guide for the on-site portion of the study and was designed to be filled out by the researcher rather than the respondent. This form could be completed either before or after the trip and included basic demographic information (e.g. group size, group type, length of stay) and contact information for each member of the group. The front-end form served several purposes:

1. The primary purpose of the on-site interview was to collect contact information from all adult visitors (> 15 years old) in the group so that they could be mailed a survey after they returned home from their trip.
2. The second purpose of the interview was to provide an opportunity to make face-to-face contact with potential respondents and to re-enforce the importance of the research. This personal contact was an opportunity to ‘make the sell’ to improve response rates on the mail-back portion of the study.
3. A third purpose of the front-end interview was to collect information that could serve as a check for non-response bias on the mail-back portion of the study. This front-end data was later combined with the survey data rather than repeating the questions on the mail-back survey.

Approximately two weeks after the on site interview, individuals were mailed a survey packet. Packets included a cover letter describing the study in detail, a questionnaire to be completed, and a pre-paid envelope to return the questionnaire. Packet mailings followed a modified Dillman approach, with a reminder/thank you postcard sent one week after the first mailing and a replacement questionnaire sent two weeks after the postcard. Any undeliverable or duplicate packets were recorded and removed from future mailings.

### Sample Size

When considering sample size, obtaining a sample of at least 300 respondents is considered a “rule of thumb” to provide the appropriate power for statistical analysis. The necessary sample size for this study was based on the principles of structural equation modeling (SEM) and confirmatory factor analysis. In SEM, sample sizes should not be small because statistical tests and goodness of fit indices are sensitive to sample size as well as the magnitude of differences in covariance matrices. However, very few rules of thumb for sample size are found in the SEM literature because authors are reluctant to recommend them (MacCallum & Austin, 2000). This is partially due to differing opinions

regarding the practical importance of sample size. Jackson (2003) argues that while absolute sample size has greater practically significant effects, the ratio of observations per estimate parameter has significant effects on fit indices. Gagne and Hancock (2006) support the notion that larger samples, more indicators per factor, and stronger factor loadings are best when trying to improve model convergence and parameter estimation. While they argue indicators per factor can be a useful gauge of sample size requirements, they hesitate to make specific sample size recommendations for satisfactory convergence.

Based on these arguments, the ratio of observations per estimated parameter (e.g. regression coefficient, error variance, factor variance, covariance of the independent variables) was considered an important target when determining a necessary sample size. Kline (2005) suggests that in the context of confirmatory factor analysis a sample size large enough for a 10:1 ratio (10 observations per one estimated parameter) should be collected. Bentler (2006a) suggest that relatively large sample sizes should be used, a ratio of free parameters to be estimated to the sample size of 5:1 for a baseline in normal and elliptical estimation approaches. More generally, Grimm and Yarnold (1995) suggest a rough guideline of a sample size 5-10 times the number of measured indicators. The hypothesized relationship model consists of approximately 60 estimated parameters and 30 measured indicators. Therefore, an appropriate sample size for this study ranged from a minimum of 300 cases to nearly 600 cases. In 1991 study, the intercept method obtained a 74% response rate. Assuming a similar response rate, at least 600 user contacts were required to achieve a sample of nearly 450 individuals. This target sample size was desirable because it exceeded the minimum sample requirement and would provide added power for statistical tests.

## Questionnaire Design

One of the goals of this research was to provide information that can be incorporated into current planning frameworks. It attempts to build a general predictive model that can be useful to managers. A quantitative approach, such as a survey instrument, is well suited for addressing these types of issues. It is capable of examining phenomena that are thought to be measurable and quantifiable.

However, several of the concepts in the model (e.g. place, trust) can be abstract to those not familiar with their evaluation. Some may question if we are capable of measuring these variables using a survey instrument. One way to address this is that we are not measuring these concepts directly, but instead the attributes of the concepts (Churchill, 1979). Even though these concepts are not observable by a researcher, we believe that survey respondents have some private knowledge about their attributes. Questions that allow respondents to report their beliefs, feelings, and perceptions about these attributes provide researchers with quantifiable data that can be analyzed (Samdahl, 1991). Creating survey instruments that are a collection of these types of questions allow researchers to investigate these psychological variables that are otherwise not readily observable (DeVellis, 2003).

A mail-back questionnaire was developed to collect data for this study (Appendix B). Using Likert-type measurement items, scales were constructed to measure each of the three internal dimensions in the hypothesized relationship model. Cumulatively, these measures could be considered the relationship scales developed by the study. Likert-type measurement items were also used on several external variables along with common self-report measures of demographic variables. These scales and measurement items were

selected by utilizing previously tested items from outdoor recreation, social psychology and relational marketing research. Several new items were also developed to be applicable in the BWCAW context. The following section provides a rationale and examples of the measurement items used in the mail-back questionnaire.

### Place Identity, Dependence, and Meanings

Place is conceptualized in this study as consisting of both physical and psychological attributes. Differences in these attributes are partly based on how the setting, in this case the BWCAW, is examined and considered. From the psychological perspective, the focus is on how the setting is integrated into an individual's identity. It is determining what symbolic role and importance the setting plays in their life. This aspect is theoretically represented in the relationship to self dimension by the factor of place identity. From the physical perspective, the focus of examination is upon the nature of the setting itself, the characteristics of its physical reality and the meanings ascribed to it through human experience. It is determining the social construction of meanings and value ascribed to the specific settings. These aspects are theoretically represented by the factors of place dependence and place meanings.

In selecting measures of place identity and place dependence, previous literature examining place attachment provides a solid psychometric foundation. As previously described place identity is the emotional component of place attachment. It is considered to be a component of self-identity (Proshansky, 1978) and part of the cognitive structure that refers to a more global self-identification (Jorgensen & Stedman, 2001). Place dependence is regarded as a functional attachment associated with the importance of a place in providing a setting that supports certain goals and desired activities. This

functional attachment is embodied in the setting's physical characteristics and may increase when a place is close enough for frequent visitation (Williams & Vaske, 2003).

Recently, Williams and Vaske (2003) examined the psychometric properties of validity and reliability of place identity and dependence across items, places, and dimensions of attachment. Place identity was assessed using six items presented in a 5-point Likert-type scale (*strongly disagree* to *strongly agree*). Tests of reliability using Cronbach's alpha suggested good reliability, with values ranging from .84 to .94. Factor loads for all six items in the place identity dimensions were also statistically significant with small standard errors. Place dependence also was assessed using six items. Results demonstrated good reliability in the measures, with Cronbach's alpha levels ranging from .81 to .94. Factor loadings for the place dependence dimension were significant on five of the six items.

Overall, the confirmatory factor analyses and tests for convergent validity by Williams and Vaske (2003) demonstrated the data provided an acceptable fit for the place identity and place dependence dimensions. They also suggest that factor loadings were consistent with those typically reported in the place literature. Based on these findings, this study adopted the six significant identity measurement items and the five significant dependence measurement items as its scales for place identity and dependence. These items are listed as the primary measures in Table 3.

Place meanings are operationalized as descriptive statements or beliefs about a setting that are based on environmental attributes and the management activities that

**Table 3: Measures of Place Identity and Dependence**

---

*Primary measures<sup>a</sup>*

Place Identity

- I am very attached to the Boundary Waters.
- I feel like the Boundary Waters is a part of me.
- I identify strongly with the Boundary Waters
- The Boundary Waters is very special to me.
- The Boundary Waters means a lot to me.
- Visiting the Boundary Waters says a lot about who I am.

Place Dependence

- The Boundary Waters is the best place for what I like to do.
  - No other place can compare to the Boundary Waters.
  - I get more satisfaction out of visiting the Boundary Waters than any other.
  - Doing what I do at the Boundary waters is more important to me than doing it in any other place.
  - I wouldn't substitute any other area for doing the type of things I do at the Boundary Waters.
- 

<sup>a</sup> Williams & Vaske (2003)

affect them (Stedman, 2003a; Stedman, 2003b). These meanings go beyond examining the strength of an attachment to attempting to understand to what people are attached. Previous studies by Stedman (2002; 2003a) have assessed place meanings via a series of eight items attempting to measure the level of agreement with belief statements about the nature of the setting (e.g. “this forest represents a pristine wilderness”). A 5-point Likert-type scale measured the level of agreement (*strongly disagree* to *strongly agree*) for each statement. Using maximum likelihood factor analysis, a clear two-factor solution was revealed. The primary factor was labeled as being “up north” ( $\alpha=.824$ ) and addressed the symbolic and cultural meanings of the setting, while the secondary factor relating to the place as a “community” ( $\alpha=.680$ ). The results also showed that the “up north” factor described 35.1% of the variance in the sample and the majority of respondents had high agreement with statements from the factor.

This study adapted items from Stedman’s “up north” factor to investigate the place meanings associated with the BWCAW. The term “up north” in these items was substitute for “the north woods” in an attempt to be more applicable to the context of the BWCAW. Items from the “community” factor were not used because wording of items in the factor referred to “neighbors” and “residential neighborhood” which did not seem directly applicable to a wilderness recreation context. The four measures of place meanings are presented in Table 4.

**Table 4: Place Meaning measures<sup>a</sup>**

<i>The Boundary Waters Canoe Area Wilderness is</i>
A place to escape from civilization.
The real “north woods”.
A place of high environmental quality.
A pristine wilderness

<sup>a</sup> Adapted from Stedman (2002; 2003a)

Life Centrality

As previously described, McIntyre and Pigram (1992) theoretically conceptualized leisure involvement as consisting of attraction, self expression, and centrality to lifestyle. Kyle et al. (2004a) have adapted items from this work that evaluate leisure involvement in an outdoor recreation context. However, when comparing items from the place identity scale validated by Williams and Vaske (2003) to Kyle et al.’s (2004a) adapted leisure involvement scale, similar wording and some duplication appears across the attraction and self-expression dimensions of leisure involvement and place identity items of place attachment. While this redundancy lends support and face validity for the inclusion of place identity and leisure involvement as part of a larger construct, it creates an issue when attempting to understand the unique contribution of each factor to a relationship to self. Therefore, to keep each of these concepts as a distinct factor

attributed to the self dimension, this study only utilized the life centrality factor of leisure involvement.

Kyle et al. (2004a) used five items presented in a 5-point Likert-type scale (*strongly disagree* to *strongly agree*) to measure life centrality. Although reliability was acceptable ( $\alpha=.78$ ), wording of one item (“I find a lot of my life organized around hiking activities) did not translate well for the BWCAW context. Therefore, only 4 items of the life centrality scale were used on the questionnaire (Table 5).

**Table 5: Life Centrality measures<sup>a</sup>**

---

I find a lot of my life organized around the Boundary Waters.  
I enjoy discussing the Boundary Waters with my friends.  
Most of my friends are in some way connected with the Boundary Waters.  
The Boundary Waters has a central role in my life.

---

<sup>a</sup> Adapted from Kyle et al. (2004a)

### Trust and Commitment

A variety of measures for trust have been utilized in psychology (Moorman et al., 1992; Wieselquist et al., 1999) and natural resource management (Borrie et al., 2002; Liljeblad, 2005; Winter et al., 1999) A common theme of trust research in natural resource management has been the salient values similarity model of Earle and Cvetkovich (1995). This model presumes trust is a function of the norms and values the public shares with managing agencies. However, recent work by Liljeblad and Borrie (2006) has suggested that a multi-dimension approach that goes beyond salient values similarity is more appropriate.

Despite this new research, trust was measured in this study based on the salient values similarity model. This decision was partly made because a multi-dimensional trust factor creates a less parsimonious relationship model. It was also made because measures of trust had already been effectively adapted into a natural resource context by Winter et al. (1999) and Borrie et al. (2002) Measures from these studies were adapted to create four Likert-type scale items for the BWCAW context and are presented in Table 6.

**Table 6: Measures of Trust<sup>a</sup> and Commitment<sup>b</sup>**

---

Trust

- The Forest Service shares my values about how the Boundary Waters should be managed.
- I share the Forest Service's goals for the Boundary Waters.
- The Forest Service supports my views about the Boundary Waters.
- I trust the Forest Service in their efforts to manage the Boundary Waters

Commitment

*The connection I have with the Forest Service*

- ... is something I really care about.
  - ... is something I intend to maintain indefinitely.
  - ...deserves my maximum effort to maintain.
  - ... is very important to me.
  - ...is something I am very committed to.
  - ... is very much like being family.
  - ...is of very little significance to me.
- 

<sup>a</sup> Adapted from Winter et al. (1999) and Borrie et al. (2002)

<sup>b</sup>Morgan & Hunt (1994)

Commitment was measured using seven Likert-type scale items from Morgan and Hunt (1994)(Table 6). They explain that no scale for commitment existed for an interorganizational relationship at the inception of their study. Their measures were adapted from organizational commitment scales to reflect their definition of relationship commitment. Because the Forest Service is the organization of interest for commitment in this study, the measures by Morgan and Hunt (1994) were considered appropriate.

They were adapted from an original 7-point scale to a 5-point scale so that all internal relationship factors would be scaled the same.

### Resource and Social Conditions

In the concurrent visitor trend study, numerous wilderness resource conditions are evaluated to determine which are considered the most problematic and whether these conditions have been improved or getting worse over time. The perception of problematic resource conditions is also considered an important visitor evaluation in this study. However, this evaluation had to be conceptualized to allow its incorporation into the hypothesized model. To achieve this, a list of 17 wilderness conditions was presented to the participants (Appendix B). While wilderness conditions can be viewed as positive (e.g. solitude, challenge), the majority of these items were focused on visitor's perceptions of negative resource conditions and impacts. Participants evaluated each item based on the extent to which they experience those conditions during their visit. Items were scales from 0 (Not at all) to 9 (All the time). From these responses, a weighted mean score was calculated. This score represents the participant's perception of the absence/presence of problematic resource conditions and, in essence, serves as a proxy for their perception of "naturalness" in the wilderness context. It was based on the number of items with an actual score reported on a case by case basis. Items with "don't know" were therefore dropped as to not influence the mean index score for that case.

Evaluation of social conditions can be examined in multiple ways. Participants can be asked to self report their level of perceived crowding, the number of groups seen during the course of the trip, or their preferences for social conditions (see Manning, 1999). While each of these approaches could address the social conditions of the

BWCAW, they do not address issues specific to that context (e.g. day users, congestion at portages). Therefore, items were adapted from Kyle et al. (2004b) and based off of recommendations by managers to create an index for evaluating social conditions (Appendix B). Six items on a 3-point scale from “not a problem” to “a big problem” were presented to participants with weighted mean scores calculated as described above for the index.<sup>3</sup> This weighted mean score was then utilized to represent a participant’s evaluation of social conditions in the hypothesized relationship model.

### Permits

In response to increased recreation demand and concern over social and resource conditions in the BWCAW, managers have implemented a use rationing system that requires permits for all overnight use. A quota system based on entry point is in place during the peak summer season from May 1<sup>st</sup> to September 30<sup>th</sup>. In 1991, changes were made in this permitting system to also include all day use. While managers do not plan to change the current permitting system, they are interested in how it is functioning. Specifically, they are concerned with whether the system is easy to use, convenient, and efficient.

When conceptualized relative to a relationship with the BWCAW, permits appear to be a constant. Unless future managers decide to eliminate the permit system, which is highly unlikely, all users are affected equally by the requirement to obtain a permit. However, the functionality of the system can arguably affect an individual’s relationship. Negative experience associated with obtaining a permit can influence how individuals perceive the Forest Service and their ability as managers. Also, any hassles or inconveniences experienced by users could theoretically alter the nature of the place and

---

<sup>3</sup> A 3-point scale was used to be consistent with the format presented by Kyle et al. (2004b)

what it means to the individual. To them, the BWCAW may be a place that is supposed to be free of these everyday problems. For these reasons, the functionality of the permit system can be an important variable in the relationship model.

To evaluate the permit system, new measures were developed that are specific to the context and system currently in place in the BWCAW. These measures addressed issues related to the convenience of reserving a permit, picking up the permit, hours of operation at permit stations and satisfaction with the overall process of obtaining a permit. Items used a 9-point Likert-type scales ranging from 0 (very convenient/satisfied) to 9 (very inconvenient/unsatisfied). It was assumed that all aspects of the functionality of the permit system are not equal. Therefore, permit system measures were treated as individual external variables in the relationship model.

### User Fees

Federal laws and Forest Service policies can have a dramatic effect on the landscape of the BWCAW. Laws and policies can influence how individuals relate to a setting, but can be challenging to evaluate because they generally apply to all users. This creates a situation where no variation exists across the population because these laws and policies influence everyone equally. However, user attitudes towards these laws and policies do vary and can be measured. Therefore, it is appropriate to investigate individual attitudes and perceptions regarding different laws and policies.

The implementation of a user fee program influences our perception of the meaning of public lands. User fees for the BWCAW first began being charged in 1998 as part of the Recreation Fee Demonstration Project. Current managers have expressed an interest in better understanding how visitors feel about this relatively recent policy

change. However, this interest is not based upon the notion of willingness to pay or the need to make pricing decisions. Such a perspective overly characterizes the BWCAW and related experiences as a commodity based on supply and demand principles. Instead, managers are more interested in user attitudes toward the overall fee program and how aware users are of the program currently in place.

This study developed its measure of fees to focus on user's attitudes towards the BWCAW fee program. Several studies have examined individual's attitudes towards fee programs administered by the Forest Service. Kyle, Absher, and Graefe (2003) developed an index consisting of five Likert-type items to measure attitudes toward the fee program at the Mono Basin Scenic Area in California. Subjects were asked to report how they felt about fees by indicating their agreement with each item on a 5-point scale. The reliability coefficient for this index was .87. Winter et al. (1999) used four Likert-type items (scaled from 1-4) to assess attitudes of the fee program for the Enterprise Forest Project in southern California. Following a reliability analysis, the final scale comprised of three items with an  $\alpha = .9033$ .

This pool of items from both studies was adapted to measure attitude towards fees. Items from Winter et al. (1999) were rescaled to a 5-point scale (strongly disagree to strongly agree) to allow for a mean score to be calculated from the index of items. These nine items are presented in Table 7.

### Ecological Events and Technology

Natural disturbances and changing technologies are two external forces that to a certain extent are beyond management control. They can quickly and dynamically alter the physical settings and the nature of the experience provided by that setting. In recent

**Table 7: Attitude Towards Fee Program measures**

---

I understand the reasons behind the fee program. <sup>a</sup>
Overall, I approve of the fee program at the Boundary Waters.
The fee program will limit my access to this site.
I should not have to pay to visit recreation sites.
I already pay enough taxes to support recreation sites.
Fees are inappropriate because they exclude some visitors from recreational experiences.
Overall, the fee program is a good thing. <sup>b</sup>
I think the Forest Service needs to charge the fees in order to maintain the quality of services provided to the public.
The fee money will go directly into improving forest services and personnel.

---

<sup>a</sup> Adapted from Kyle, Absher, & Graefe (2003)

<sup>b</sup> Adapted from Winter et al. (1999)

years, the BWCAW has experienced violent storms and wildland fires that have had dramatic effects to the landscape. To investigate the influence of these ecological events, participants were asked what effect recent wildfire and the blowdown storm of 1999 had on their experience during their visit. An individual item for each event was scaled from 0 (Not at all) to 9 (Significant Effect). As with permits, it was assumed aspects of these ecological events are not equal and measures were treated as individual external variables in the relationship model.

Technological advances are constantly influencing outdoor recreation and the way individuals interact with their environment. Cell phones, portable gas stoves, and GPS units have all become available for use in a wilderness context. To understand the influence of technology on a wilderness relationship, individuals were presented with 13 items ranging from a flashlight to an iPod and asked whether they were brought on their current trip. Using a Guttman scale approach, these responses were used to classify individuals as having low to high amounts of technology present on their trip. This process will be further described in the following chapter.

### Experience & Demographics (including DFH)

The remaining measurement items of the mail-back questionnaire consist of several self-report measures. This includes age in years, education in years, distance from home (DFH) in miles, and income based on \$20,000 increments. Except for income, these variables were operationalized as continuous measures to assist with their interpretation and inclusion in the hypothesized structural equation model.

As previously described, experience use history items were adapted from Schreyer et al. (1984) and also Watson, Roggenbuck, and Williams (1991). These include number of previous visits to the BWCAW, year of first visit to the BWCAW, and the number of other federal wilderness areas visited. Watson et al. (1991) suggest composite indices should not be calculated for past experiences because it is not a unidimensional construct. They argue that there is little common sense justification for adding across different units of experience measurement. Following these arguments, this study chose to utilize EUH measurements as individual external variables in the model.

### Analysis

Testing and analysis of the hypothesized relationship with wilderness model required a certain level of flexibility. Due to the conceptual nature of this study, a strict specified plan for analysis was not prudent because the possibility existed that the original hypothesized model would fail. This was possible because the original model was proposed as a structural regression model. A structural regression is a hybrid model that includes causal effects similar to path analysis and incorporates a measurement model similar to confirmatory factor analysis (Kline, 2005). If either of these elements failed, the analysis would break down. Therefore, this study took an incremental

approach to the analysis that is more fully described in Chapter 4. This section will explain several of the basic concepts of structural equation modeling and confirmatory factor analysis. These two techniques represent the primary analysis performed in this study.

### Structural Equation Modeling

As described by Kline (2005), “structural equation modeling does not designate a single statistical technique, but instead refers to a family of related procedures.” (pg. 9) This “family” of models includes covariance structure analysis, latent variable analysis, confirmatory factor analysis, and what is often known simply as LISREL (Hair, Anderson, Tatham, & Black, 1998). The term structural equation modeling (SEM) conveys two important aspects of the procedure: 1) that the processes under investigation are represented by a series of structural equations, and 2) the structural relationships of these equations can be modeled pictorially for a clearer conceptualization of theory (Byrne, 1994).

SEM is based on creating a priori assumptions about the relationship of various independent and dependent variables. The basic statistic used in structural equation modeling is the covariance, the unstandardized correlation between variables (Kline, 2005). Using the covariance, the main goals of SEM becomes understanding the pattern of correlations among a group of variables and explaining as much of those variable’s variance as possible. These relationships are then examined in terms of models. Models are used as a representation of the given data. They are estimated most commonly using maximum likelihood estimation. This estimation method derives parameter estimates that are the ones that maximize the likelihood that the data, or simple the observed

covariances, were drawn from this population (Kline, 2005). Maximum likelihood is a normal theory method of estimation and is efficient and unbiased when assumptions of multivariate normality are met (Hair et al., 1998).

Because SEM is data driven, the goal is not to “prove” the true model (Kline, 2005). Instead, the object is to reject false models as is the case with traditional null hypothesis testing. To evaluate the fit of the model, the SEM procedure relies upon fit indices. These indices are measures based on the correspondence of the actual input data with that predicted from the proposed model (Hair et al., 1998). Numerous indices are available in standard SEM computer programs and much debate has occurred over which indices are the most appropriate. However, because a single index reflects only a particular aspect of model fit, it is most appropriate to utilize a set of fit indices to evaluate SEM models. The indices used in this study, along with their rules of thumb for acceptability, will be discussed in Chapter 4.

One of the strengths of SEM is the ability to test alternative models to determine which provides the best fit for the data. While post-hoc modeling is not preferable to a prior conceptualized theoretical model, it does provide the opportunity to explore different relationships and connections within the data that may not have been previously considered. This research is open to exploring these options if the proposed model does not exist as predicted or if complications arise during the data collection process. This flexibility will allow for an understanding of relationships within the BWCAW context to still be achieved.

Another strength of SEM is modeling relationships with multiple dependent variables and latent variables. A latent variable is a hypothesized and unobserved

construct (e.g. place identity, trust) that can only be approximated by other measured variables (Hair et al., 1998). Because the hypothesized wilderness relationship model contains numerous latent variables, SEM techniques were the most appropriate for analyzing the data. It allowed for the testing of the original hypothesized model and subsequent respecification of the model to most accurately represent the data from the sample. In addition, SEM was capable of accommodating the multiple structural regressions for the dependent dimensions of self, management agency, and place relative to the numerous independent variables.

Numerous software packages are available for conducting structural equation modeling. This study used EQS 6.1 for Windows (Bentler, 2006b). This program was selected for its strengths in several areas. First, EQS 6.1 provides an advanced graphical user interface for drawing hypothesized models. This interface is especially useful for respecification of model and for visualizing casual relationships.

Second, EQS 6.1 uses the Bentler-Weeks model for data representation, described as follows by Byrne (1994). Given that sample data comprises of observed scores only, there needs to be an internal mechanism where data is transposed into parameters in the model. Parameters are the regression coefficient and the variance and covariance of the independent variables (Bentler, 2006a). This transposition is accomplished by a mathematical model representing the entire system of variables. This system of EQS 6.1 allows all variables to be categorized as either a dependent or independent variable. Any variable can influence any other variable and independent variables can be correlated (Bentler, 2000). Dependent variables are visually represented in model with at least one unidirectional arrow pointed at them. Independent variables in SEM model have no

unidirectional arrows pointed towards them. This representation is beneficial for this study where a second order factor analysis is hypothesized following by a hybrid structural regression.

Finally, EQS 6.1 provides nonnormal goodness-of-fit indices as part of its standard output. This study's sample was examined for evidence of multivariate nonnormality and skewness (discussed in Chapter 4). If nonnormality is present, corrections for maximum likelihood estimation are necessary to provide robust parameter estimates. EQS 6.1 provides options to easily include these corrections in the standard analysis

### Confirmatory Factor Analysis

One modeling technique in the SEM family is confirmatory factor analysis. Unlike exploratory factor analysis where the links between observed and latent variables are uncertain, confirmatory factor analysis (CFA) draws on knowledge from theory and empirical research to hypothesize a priori linkages between variables and then tests this pattern statistically (Byrne, 1994). This technique, CFA, is the most appropriate for this study because the structure of the relationship model is not completely unknown. Previous literature and theory has informed the hypothesized model and one of the objectives of this study is to test the validity of this model. Also, CFA is particularly useful in the validation of measurement scales for specific constructs (Hair et al., 1998). Therefore, a confirmatory approach is preferred to an exploratory approach.

CFA models consist of latent variables and measured variables. Measured variables are described as indicators of the latent constructs. Each indicator is a continuous variable represented by having two causes, a single underlying factor that the

indicator measures and all other unique sources of variation represented by an error term (Kline, 2005). Thus, CFA examines two sources of variation: 1) the influence of latent constructs on measured variables, and 2) the unique measurement error (Grimm & Yarnold, 1995). Measurement errors are considered independent of each other and of the latent constructs.

Because CFA is part of the SEM family, the objective of the analysis is to examine the goodness of fit of the hypothesized relationships between latent variables and measured variables based on the data. Once again, fit indices are used to evaluate the correspondents of the actual input data with that of predicted model. Based on these fit indices, adjustments in the measurement scales and respecification of the model can then be proposed. Ultimately, the goal of these adjustments and changes is to improve model fit and to more accurately represent the underlying structure and patterns of the data.

## CHAPTER FOUR: ANALYSIS & RESULTS

Wilderness relationships have been conceptualized as complex, multidimensional phenomena embedded within an individual's self identity. Because of this complexity, it is impossible to accurately represent any of the participants in this study with the data from any one question. Likewise, this study proposes that multiple external forces concurrently are influencing several internal dimensions of a wilderness relationship. To consider data from any one item would be misleading and ignore the comprehensive understanding that can be achieved through examining the data collectively. To provide such a comprehensive understanding, the data from the current study has been analyzed incrementally and presented in three sections.

The first results section describes the descriptive statistics from the on-site interview and the procedures used in data cleaning and management. Specifically, it reports the results for the tests of nonresponse bias in the sample and the conventions used to address missing values in the sample. This section also describes how composite scores were calculated for the independent variables for subsequent use in the multiple regression analysis. The second results section presents the results of the confirmatory factor analysis performed with the sample. It evaluates the hypothesized wilderness relationship model and several alternative models that were tested to maximize goodness of fit. Through model respecification and modification, a preferred "relationship with wilderness" model is presented. Finally, the third results section uses factor scores from the confirmatory factor analysis to perform a multiple regression analysis with several independent variables. This analysis explores which independent variables may have an association with an individual's relationship with the BWCAW. A comprehensive

understanding of these analyses and results will allow for future research recommendations to be made in the final chapter.

### Sample Statistics and Data Management

#### Response Rate

A total of 884 groups and 2,103 individuals consisting of both day users and overnight users were contacted during the sampling period. Of these contacts, 1,807 individuals were overnight users, the population of interest for this study. Individuals were randomly selected from this sample pool using a random number generator and equally assigned to receive either this study's questionnaire or the concurrent 2007 visitor trend study questionnaire. Initially, 904 individuals were mailed relationship questionnaires. After adjusting for undeliverable mailings, the potential sample of respondents consisted of 893 individuals.

Questionnaires were collected through December 31<sup>st</sup>, 2007. No further questionnaires were received after this date. A total of 621 completed questionnaires were returned for an overall response rate of 69.5%. An examination of these responses found a few instances where individuals returned multiple questionnaires (e.g. copies from second mailings) or questionnaires were not completed by the individual interviewed on site (e.g. different family member responded). After adjusting for these unusable questionnaires, the sample consisted of 616 completed questionnaires and yielded a response rate of 69%. This sample size was well above the 5:1 ratio suggested by Bentler (2006a), which would have required 300 cases for the estimation of the 60 free parameters in the proposed relationship scale. Therefore, the sample was considered sufficient for conducting structural equation modeling and confirmatory factor analysis.

## Nonresponse Bias

Following data cleaning, two different checks of possible sample bias were performed. For the first check, independent sample T-tests and Pearson's Chi-square tests were conducted to examine if any bias existed in the assignment of overnight users to either this study's relationship to wilderness questionnaire or to the concurrent 2007 visitor trend study format. The variables of interest for these tests were: number of previous visits to the BWCAW, year of 1<sup>st</sup> visit to the BWCAW, group size, group type, number of nights spent in the United States, number of nights spent in Canada, whether the group employed the services of an outfitter, and whether the group employed the services of a guide. Due to significant outliers, number of previous visits was delimited to 3 standard deviations above the mean. The results of these tests are presented in Table 8.

Results showed no significant differences between the visitor trend study and this study's sample populations on all target variables except group type. Group type was classified as family, friends, family and friends, organization/club, or alone. While the Pearson's Chi-square ( $\chi^2=12.202$ ,  $p=.032$ ,  $df=5$ ) was significant, examination of counts by each group type category showed no practical trends that would require correction (see Appendix C). Therefore, it was assumed that no significant bias existed in randomly assigning overnight users to the two questionnaire formats.

For the second check, independent sample T-tests and Pearson's Chi-square tests were again conducted to determine if any bias existed between respondents and nonrespondents of the relationship to wilderness questionnaire. The variables of interest for this set of tests were: number of previous visits to the BWCAW, year of 1<sup>st</sup> visit to the BWCAW, number of nights spent in the United States, number of nights spent in Canada,

**Table 8: Response Bias of Trend Study vs. Relationship Study Respondents**

Variable	Mean	Std. Deviation	Test Statistic	
			<i>t-value</i>	<i>Pearson <math>\chi^2</math></i>
Number of Previous Visits				
- trend study (n=893)	13.26	22.017	.331	NA
- relationship (n=889)	12.91	22.759	<i>p</i> =.741 <i>df</i> =1780	
Year of 1 <sup>st</sup> Visit				
- trend study (n=887)	1991.52	14.064	-1.089	NA
- relationship (n=886)	1992.26	14.117	<i>p</i> =.276 <i>df</i> =1771	
Group Size				
- trend study (n=903)	4.50	2.145	-1.123	NA
- relationship (n=904)	4.61	2.146	<i>p</i> =.262 <i>df</i> =1805	
Group Type				
- trend study (n=903)	NA	NA	NA	12.202
- relationship (n=904)	NA	NA		<i>p</i> =.032 <i>df</i> =5
Nights in US				
- trend study (n=903)	4.09	1.821	-.882	NA
- relationship (n=904)	4.16	1.854	<i>p</i> =.378 <i>df</i> =1805	
Nights in Canada				
- trend study (n=903)	.20	1.228	.973	NA
- relationship (n=904)	.15	.993	<i>p</i> =.331 <i>df</i> =1805	
Use Services of Outfitter				
- trend study (n=903)	NA	NA	NA	2.360
- relationship (n=904)	NA	NA		<i>p</i> =.307 <i>df</i> =2
Use Services of Guide				
- trend study (n=903)	NA	NA	NA	.204
- relationship (n=904)	NA	NA		<i>p</i> =.651 <i>df</i> =1

whether the group employed the services of an outfitter, and whether the group employed the services of a guide. Once again, number of previous visits was delimited to 3 standard deviations above the mean. The results of the nonresponse bias tests are presented in Table 9.

No significant differences were found between respondents and nonrespondents for number of previous visits, nights in the US, use of an outfitter, or use of a guide. However, significant differences were present between nonrespondents and respondents for year of 1<sup>st</sup> visit and nights in Canada. Closer examination of the difference in 1<sup>st</sup> visit represents a mean difference of approximately 5 years, biased towards an earlier year of first visit. Frequencies also show that 27% of nonrespondents were first-time visitors compared to 16% of respondents. Despite these discrepancies, this bias is not interpreted to be practically significant. First-time BWCAW users represented the largest category for the year of 1<sup>st</sup> visit variable. To weight the sample toward first-time respondents would be overemphasizing a segment of the sample that is already substantial. Thus, such circular logic was not considered appropriate.

In regards to the significant difference of nights in Canada, a substantial portion of respondents did not provide a response to this question. While no response could be assumed to represent “zero” nights in Canada, the convention was adopted that no response would be considered missing data. Further, recoding of missing data as “0” nights in Canada and retesting for differences found no significant differences between respondents and nonrespondents. Therefore, no response bias was assumed in the sample for nights in Canada.

Finally, respondents were examined for any discrepancies in the number

**Table 9: Response Bias of Respondents vs. Nonrespondents**

Variable	Mean	Std. Deviation	Test Statistic	
			<i>t-value</i>	<i>Pearson <math>\chi^2</math></i>
Number of Previous Visits - respondents (n=566)	11.64	17.379	.017	NA
- nonrespondents (n=282)	11.61	27.991	<i>p</i> =.986 <i>df</i> =392.110	
Year of 1 <sup>st</sup> Visit - respondents (n=606)	1990.44	14.443	-5.629	NA
- nonrespondents (n=282)	1995.73	12.340	<i>p</i> <.001 <i>df</i> =633.809	
Nights in US - respondents (n=593)	4.22	2.024	1.064	NA
- nonrespondents (n=288)	4.08	1.644	<i>p</i> =.287 <i>df</i> =685.005	
Nights in Canada - respondents (n=306)	.38	1.480	3.195	NA
- nonrespondents (n=288)	.08	.721	<i>p</i> =.001 <i>df</i> =447.881	
Use Services of Outfitter - respondents (n=601)	NA	NA	NA	4.199
- nonrespondents (n=288)	NA	NA		<i>p</i> =.123 <i>df</i> =2
Use Services of Guide - respondents (n=597)	NA	NA	NA	2.728
- nonrespondents (n=288)	NA	NA		<i>p</i> =.099 <i>df</i> =1

of previous visits, year of 1<sup>st</sup> visit, nights in US, and nights in Canada between their responses during the on-site interview and on the completed mail-back questionnaire. The repetition of these questions effectively represented a repeated measures design and appropriate statistical tests (simple T-tests) for such a design were utilized. Results showed no significant difference on any of these variables. Based on these results, it was

determined that no practical response bias existed in the sample and a weighting scheme was not justified.

### Missing Values

Hair et al. (1998) describe the concern for understanding missing data as similar to the need to understand the cause of nonresponse in the data collection process. The aim of examining missing data is to identify whether any underlying pattern or process exists in the data that could possibly lead to bias. The need to address missing values in this sample is also important for the use of structural equation modeling and EQS 6.1. SEM relies on means, standard deviations, and correlations for modeling the data (Bentler, 2004). The formulas to calculate these statistics in EQS 6.1 assume a complete data matrix without missing values. If specific steps are not taken in EQS 6.1 to address cases with missing data, the program defaults to listwise deletion of any case with missing data (Bentler, 2004). Listwise deletion is the deletion of a case, or respondent, from the analysis. This form of complete-case analysis might be appropriate if only a few cases are eliminated from a large sample, but can be problematic if large segments of the sample are lost. Because of this importance in understanding missing data in the sample, a thorough examination was conducted. Complete descriptions of the strategies used to address missing data in the sample are presented in the remainder of this section.

As previously mentioned, listwise deletion is a complete-case analysis approach. It is the simplest and most direct approach for dealing with missing data because only those cases with complete data are utilized (Hair et al., 1998). The sample was first examined to determine if listwise deletion would be a sufficient approach to address missing values. Results showed that only 319 of the 616 cases, or 52%, had complete

data for all the 90 variables of interest. Removing nearly half the sample through listwise deletion would discard large amounts of valid data, along with reducing the sample size to nearly below accepted levels for structural equation modeling. Based on these results, an approach other than strictly listwise deletion was necessary for addressing missing values in the sample.

Further examination of the data showed several patterns in the missing values. In some instances, a handful of respondents apparently skipped the entire first two pages of the questionnaire. This accounted for a minimum of 19 missing responses per questionnaire for these instances. Also, a few individuals missed subsequent sections entirely or failed to complete the questionnaire. However, these omissions did not appear systematic or an artifact of the questionnaire design. Therefore, the overall pattern of missing values of the sample was deemed to be “missing completely at random” and subsequently analyzed as MCAR (Hair et al., 1998).

Assuming this pattern, it was decided that only the cases with the most chronic issues of missing values were to be dropped from the sample. The cutoff for dropping cases was set at 9 missing items or more, which represents 10% of the variables of interest in the survey. This decision was partly made because it prevented a large number of qualifications that would be necessary to describe the results of any analysis due to these outlier cases. Additionally, these cases were also not used in calculating mean scores. Using this cutoff, dropped cases accounted for roughly 8.4% (n=52) of the sample. This resulted in a final working sample of n=564. All subsequently reported analysis and results in this study are based on this sample size.

Despite addressing the most chronic cases with missing values, the issue still remained to address the 245 cases with at least one missing value. The most basic and widely used method for replacing missing values is mean substitution (Hair et al., 1998; Kline, 2005). This method involves replacing a missing value with the overall sample mean for that variable based on all valid responses. While this method has the advantage of being easy to implement and provides complete information for all cases (Hair et al., 1998), it can have several disadvantages if the proportion of missing values is relatively high. These include underestimating the error variance and distorting the actual distribution due to imputing just a single constant value (Hair et al., 1998; Kline, 2005). However, Bentler (2004) argues mean imputation can be acceptable when only a tiny percent, say half of 1%, are missing in a completely random way. In this sample, 564 cases and 90 variables of interest produce 50,760 scores. A total of 511 scores are missing, approximately .01% of the sample. Due to this relatively low percentage and random pattern of missing scores, mean substitution was determined to be an acceptable approach to address the remaining missing values.

For the 30 item relationship scale, means were substituted for missing scores based on the mean scores of individual items, not the mean of the entire relationship scale. In several cases (n=10), individuals responded to the trust and commitment items by writing on the questionnaire that they had no commitment to the Forest Service or did not understand the question. For these cases, a score of '3' was substituted since the 5-point items were scaled for this midpoint to represent neutral or a "don't know" response.

Missing scores for the evaluation of social conditions and perception of resource condition items were also substituted with mean score based on individual items. Before

these mean scores were calculated, the “don’t know” responses were recoded as system missing in SPSS so as to not inaccurately affect the mean. It is also important to note that the presence of a “don’t know” response for these items provides further justification for mean substitution. A blank response on these items is fundamentally different than “don’t know” because respondents had the option to fill in “don’t know” and chose not to select that option. While respondent’s true score on the items cannot be determined, mean substitution provides a systematic and efficient way to estimate a possible score for these items.

Mean values from individual items were once again used to replace missing scores on the permit, user fees, and ecological events items. However, mean substitution was not possible on the technology scale because of the dichotomous choice of yes/no for the presence of certain technologies and equipment. To prepare the data for use as a Guttman scale, missing scores were replaced with a ‘no’ response. This was a logical assumption because respondents did select ‘yes’ responses on different items and appeared to make a conscious effort to describe what items were present on their trip. Therefore, failure to answer an item could be scored as though the respondents had checked the “no” category (Babbie, 2004, p. 162).

As described in the previous chapter, a composite score was not used to represent EUH and measures were utilized as individual, external variables in the model. However, a decision was made to drop “*the number of other wilderness areas visited*” for two reasons. First, a good number of respondents (n=56) reported “some”, “many”, or another subjective response for this question. These responses logically cannot be substituted by mean scores. Second, more confidence can be placed with the variables “*number of*

*previous visits to the BWCAW*” and “*year of first visit to the BWCAW*” because these variables were tested for any discrepancies or bias as repeated measure variables across the sample and results showed no apparent bias in these scores. For these reasons, “*the number of other wilderness areas visited*” was dropped from further analysis.

Mean substitution was used for both EUH variables, but a specific procedure was necessary for “number of previous visits to the BWCAW”. A number of respondents reported a number of visits “plus” (e.g. 50+ visits), making their real score on this variable impossible to determine. To replace these responses with real scores, the sample was segmented on this variable to calculate the appropriate sample mean. For example, for respondents who reported “50 plus” visits, the mean score of all respondents with 50 or more visits was calculated and substituted as the appropriate mean. Cases (n=9) simply with a missing score were replaced with the overall mean (17.42 visits) of this variable.

Individual missing scores for the demographic variables of age, education in years, and DFH were substituted with each variable’s mean score. Because income was categorized in \$20,000 increments, the midpoint of the reported increment was used as the income score. To calculate the midpoint for the “\$200,000 or more” increment, a histogram of all values was plotted with a normal curve superimposed over the distribution. This histogram was then used to determine the extreme of the “\$200,000 or more” increment. The normal curve of this histogram intercepted the x-axis at \$260,000, suggesting the estimated midpoint of the increment to be \$230,000.

Addressing missing values in social science data continues to be a controversial issue. However, it remains a crucial step in data preparation, specifically in the case of SEM and other techniques that required a complete data matrix. While missing values

were an issue in this study, the approach taken to address this issue was driven by the conclusion that missing values were only presented at a very low level. Again, only .01% of scores were missing from the sample. Implications for the results of this study may exist (e.g. distortion of actual values), but this researcher would argue that these implications are minimal and future analysis could be performed to support these arguments. The analysis could be re-run using list-wise deletion to compare results between the data with missing value replacement and those only utilizing completed cases. Techniques other than mean replacement (e.g. regression imputation, EM imputation) could also be used to address missing values and the results compared. Regardless, the approach taken in this study was rigorous and rational and should not be interpreted as a weakness in the data or the results.

#### New Variables Calculated

After all missing scores were substituted in the sample, additional calculations were made as necessary to represent the external variables in the model. Within the ‘perceived naturalness of resource conditions’ scale, items 7b (“*Opportunities to see wildlife*”) and 7f (“*Areas closed due to fire*”) were considered for deletion (see Appendix B). Compared to the other items in the scale, neither is related to negatively-caused human changes where responsibility can be placed on the visitor. Information regarding the perception of these items is also not directly helpful in suggesting management actions. Therefore, a reliability analysis was run to determine if items 7b and 7f should be dropped. Results were  $\alpha = .837$  for the full 17 item scale with Cronbach’s alpha improving to .849 and .844 respectively with the omission of 7b and 7f. Based on these results and the theoretical arguments, these items were dropped from the scale.

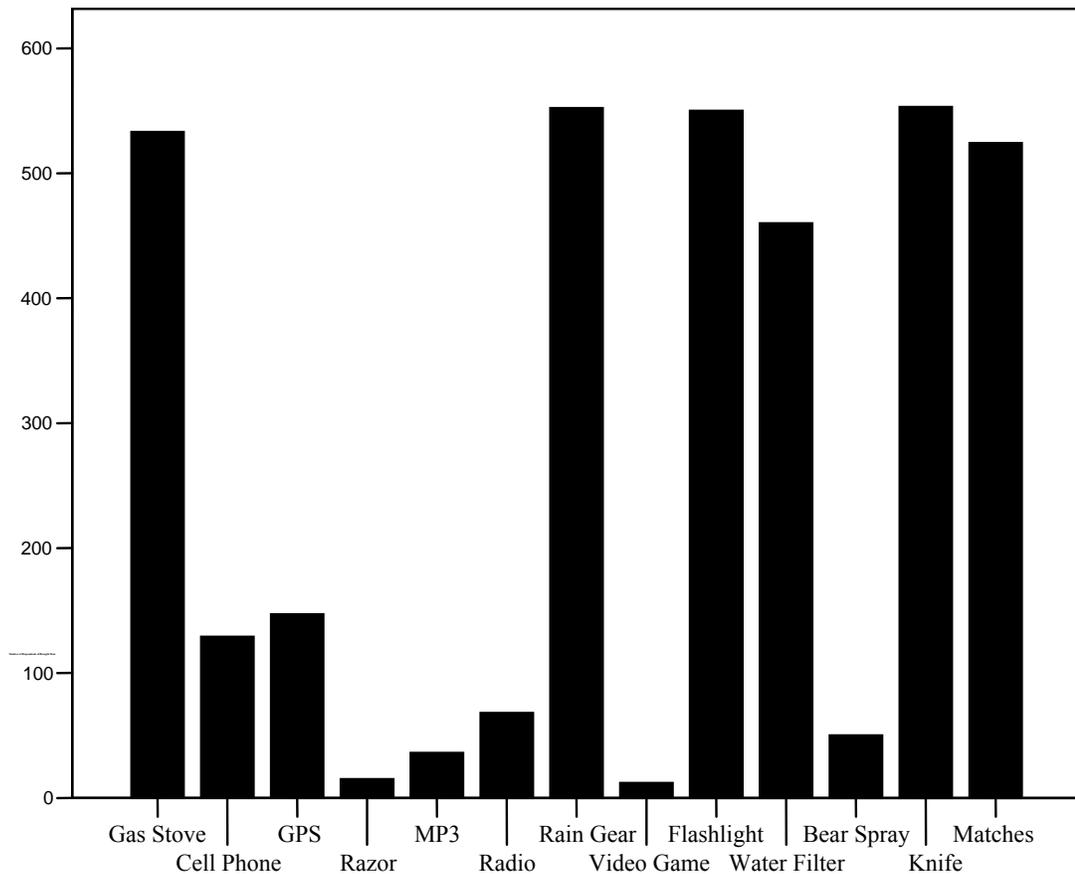
Information from on-site interviews and returned questionnaires demonstrated that some visitors were not involved with reserving permits, picking up permits, or visiting a permit station or cooperator. Consequently, creating an index score for each individual's evaluation of the functionality of the permit system was not appropriate. A linear regression was used to determine if items 8a, ("*how convenient to reserve*"), 8b ("*how convenient to pick up*"), and 8c ("*how convenient were hours of operation*") are good predictors of an individual's overall satisfaction with the process of obtaining a permit (Item 8d), and could subsequently be dropped. Results showed a strong linear relationship between these variables with a model fit (R-squared) of .728 and all beta coefficients significant at  $p < .001$ . Therefore, satisfaction with the process of obtaining a permit was used as a single item evaluation of the functionality of the permit system.

Attempting to measuring technology can be difficult. Debate can exist over which items (e.g. cell phones, gas stoves) are the best indicators of different levels of technology present in a wilderness setting. This study attempted to measure technology by the construction of a Guttman scale. The function of a Guttman scale is efficient data reduction and is based on the fact that some items under consideration may be more extreme indicators of the variables than others (Babbie, 2004). It assumes that respondents who report on a strong indicator of a variable, will also report on all the weaker indicators. For example, if someone is willing to bring a GPS unit into the BWCAW, they are mostly likely also willing to bring a flashlight.

To construct the Guttman scale, individuals were given a list of 13 items that may have been brought on their trip. While any list of technology present in the BWCAW cannot be exhaustive, these items were selected as possible indicators that could create a

scalar structure that would range from “low technology” present (e.g. knife) to “high technology” present (e.g. MP3 player). To efficiently reduce the data into different levels of technology, it was necessary to select items to be the individual indicators of low, medium, and high levels of technology. To select these three items, frequencies of “yes” responses for the presence of these items were graphed to determine possible segments of the technology scale (Figure 4). The inter-item correlations of each item in these possible segments (low, medium, high) were then examined to determine which item had the highest correlation among the other items in the segment and therefore best represented that segment. The low item selected was presence of a knife, the medium item was

**Figure 4: Frequencies of Responses for Technology Scale**



presence of a GPS unit, and the high item was presence of a MP3 player. Although a portable video game was the item least frequently brought (n=12), it did not have the highest inter-item correlation among other high technology items (MP3, razor). Thus, indicator selection was made empirically based on the structure observed among the actual data instead of by some subjective or theoretical reasoning. It allowed a scalar structure to emerge based on the present of technology in the BWCAW setting according to visitor respondents.

Once the three indicators for level of technology were selected, respondents were assigned a scale score. Presence of a knife was assigned a “low technology” score, a GPS unit and a knife a “medium technology” score, and a MP3 player, GPS unit, and a knife a “high technology” score. These scores were assigned with the aim of minimizing the errors that would be made in reconstructing the original responses (Babbie, 2004). To determine the extent to which the empirical responses formed a Guttman scale, the coefficient of reproducibility was calculated. This coefficient is the percentage of original responses that could be reproduced knowing the scale scores used to summarize them. For this sample, the coefficient of reproducibility was 98.8%, a highly acceptable level. These new scores, along with the other previously described measured variables, comprise the working sample for this study.

### Descriptive Statistics

A summary of descriptive statistics from the sample are presented in Table 10. Respondents were predominately male (72%), middle-aged, and well educated (16 years of education is equivalent to an undergraduate college degree). Most could also be considered upper middle-class, with 70% of the sample reporting annual household

incomes of approximately \$70,000 or more. These demographics are consistent with previous wilderness user profiles (Roggenbuck & Watson, 1989; Watson, Williams, Roggenbuck, & Daigle, 1992). Groups predominantly consisted of family members and/or friends, with organization and clubs representing approximately 6% of the sample. Mean group size was 4 individuals, below the maximum of 9 per BWCAW regulations.

**Table 10: Descriptive Statistics of the Sample<sup>a</sup>**

Variable	Mean	Std. Deviation
Age	44.46	13.48
Education (in years)	16.30	2.61
Income (in dollars)	\$88590.44	\$49238.55
Gender <sup>b</sup>		
Male	72.1%	
Female	27.9%	
Group Type		
Family	35.8%	
Friends	21.8%	
Family & Friends	35.3%	
Alone	1.4%	
Organization or Club	5.7%	
Group Size	4.45	2.08
Nights in US	4.25	1.96
Number of Previous Visits	14.60	22.17
Year of 1 <sup>st</sup> Visit	1990	14.17
Used Services of Outfitter		
Not at all	59.8%	
Yes, for SOME	35.3%	
Yes, for ALL	5.0%	
Used Services of Guide		
Yes	0.2%	
No	99.8%	

<sup>a</sup> Sample size, n=564

<sup>b</sup> n=556

Respondents in the sample appeared to be experienced BWCAW users. The mean number of previous visits to the BWCAW for respondent was approximately 15 visits. Some had been visiting the area prior to its designation as wilderness in 1964, with the mean first year of visit around 1990. However, 15-16% of respondents were first-time visitors without any prior experience in the BWCAW.

On their current trip, respondents spent an average of 4.25 nights in the BWCAW. Approximately 60% of respondents reported not using the services of an outfitter with only 5% reported being completely outfitted. Only one individual reported using the services of a guide, but this is not considered representative of overnight guided use in the BWCAW. Though it is assumed overnight guiding is low, the sampling frame was not specifically designed to target this type of wilderness use.

Along with the descriptive analysis, a reliability analysis was also conducted to examine how the performance of the questionnaire's numerous scale items compare to that of the same items in previous studies. This comparison is presented in Table 11.

The overall reliability of the relationship scale was  $\alpha = .95$ . A generally agreed upon lower limit of acceptability is .60 to .70 (Hair et al., 1998). Therefore, this scale based on the sample data was assumed to be reliable. However, because reliability is influenced (i.e. better reliability) by the total number of items, it was no surprise the 30-item scale was highly reliable. Individual scales for the hypothesized internal factors were also acceptable, ranging from .78 (*Life Centrality*) to .94 (*Trust*). User fees, a proposed external force change, was also acceptable with  $\alpha = .87$ . When compared to the tested reliabilities of these scales in previous literature, all results from this study equaled

**Table 11: Comparison of Sample Reliabilities to Previous Studies<sup>a</sup>**

Scale items	Cronbach's Alpha	Previously Tested Reliabilities <sup>b</sup>
Relationship Scale	.95	NA
Place Identity (6 items)	.93	.84-.94
Place Dependence (5 items)	.88	.81-.94
Place Meanings (4 items)	.89	.82
Life Centrality (4 items)	.78	.78
Trust (4 items)	.94	.93
Commitment (7 items)	.92	.90
User Fees (9 items)	.87	.87-.90

<sup>a</sup> Only those items that were part of the relationship scale or used to calculate a mean score are presented.

<sup>b</sup> Measures as described by previous literature in Chapter 3

or exceed those scores. This provides validation for the use of these items and their application within the BWCAW and a wilderness context.

In the next section, results are presented from the confirmatory factor analysis. This analysis examined the dimensionality and underlying structure of the hypothesized relationship model. Model testing began first with exploring issues in multivariate normality and determining if models were identified. Next, model fit was assessed by examining the standardized residuals and various fit indices for the model. Finally, if models were found to be unacceptable, they were respecified based on alternative factor loadings or omission of individuals measure items.

## Model Testing – Confirmatory Factor Analysis

The purpose of the confirmatory factor analysis (CFA) was to examine the underlying structure of the data relative to the proposed relationship model. The data utilized for this analysis was that of the 30 relationship scale items all presented in a 5-point Likert-type format (*strongly disagree to strongly agree*). Descriptive statistics for these items is presented in Appendix C. Modeling measured variables into their possible latent factors is defined as the measurement model in SEM (Bentler, 2006a). This measurement model depicts the links between latent variables and their observed measures (Byrne, 1994). A total of five models had to be considered given the statistical characteristics of each model and the desire to achieve the best model fit.

In the previous chapter that operationalized the relationship model, consideration of identification was described as an important issue for systems of simultaneous equations. Identification is also an important property of the measurement model in CFA and the first step of model testing. Kline (2005) defines a model as identified if it is theoretically possible to derive a unique estimate of each parameter. More simply, a model must contain sufficient information from the input data to attain a determinate solution of parameter estimation. If a model is underidentified (e.g. not enough information) an infinite number of solutions are possible. If a model is overidentified, an excess of information is present and results in positive degree of freedom that allow for rejection of the model (Byrne, 1994). Kline explains that two necessary conditions must be met in order for any CFA model to be identified. First, the number of free parameters<sup>4</sup>

---

<sup>4</sup> The total number of variances and covariances of factors and measurement errors plus the direct effects of the factors on the indicators.

must be less than or equal to the number of observations.<sup>5</sup> Second, every latent variable, which includes the measurement errors and factors, must have a scale or metric. In this chapter, these conditions are specifically examined for the primary hypothesized models, and subsequently validated by the degrees of freedom for each of the alternative models.

Measurement models with more observations than parameters are described as overidentified and usually do not perfectly fit the data (Kline, 2005). Thus, the second step of model testing is the consideration and maximization of goodness of fit for a proposed model. Goodness of fit is the degree to which the observed input data is predicted by the estimated model (Hair et al., 1998). Model fit in SEM is evaluated through the use of fit indices. Numerous indices are available across the SEM literature and much debate exists over which indices are most appropriate. Kline (2005) suggests a minimum set of fits indices that should be reported and interpreted when presenting the results of SEM analyses. The fit indices are: the model chi-square, the root mean square error of approximation (RMSEA) with 90% confidence intervals, the Bentler (1990) comparative fit index (CFI), and the standardized root mean square residual (SRMR). For model chi-square, higher values suggest poor model fit. However, this statistic is based on achieving perfect population fit and influenced by sample size. For these reasons, the more important interpretation of this statistic is to examine the change in model chi-square for alternative models relative to the original hypothesized model. A significant change thus suggests an improvement in the goodness of fit.

Several cutoff values for acceptable fit exist for the other indices. Kline (2005) suggests  $RMSEA \leq .05$  for close approximate fit with a 90% confidence interval of .05 to

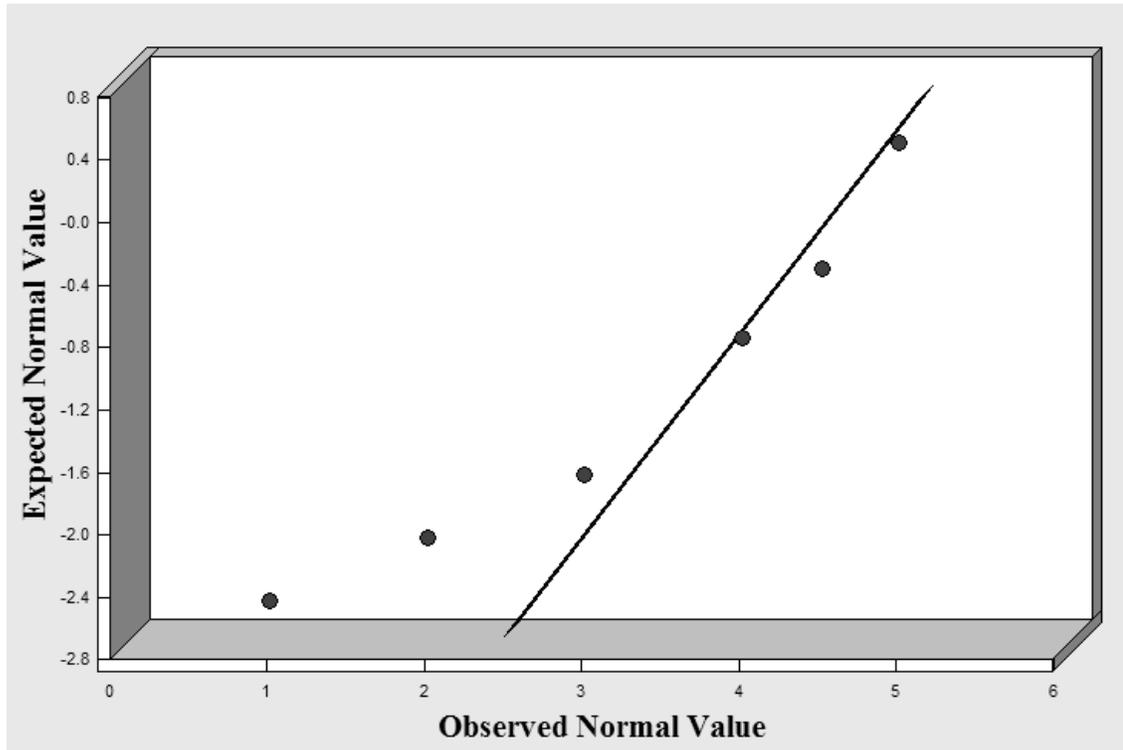
---

<sup>5</sup> The number of observations equals  $\nu(\nu + 1)/2$ , where  $\nu$  is the number of observed variables. This SEM terminology is not referring to the number of sample cases ( $n=564$ ).

.08 for reasonable error of approximation. He also suggests  $CFI > .90$  and  $SRMR < .10$ . Hu and Bentler (1999) propose more rigid cutoff values in attempts to lower type II error rates. They suggests  $CFI > .95$ ,  $RMSEA < .06$ , and  $SRMR < .08$  or  $.09$ . Due to the exploratory nature of wilderness relationships, this study adopted the less rigid cutoff values proposed by Kline to evaluate model fit. However, these fit indices were interpreted in combination with the model chi-square and standardized residuals to make the best judgment regarding model fit. Therefore, a single fit index was not responsible for outright model rejection.

Finally, a need existed to examine the assumption of normality for the confirmatory factor analysis. In SEM, violation of the multivariate normality assumption has implications for hypothesis testing and error rates. While parameter estimates can be accurate in large samples if nonnormality exists, standard errors tend to be too low and result in inflated Type I error rates (Kline, 2005). Therefore, normality was assessed by examining skewness, kurtosis, and normal probability plots (Figure 5) in EQS 6.1. A univariate analysis of the individual relationships measurement items showed that the absolute value of skewness ranged from .03 (“*The connection I have with the Forest Service is something I really care about*”) to 2.08 (“*The Boundary Waters Wilderness is a place of high environmental quality*”). The four place meaning measures all had skewness values greater than 1.36. The absolute value of kurtosis ranged from .11 (“*The Forest Service shares my values about how the BW should be managed*”) to 5.48 (“*The Boundary Waters Wilderness is a place of high environmental quality*”). Once again, all four place meaning measure had the highest kurtosis values.

**Figure 5: Normal Probability Plot for Item 5s**



Hair et al. (1998) suggest that skewness values outside the range of -1 to +1 indicate substantially skewed distributions. Kline (2005) suggests that variables with absolute values of skewness greater than 3.0 can be described as “extremely” skewed. He further describes absolute values of kurtosis between 8.0 and 20.0 as indicating “extreme” kurtosis. Based on these guidelines and examination of the normal probability plots, it was determined that the sample possessed a moderate, but acceptable, amount of skewness and kurtosis.

Although the level of nonnormality was acceptable, a corrected normal theory method was used to address this issue. The Satorra-Bentler scaled statistic was used to provide robust chi-square values, standard error estimates, and adjusted fit indices. This statistic has been shown to perform better than uncorrected statistics when the normal distribution assumption is false (Hu, Bentler, & Kano, 1992). It adjusts downward the

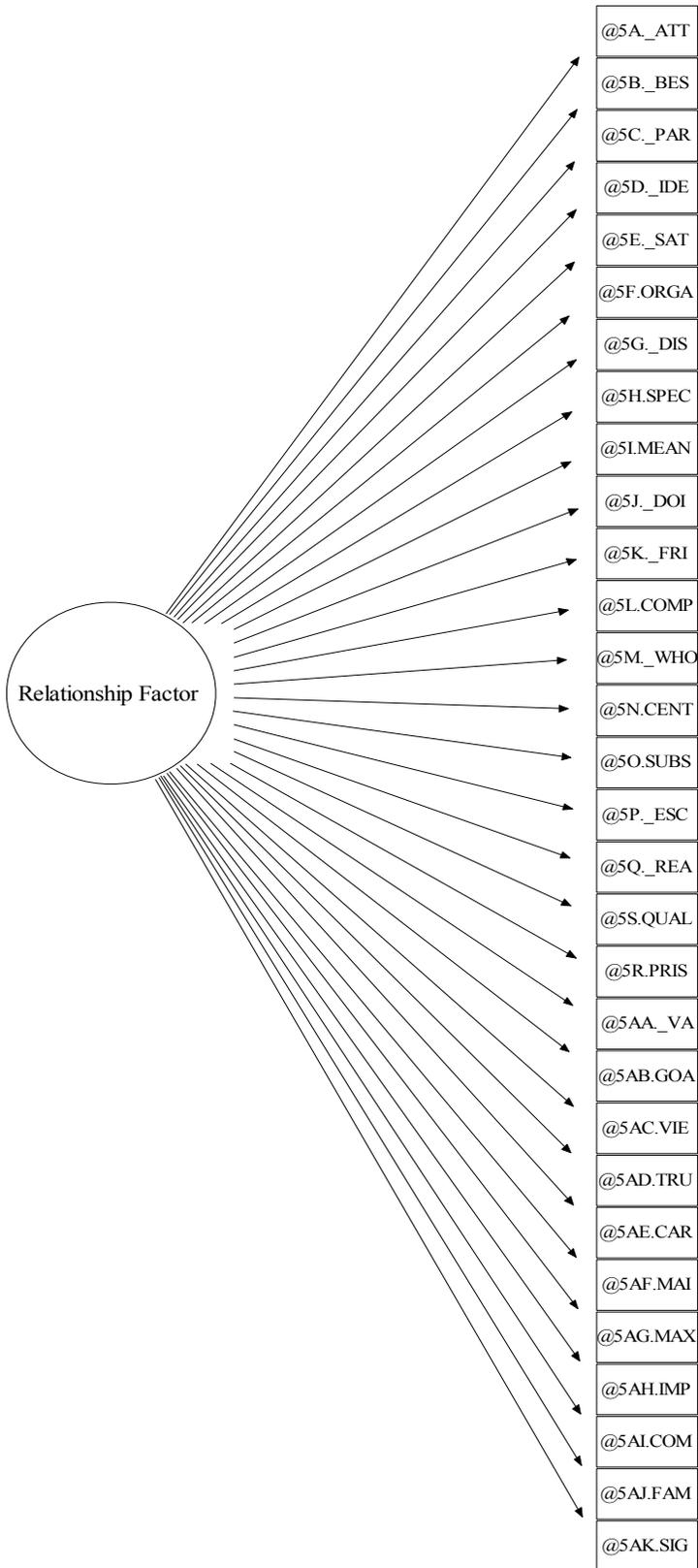
value of chi-square from standard maximum likelihood estimation by an amount that reflects the degree of observed kurtosis (Kline, 2005). It is designed to more closely approximate chi-square than the usual test statistic and to perform as well or better than asymptotically distribution free methods generally recommended for nonnormal multivariate data (Bentler, 2006a; Byrne, 1994). The Satorra-Bentler scaled statistic is also the most reliable test statistic for evaluating covariance structure models under various distributions and sample sizes (Byrne, 1994).

### Single Factor Model

The next step in model testing was the examination of a single factor model. Testing a single factor model is an important step because the inability to reject such a model suggests that the measured variables do not show discriminant validity (Kline, 2005). That is, the variables would seem to measure only one domain and not the multiple dimensions hypothesized by this study. Thus, a model was tested that depicted all 30 relationship items influence by a single underlying relationship factor. This model is illustrated in Figure 6. Note that for SEM diagrams such as this, it is the convention that all measured variables are represented by rectangles and all latent variables are represented by circles. Also, one-way arrows represent partial regression coefficients and two-way arrows represent a covariance (Bentler, 2006a). Measured items for all diagrams have been abbreviated to variable notation. Full item wording is presented in Appendix B.

In terms of model identification, 60 free parameters were estimated (29 factor loadings, 30 error variances, 1 factor variance). A total of 465 observations (see previous footnote) are utilized in the model, thus the model was overidentified with 405 degrees of

**Figure 6: Single Factor Model (Model 1)**



freedom. To assign a scale to the latent variable, it is common to fix the loading on one indicator of each factor, usually that of the highest loading indicator (Grimm & Yarnold, 1995). In this case, the loading of measured variable, “*I am very attached to the Boundary Waters*”, was fixed at 1.0 for the single latent variable. Based on these actions, the single factor model met the requirements for model identification (i.e. # of free parameters  $\leq$  to # of observations, every latent variable has a scale).

Results in EQS 6.1 for the single factor model showed the normalized estimate of multivariate kurtosis for this model was 57.403. This  $z$ -statistic indicated the presence of nonnormality and significant positive kurtosis, thus validating the use of the Satorra-Bentler scaled statistic as a corrected normal theory method for the data. The Satorra-Bentler (S-B)  $\chi^2 = 5896.300$  with 405 degrees of freedom. This statistic was significantly smaller than the  $\chi^2$  statistic from the uncorrected normal model ( $\chi^2 = 7880.258$ ), suggesting better model fit than the uncorrected normal model and further supporting the use of a corrected normal theory method.

Model fit assessment continued with examining the standardized residuals. If the model describes the data well, standardized residuals should be small and evenly distributed (Byrne, 1994). Large residuals on individual parameters indicate misspecification (Joreskog & Sorbom, 1988). While a “rule of thumb” is not stated for the size of residuals, values above .100 on a standardized scale were considered to indicate misfit. In EQS 6.1, the off-diagonal standardized residuals play a major role in affecting goodness of fit  $\chi^2$  statistics (Byrne, 1994). For this reason, the average off-diagonal standardized statistic was used to assess model fit in this analysis. In the single factor model, standardized residuals were normally distributed, but the average off-

diagonal standardized residual was .107. Additionally, the 20 largest residuals all exceeded .429, thus suggesting a poorly fit model.

Examination of the goodness of fit indices also suggests a poorly fit model. Model CFI = .460, RMSEA = .155 (90% confidence interval = .152-.159), and SRMR = .151. These values were not within the range of acceptable model fit. Therefore, it was determined that a single factor model did not fit the data well. These results confirm the discriminant validity of the measured variables and that individual variables are not loading on a single underlying factor. Quite simply, the data collected in this study suggest that a relationship with wilderness is a multi-factor construct, more complex than can be summarized by a single factor.

#### Full Latent Factor Model

With evidence rejecting a single factor model, a full latent factor model was tested. This model was specified based on the proposed model of a wilderness relationship illustrated in Figure 1. The full latent factor model (Model 2) included factor correlations between the self dimensions (place identity & life centrality), management agency dimensions (trust & commitment) and the place dimensions (place meanings and place dependence). In addition, a factor correlation between place identity and place dependence was included, based on the theoretical relationship described by Williams and Vaske (2003) as the two dimensions of place attachment.

A total of 64 free parameters were estimated (30 factor loadings, 30 error variances, 4 factor covariances). Factors scales were assigned by fixing all six factor variances at 1.0. Based on these constraints, the model was overidentified with 401 degrees of freedom. Also, because the same dataset was utilized for this model (and all

subsequent models) as for the single factor model, the normalized estimate of multivariate kurtosis remained at 57.403. Again, this indicated nonnormality and validated the use of the Satorra-Bentler scaled statistic for all subsequent models.

The average off-diagonal standardized residual in Model 2 was .224 and the 20 largest residuals all exceeded .437. Once again, these statistics suggest poor model fit. The calculated goodness of fit indices were as follows: S-B  $\chi^2 = 2085.605$  ( $p < .001$ , 401  $df$ ), CFI = .834, RMSEA = .086 (90% confidence interval = .083 -.090), SRMR = .256. The  $\Delta$ S-B  $\chi^2$  (3810.695 for  $df = 4$ ) from the single factor model to the full latent factor model was significantly different, which typically suggests an improvement in model fit. However, all of the goodness of fit indices were not within the acceptable range for good approximate model fit. Taken collectively with the size of the standardized residuals, these fit indices results suggest the necessity to respecify the model.

Due to the presence of multivariate kurtosis in the model, individual cases were examined to determine which were contributing the most to nonnormality. Results showed Case #99 contributed the most to multivariate kurtosis and therefore, could possibly be removed as an outlier. Model 2 was retested with Case #99 omitted to determine if goodness of fit would improve. Retest goodness of fit indices (S-B  $\chi^2 = 2160.426$ , CFI = .828, RMSEA = .088, SRMR = .257) suggested that this case, despite being an outlier, was not largely responsible for poor model fit. In actuality, model fit worsened with the removal of the case from the dataset. Therefore, these results suggest that model misspecification, not an outlier, is most responsible for poor fit (Byrne, 1994) and respecification of a new model with the full dataset is warranted.

### Full Model with Complete Covariance

Model 2 tested a restricted version of a full latent factor model and resulted in poor model fit. It had placed restrictions on factor covariances, allowing only a few factors to covary with one another. To improve the goodness of fit to the data, this model was respecified as a more general and relaxed model (Model 3). Model 3 specified no restrictions on factor covariance and allowed for all six hypothesized factors (place identity, life centrality, trust, commitment, place meanings, place dependence) to individually covary with all other factors (Figure 7). A total of 75 free parameters were estimated (30 factor loadings, 30 error variances, 15 factor covariances) and factors scales were once again set by fixing all six factor variances (1.0) This specified an overidentified model with 390 degrees of freedom.

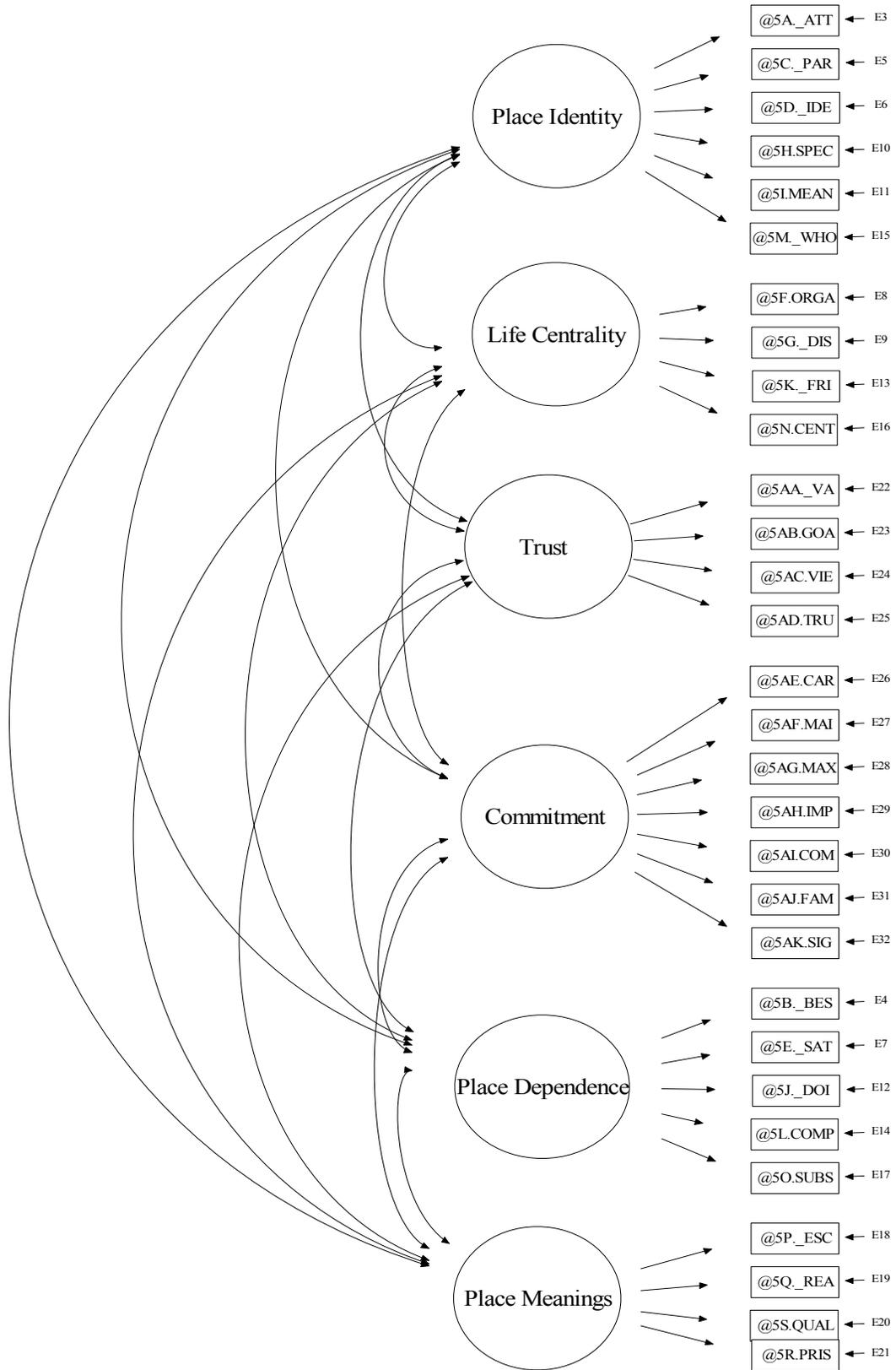
Results showed that standardized residuals improved compared to Model 2, with the average off-diagonal standardized residual (.046) and the 20 largest residuals (.329 - .131) all decreasing. Goodness of fit indices (S-B  $\chi^2 = 1406.300$  ( $p < .001$ , 390 *df*), CFI = .900 RMSEA = .068 (90% confidence interval = .064 -.072), SRMR = .064) also improved to values that are considered an acceptable approximation of model fit based on the previously described cutoffs for CFI, RMSEA, and SRMR. The Satorra-Bentler  $\chi^2$  decreased from 2160.426 to 1406.300, but was still significant ( $p < .001$ ).<sup>6</sup> However, the  $\Delta$ S-B  $\chi^2_{(11)} = 754.126$  represents a significant decrease between models. This change suggests an improved model and a better goodness of fit for the data.

Although Model 3 was statistically acceptable, several fit indices were only marginally within suggested cutoffs. Therefore, further testing was conducted to assess if

---

<sup>6</sup> For an overidentified model, a significant  $\chi^2$  statistic is interpreted as the proposed model being significantly different from a null model with perfect fit in the population.

**Figure 7: Full Model with Complete Covariance (Model 3)**



model fit could be improved with additional model respecification. The Lagrange Multiplier (LM) Test was conducted to determine whether specification of certain parameters as free rather than fixed would lead to a better fitting model (Byrne, 1994). LM Test results are reported as  $\chi^2$  statistics for each parameter with significantly large statistics signifying misspecification. Results of the LM Test on Model 3 suggested that the measured variable 5g, "*I enjoy discussing the BW with my friends*", which was specified to load on the Life Centrality factor, should also be allowed to cross load on the Place Identity factor (LM  $\chi^2= 128.740$ ,  $df= 1$ ,  $p< .001$ ). Specifically, such a respecification would decrease the S-B  $\chi^2$  statistic and improve the overall model goodness of fit. Therefore, Model 3 was retested with the measurement variable 5g specified to load on both the Life Centrality and Place Identity factor.

The results of the retest showed  $\Delta S-B \chi^2_{(1)} = 102.2839$  that was a significant decrease between models, just as suggested by the LM test. Also, all goodness of fit indices improved (CFI=.910, RMSEA=.065, 90% confidence interval = .061-.068, SRMR= .047). While these results supported the cross loading of the targeted variable, examination of the individual parameter estimates (e.g. regression coefficients) suggested otherwise. The robust test statistics suggest that the parameter estimates were only significant ( $p=.05$ ) for the Place Identity factor, not the Life Centrality factor when cross loaded. In addition, the standardized regression equation for the model indicates a very weak correlation (.022) between the targeted variable and the Life Centrality factor.

While the respecification of Model 3 demonstrated an improved goodness of fit, theoretically allowing variables to cross load on multiple factors may not make substantive sense. It becomes difficult to discriminate which of the underlying factors is

responsible for influencing an individual's response to a particular measurement item. Cross loading measured variables also makes statistical interpretation very difficult. Parameter estimates in confirmatory factor analysis are considered factor loadings. If these factor loadings are standardized, they can be interpreted as estimated correlations between the indicator and the factor (Kline, 2005). However, if indicators cross load on different factors, standardized estimates are no longer scaled as correlations and the unique contribution from each factor cannot be as clearly interpreted. For these reasons, the crossing loading of the variable 5g on Life Centrality and Place Identity in the proposed model was rejected. However, the insights from the LM test were used to propose a new model (Model 4) as described below.

#### Five Factor Relationship Model

Results from the LM test introduced the possibility of cross loading measurement items between factors. This suggestion brought into question whether the hypothesized factors for each of the three internal dimensions (Self, Management Agency, Place) in the hypothesized wilderness relationship model (Figure 1) were relevant and necessary for good model fit. That is, factors possibly could be dropped to improve the model fit. To examine this possibility, the factor structure for each internal dimension was examined to determine if any sources of model misfit existed (Table 12). Results from this process were then used to make incremental adjustments to a respecified, full factor model.

The Place Identity and Life Centrality factors initially showed poor model fit (S-B  $\chi^2 = 476.051$ , CFI = .862, RMSEA = .152, 90% confidence interval = .140 -.164, SRMR = .088). As in the previous model, the LM test suggested cross loading the measured

**Table 12: Factor Structure of Internal Dimensions of a Relationship**

Dimension	Goodness of Fit Indices			
	S-B $\chi^2$	CFI	RMSEA (90% CI)	SRMR
Self Factors <i>Place Identity</i> <i>Life Centrality</i>	476.051	.862	.152 (.140-.164)	.088
Management Agency Factors <i>Trust</i> <i>Commitment</i>	138.569	.977	.063 (.051-.074)	.029
Place Factors <i>Place Meanings</i> <i>Place Dependence</i>	125.919	.932	.083 (.068-.097)	.043

variable 5g between factors, but also cross loading the measured item 5k, “*Most of my friends are in some way connected with the BW*” between both factors. For the sake of the interpretability of results and to increase model parsimony, both of these items were dropped from the model. Conversely, the Trust and Commitment factors initially demonstrated the best model fit of all the three internal dimensions (S-B  $\chi^2 = 138.569$ , CFI = .977, RMSEA = .063, 90% confidence interval = .051 -.074, SRMR = .029). However, the LM test once again showed possible cross loadings between factors, in this case associated with variable 5ak, “*The connection I have with the Forest Service is of very little significance to me*”. As with the convention adopted in the previous dimension, this item was dropped from the model. Lastly, the Place Meanings and Place Dependence factor also initially demonstrated good model fit (S-B  $\chi^2 = 125.919$ , CFI = .932, RMSEA = .083, 90% confidence interval = .068 -.097, SRMR = .043). As with the previous dimensions, examination of the LM test results suggested a cross loading measured variable, in this case 5l, “*No other place can compare to the BW*”. Again, this item was dropped from the model.

For each internal dimension, the omission of these measured items decreased the S-B  $\chi^2$  statistics and improved the goodness of fit indices. These results were utilized to specify Model 4, a hybrid of Model 3 with complete covariances between factors and variables 5g, 5k, 5l, and 5ak removed from the model. Factors scales were again set by fixing all six factor variances (1.0) and the model is overidentified with 284 degrees of freedom. Results showed improved standardized residuals compared to Model 3, with the average off diagonal standardized residual (.034) and the 20 largest residuals (.160-.085) all decreasing. Model goodness of fit statistics (S-B  $\chi^2 = 1031.653$  ( $p < .001$ , 284 *df*), CFI = .918 RMSEA = .068 (90% confidence interval = .064 -.073), SRMR = .043) also improved, with the  $\Delta$ S-B  $\chi^2_{(106)} = 374.647$  representing a significant decrease between models. This provided support for accepting Model 4 as a better fit for the data.

Despite these improvements, further respecification of Model 4 was necessary. Results of the LM test showed the need for further cross loadings between Place Identity measured variables and the Life Centrality factor, decreasing the ability to interpret results. More importantly, the Life Centrality factor in Model 4 was only composed of two measured variables after the deletions of variables 5g and 5k. As described by Kline (2005) first-order factors constructed by less than three measured variables run the risk of being underidentified in the model. For these statistical and substantive reasons, the Life Centrality factor and its remaining measured variables were dropped and a new model, Model 5 (Figure 8), was specified.

Model 5 was overidentified with 242 degrees of freedom. Compared to Model 4, the average off diagonal standardized residual (.034) and the 20 largest residuals (.147

**Figure 8: Preferred Factor Model (Model 5)**



-.081) were approximately the same. Several goodness of fit indices (RMSEA = .068, 90% confidence interval = .063-.073, SRMR = .042) also were nearly identical to Model 4. However, the CFI for Model 5 increased from .918 to .921 and the S-B  $\chi^2$  decreased to 878.090. More importantly, the  $\Delta$ S-B  $\chi^2_{(42)} = 153.563$  was a significant decrease between the models. Based on these indices, Model 5 was designated as the preferred first-order factor model to fit the data from the sample. A summary of goodness of fit indices across all tested models are presented in Table 13.

It is important to note that in SEM it is possible to overfit the model. Any model will perfectly fit the data if it is specified to be as complex as possible (Kline, 2005). Consequently, an important part of model respecification after examining identification, standardized residuals, and goodness of fit indices is the goal of parsimony. As is the case between Models 4 and 5, given different models with similar explanatory power and comparable model fit for the same data, the simpler model (Model 5) that is less complex

**Table 13: Summary of Goodness of Fit Statistics for Comparative Models<sup>a</sup>**

Model	Goodness of Fit Indices				
	S-B $\chi^2$	<i>df</i>	CFI	RMSEA (90% CI)	SRMR
Single Factor Model ( <i>Model 1</i> )	5896.300	405	.460	.155 (.152-.159)	.151
Full Latent Factor Model ( <i>Model 2</i> )	2085.605	401	.834	.086 (.083-.090)	.256
Full Model w/ Complete Covariance ( <i>Model 3</i> )	1406.300	390	.900	.068 (.064-.072)	.064
Hybrid Full Factor Model ( <i>Model 4</i> )	1031.653	284	.918	.068 (.064-.073)	.043
Preferred Five Factor Model ( <i>Model 5</i> )	878.090	242	.921	.068 (.063-.073)	.042

<sup>a</sup> Suggested fit indices cutoffs: CFI > .90-.95, RMSEA ≤ .05-.06, 90%CI = .05-.08, SRMR < .08-.10.

and with less parameters to approximate the structure of the data is preferred (Kline, 2005). The omission of the Life Centrality factor from Model 5 specifies a less complex and more parsimonious model. It also addresses any problematic interpretation and complexity of factor loadings and standardized correlations by removing possible cross loadings between factors as suggested in Model 4. Thus, the achievement of parsimony in Model 5 provides additional support for accepting the model when considered in concert with the improvement in goodness of fit indices.

Additional statistical examination also supported and further validated the selection of Model 5 as the preferred first-order factor model. Several of these statistics are shown in Table 14. Tests of significance for individual parameter estimates based on robust standard errors were all significant ( $p = .05$ ). Also, measured variables or factor indicators showed good psychometric properties with relatively high standardized correlations or factor loadings that ranged from .713 to .945.  $R^2$  values, the proportion of explained common indicator variance (Kline, 2005), were also high, ranging from .508 to .893. These statistics support the notion that the measured variables used as factor indicators in Model 5 fit the sample and represented the underlying structure of the data very well.

#### Second Order Factor Analysis

While the first-order confirmatory factor analysis illustrated an underlying structure for the data consisting of five factors, it does not explore the presence of an overarching relationship factor. This can be achieved through a second-order factor analysis. A second-order factor is a higher order general factor hypothesized to account for the variance and covariance related to the first-order factors (Byrne, 1994). It

**Table 14: Standardized Correlations, Error Terms, and R<sup>2</sup> values<sup>a</sup>**

Measurement Items	Standardized correlation	Error Term	R <sup>2</sup>
<i>Place Identity</i>			
5a. Attached	.816	.578	.666
5c. Part	.872	.489	.761
5d. Identity	.864	.504	.746
5h. Special	.856	.517	.732
5i. Mean	.871	.491	.759
5m. Who	.724	.690	.524
<i>Trust</i>			
5aa. Values	.923	.384	.853
5ab. Goals	.945	.328	.893
5ac. Views	.922	.386	.851
5ad. Trust	.803	.596	.644
<i>Commitment</i>			
5ae. Care	.884	.467	.782
5af. Maintain	.900	.435	.811
5ag. Maximum	.872	.489	.761
5ah. Important	.908	.419	.825
5ai. Committed	.892	.452	.796
5aj. Family	.733	.681	.537
<i>Place Meanings</i>			
5p. Escape	.795	.606	.633
5q. Real	.832	.554	.693
5r. Pristine	.773	.635	.597
5s. Quality	.873	.487	.763
<i>Place Dependence</i>			
5b. Best	.847	.531	.718
5e. Satisfaction	.835	.550	.698
5j. DOI	.816	.578	.665
5o. Substitute	.713	.701	.508

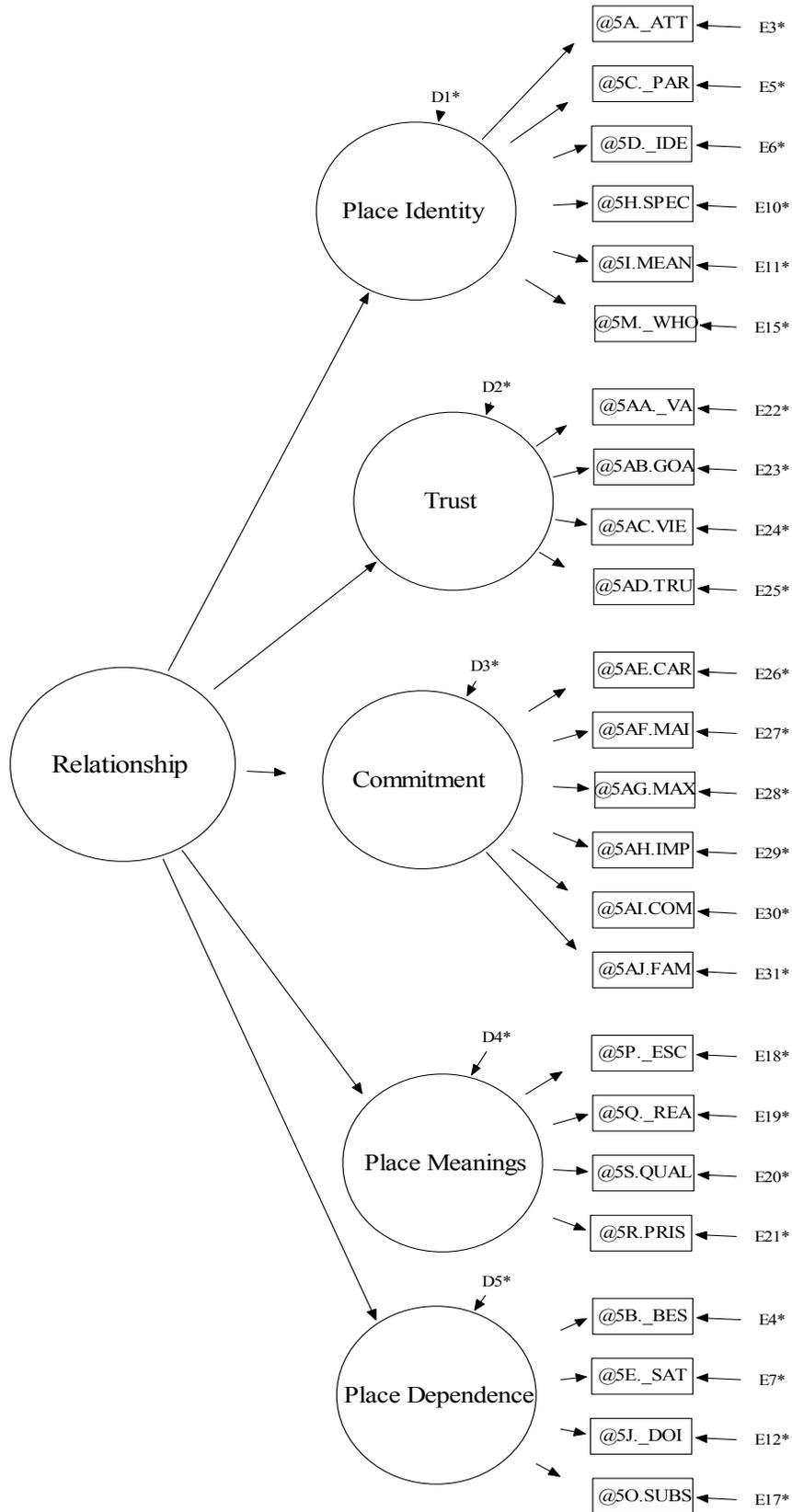
<sup>a</sup> Measured items are abbreviated to key words. Full item wording is presented in Appendix B

is measured indirectly through the indicators of the first-order factors (Kline, 2005) and does not have its own set of measured variables. Also, the construction of a second-order relationship factor is a means to provide a metric for the presence or absence of a wilderness relationship for this study's respondents. This indirect measurement through

first-order factors and establishment of a metric for the second-order factor differentiate the second-order factor model from the single factor model (Model 1) previously tested.

The identification rules of a second-order factor analysis are the same as that of a first-order factor analysis. However, Kline (2005) further recommends that any second-order factor must have at least three first-order factors as indicators to avoid the risk of the model being underidentified. For this reason, the original proposed model diagrammed in Figure 1 presented several significant issues. First, the dimensions of relationship to self, management agency, and place in this model are specified as second-order factors measured strictly by two first-order factors (e.g. Management Agency measured by the Trust and Commitment factors). Each could be statistically underidentified in the model because two factors do not provide enough information to uniquely estimate the model. Second, the omission of the Life Centrality factor in the preferred first-order model negates a Relationship to Self second-order factor. The Place Identity factor and its measured variables would then be accounting for all factor variance. Third, to provide a metric for an overarching relationship factor, a third-order factor analysis model would need to be specified. Regardless of any statistical concerns, such a model is practically more difficult to interpret and test. Due to these issues, the decision was made to test an alternative second-order factor model as shown in Figure 9. This model contains a single second-order relationship factor measured by five underlying first-order factors (Place Identity, Trust, Commitment, Place Meanings, Place Dependence). This model was both mathematically appropriate for confirmatory factor analysis and substantively appropriate for this study's goal of testing a hypothesized relationship with wilderness construct.

**Figure 9: Single Relationship Factor Model**



Results showed that the second-order factor model was overidentified with 247 degrees of freedom. All standardized parameter estimates between the individual measured variables and the five first-order factors were the same as in Model 5 because this portion of the model was equivalent to the first-order model. The average off diagonal standardized residual was .065 and the 20 largest residuals ranged from .286 to .224. The model goodness of fit statistics were as follows: S-B  $\chi^2 = 1031.083$  ( $p < .001$ , 247 *df*), CFI = .903. RMSEA = .075, 90% confidence interval = .070 -.080), SRMR = .093. While arguably not as definitive as the first-order model goodness of fit statistics, these results were still a reasonable approximate of goodness of fit for the model based on the cutoffs suggested by Kline (2005).

Tests of significance based on robust standard errors for the parameter estimates of the second-order relationship factor were all significant ( $p < .05$ ). Examination of the second-order parameter estimates showed high standardized correlations or factor loadings between the second-order relationship factor and both the Place Identity (.935) and Place Dependence (.944) factors.  $R^2$  values were also high (.874= Place Identity, .891=Place Dependence) for both these factors. Standardized correlations of the remaining factors, Trust (.433), Commitment (.511), and Place Meanings (.545), were all of a similar magnitude, but substantially lower compared to Place Identity and Place Dependence.  $R^2$  values were also much lower (.187=Trust, .261=Commitment, .297=Place Meanings) for these factors. These results suggest that Place Identity and Place Dependence are both highly correlated with the relationship factor. High  $R^2$  values suggest a large proportion of the relationship factor's variance are described by Place Identity and Dependence. While Trust, Commitment, and Place Meanings did not have as

strong of connections with the relationship factor or explain as large a proportion of the variance, these parameters were still significant as described above.

### Alternative Models

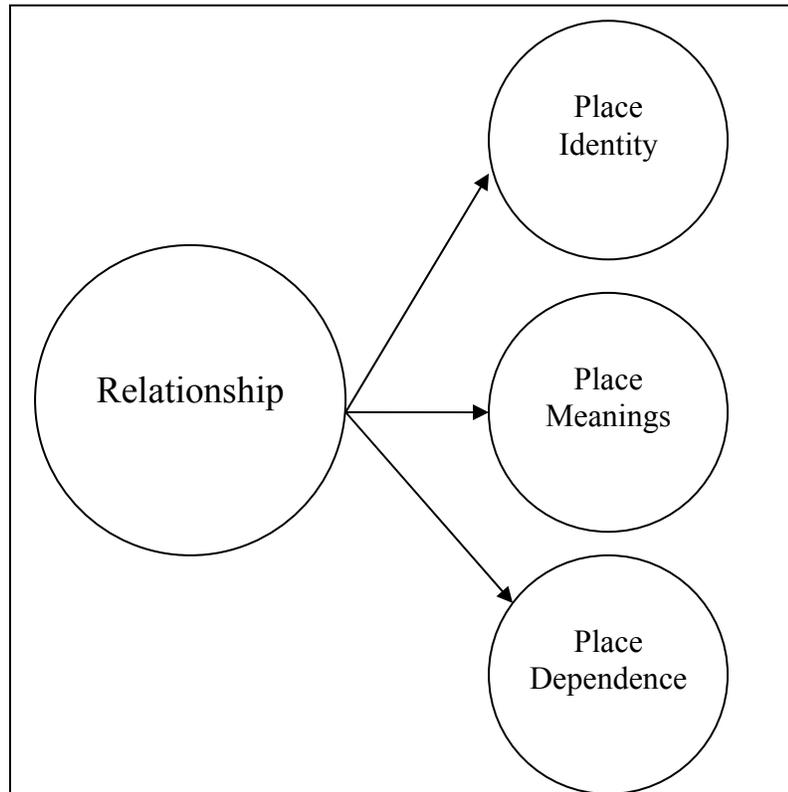
Further analysis of the second-order factor model was warranted due to the marginally acceptable goodness of fit indices and the high standardized correlations for the Place Identity and Place Dependence factors. Due to their theoretical relationship as dimensions of place attachment, the high parameter estimates for these two factors might suggest that a second-order place attachment factor exists and needs to be considered and tested. To examine this possibility, a second-order factor model was tested using the first-order factors for Place Identity, Place Meanings, and Place Dependence (Figure 10). Trust and Commitment factors were excluded so as to strictly examine the influence of those factors traditionally associated with place attachment and sense of place conceptualizations.

Initial testing of the model in EQS 6.1 failed due to the presence of linear dependence among parameters. Linear dependence occurs when the covariance matrix of parameter estimates is singular, with the given estimated parameter being a linear combination of other estimated parameters (Bentler, 2004). This is a potentially serious problem because statistical results of the model cannot be fully trusted. Linear dependence typically occurs because the parameter is underidentified in an equation (Bentler, 2004). Examination of proposed second-order factor model showed the model to be just-identified (6 free parameters, 6 observations) with zero degrees of freedom.<sup>7</sup>

---

<sup>7</sup> Degrees of freedom calculated using only parameters from first- and second-order factors.

**Figure 10: Second-Order Place Model<sup>a</sup>**



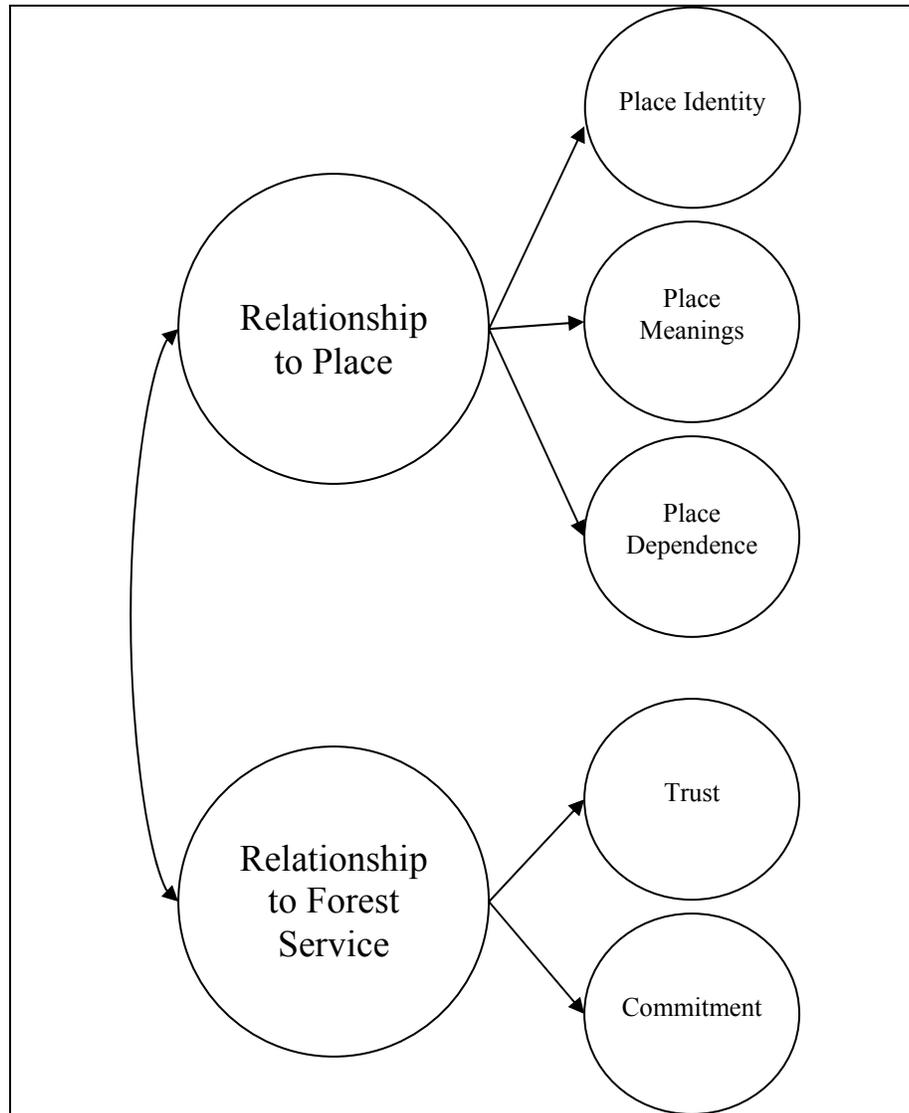
<sup>a</sup>Measured variables and error terms not depicted

This issue was corrected by placing constraints on the factors disturbances (error variances) of the Place Identity and Place Dependence factors to make them equal. This created an additional degree of freedom and allowed for model identification. Despite these corrections, goodness of fit indices for the retested model (S-B  $\chi^2 = 587.208$  ( $p < .001$ , 88 *df*), CFI= .858, RMSEA= .100, 90% confidence interval = .093-.108, SRMR=.049) suggested poor model fit.

Since the omission of the Trust and Commitment factors did not improve the goodness of fit for a second-order factor model, these factors were retained and included in another alternative model. This model consisted of two second-order factors, a Place factor measured by the three first-order place factors (Place Identity, Place Meanings,

Place Dependence) and a Relationship to Forest Service factor measured by the Trust and Commitment first-order factors (Figure 11).

**Figure 11: Second-Order Place-Forest Service Model<sup>a</sup>**



<sup>a</sup>Measured variables and error terms not depicted

The goal of this model was to test whether factors converged on a single relationship concept or represented two possibly independent concepts. These second-order factors were allowed to covary and the model was tested despite the fact that the Relationship to Forest Service factor was possibly underidentified since it was measured with only two

first-order factors. Compared to the *Single Relationship Factor* model, goodness of fit indices for the *Place-Forest Service* model showed modest improvements. The S-B  $\chi^2$  statistic decreasing from 1031.083 ( $df= 247$ ) to 969.853 ( $df= 246$ ), CFI increased from .903 to .911, and RMSEA decreased from .075 to .072

While this  $\Delta$ S-B  $\chi^2$  was statistically significant, several substantive considerations were made to determine the preferred second-order factor model. First, the purpose of this research was to examine the existence of an overarching relationship construct. Also, several external forces were hypothesized to have an influence on this relationship construct. For this purpose, the *Single Relationship Factor* model (Figure 9) has the most utility and application. Second, LM tests for both models lent support for the competing model. The *Single Relationship Factor* model's LM tests suggested possible cross loadings between the Place Identity and Place Dependence factors and the *Place-Forest Service* model's test suggested cross loadings between the Trust and Place Dependence factors. Third, when similar explanatory power exists between models for the same data, the more parsimonious model should be selected. In this case, the *Single Relationship Factor* model best achieved the goal of parsimony for model respecification<sup>8</sup>.

Based on these considerations, the *Single Relationship Factor* model was selected as the preferred model for this analysis and was the stopping point for model building. From this model, standardized factors scores were calculated for all respondents in the sample. These factor scores are a metric which act as a proxy for the presence or absence of a wilderness relationship for each respondent. Such a proxy was necessary because wilderness relationships were not measured directly by the questionnaire. In the

---

<sup>8</sup> Parsimony was not evaluated between the first-order and second-order models because testing each model had fundamentally different objectives (e.g. determine underlying structure, examine over-arching concept)

following section, these scores were used as the dependent variable in a regression analysis to examine the influence of various external variables on an individual's relationship with the BWCAW.

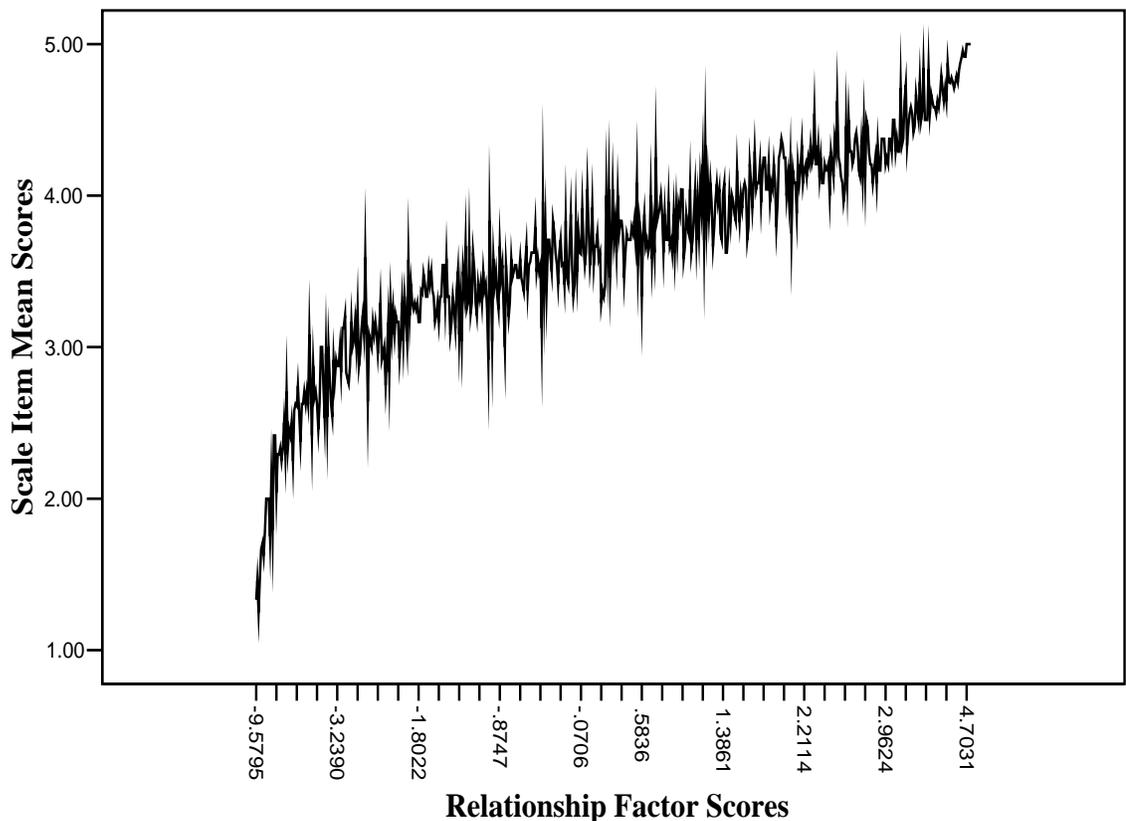
#### Multiple Regression for External Variables

This study originally proposed a structural regression model as the means to examine both the internal dimensions of a relationship and the external forces of changes that may influence such a relationship. However, results from the first-order and second-order factor analyses did not support a model with Relationship to Self, Management Agency, and Place dimensions. Instead, a Single Relationship Factor model was preferred as the underlying structure of the model. With such a structure, the previously identified system of simultaneous equations and a structural regression model were not necessary. Therefore, a multiple regression analysis was performed using SPSS 12.0 for Windows to examine the association of the external variables with an individual's relationship. While such an approach provides no statistical advantage over a structural regression, it does have increased interpretability.

The dependent variable for the multiple regression was an individual's relationship with the BWCAW. This variable was operationalized as the factor scores calculated by EQS 6.1 for the second-order relationship factor. A factor score is an unknown score of respondents on latent factors (Bentler, 2004). In this analysis, the latent factors are the five underlying first-order factors from the confirmatory factor analysis (see Figure 9). While the true factor score is unknown, EQS 6.1 calculates factors scores based on a standard regression estimator.

Factors have previously been used as dependent variables in multiple regression analyses (see Matsuoka et al., 2003). However, because factor scores ranged from -9.580 to 4.703 in the sample, it was important to understand how they were distributed and should be interpreted. To accomplish this, factor scores were plotted against respondent's mean score on the 24 relationship measurement items used in the confirmatory factor

**Figure 12: Relationship Factor Scores vs. Mean Scores**



analysis. Higher mean scores represented more overall positive agreement with the measurement items by the respondent. Theoretically, means scores and factor scores would be positively and linearly related, if one increased so did the other. The plot is presented in Figure 12. It shows a general linear relationship between an individual's means score and their factor scores. Descriptive statistics also showed factor scores had a mean of zero and a standard deviation of 2.72. Therefore, it was assumed that factor

scores could be interpreted as essentially standardized factor scores and as scores increased, so did the presence of a wilderness relationship.

The previous chapter described various external variables that were measured in this study. For the purpose of the multiple regression analysis, these variables were classified as social factor variables and management actions variables. Social factor variables included age, income, education, use of technology, distance from home, number of previous visits, and year of first visit. Management actions variables included perception of resource conditions, evaluation of social conditions, permits, user fees, and ecological conditions (wildland fires & blowdown). These external variables were utilized as the independent variables in the multiple regression analysis.

A conversion for the use of technology variable was necessary for multiple regression because it was a categorical variable. Dummy variables were created to represent each of the four level of the nonmetric variable (e.g. no, low, medium, and high technology). Each variable represented either the presence or absence of that level for each respondent. For use in the regression, the number of dummy variables in an equation is one less than the number of levels of the nonmetric variable (Hair et al., 1998). This step is taken because when all dummy variables levels are present, they are perfectly linearly related and regression coefficients cannot be estimated (Hair et al., 1998; Halcoussis, 2005). For this analysis, the dummy variable, “no technology present”, was removed due to the fact only 10 of the 564 respondents (1.8%) fell into this level of the variable.

Three different multiple regressions were tested. This included a social factors regression, a management actions regression, and a regression that included all measured

independent variables. These regressions were evaluated for their model fit and the presence of significant regression coefficients for each independent variable. Issues of multicollinearity and heteroscedasticity were also examined. Multicollinearity occurs when any independent variable is highly correlated with another variable (Hair et al., 1998). If multicollinearity is present, precise estimates of parameters are not possible. Heteroscedasticity is the presence of unequal variances. It can lead to inflated or deflated F- and t-statistics. The hypothesized regression models with the expected signs (i.e. predicted positive/negative change in the dependent variable) for regression coefficients are as follows:

**(1) Social Factors Model**

$$\text{RELATIONSHIP} = B_1 + B_2\text{AGE}_i + B_3\text{INCOME}_i + B_4\text{EDUCATION}_i + B_5\text{LOWTECH}_i + B_6\text{MIDTECH}_i - B_7\text{HIGHTECH}_i - B_8\text{DFH}_i + B_9\#\text{VISITS}_i - B_{10}\text{1stVISIT}_i + e_i$$

**(2) Management Actions Model**

$$\text{RELATIONSHIP} = B_1 + B_2\text{RESOURCE}_i + B_3\text{SOCIAL}_i - B_4\text{PERMITS}_i + B_5\text{FEES}_i - B_6\text{ECOFIRE}_i - B_7\text{ECOBD}_i + e_i$$

**(3) Combined Model**

$$\text{RELATIONSHIP} = B_1 + B_2\text{AGE}_i + B_3\text{INCOME}_i + B_4\text{EDUCATION}_i + B_5\text{LOWTECH}_i + B_6\text{MIDTECH}_i - B_7\text{HIGHTECH}_i - B_8\text{DFH}_i + B_9\#\text{VISITS}_i - B_{10}\text{1stVISIT}_i + B_{11}\text{RESOURCE}_i + B_{12}\text{SOCIAL}_i - B_{13}\text{PERMITS}_i + B_{14}\text{FEES}_i - B_{15}\text{ECOFIRE}_i - B_{16}\text{ECOBD}_i + e_i$$

Results from the Social Factors regression showed several issues. Although the F-Test suggested all regression coefficients were significantly different from zero ( $F = 2.026$ ,  $df = (9, 554)$ ,  $p = .035$ ), the  $R^2$  value was very low (.032) and only the unstandardized regression coefficient (-.036) for *Year of First Visit* was significant at  $p = .05$ . In addition, tolerance statistics suggested the presence of multicollinearity. Hair et

al. (1998) advise that tolerance statistics below .19 signify multicollinearity. Both the Low Technology (.080) and Medium Technology (.091) variables exhibited multicollinearity. Finally, partial regression plots<sup>9</sup> revealed heteroscedasticity for the *Number of Previous Visits* and *DFH* variables.

This appears due to extreme outliers in both variables, which was subsequently addressed.

Similar issues were found in the Management Actions model. Again, the F-Test was significant ( $F = 9.684, df = (6, 557) p < .001$ ), but the  $R^2$  value was low at .094. Of the independent variables, only the unstandardized regression coefficient of the *Fees* variable (1.035) was significant. While the issue of multicollinearity was not present, heteroscedasticity was exhibited slightly for the both ecological events (*wildfires*, *blowdown storm*) variables. Comparatively, this model explained more variation of the data than the Social Factors model. However, this study hypothesized that all of these external variables are acting simultaneously on an individual's relationship to the BWCAW. Thus, all variables were combined into a single multiple regression model to test their influence on relationship factor scores.

For the combined model, all regression coefficients were significantly different from zero ( $F = 5.299, df = (15, 548) p < .001$ ) and the  $R^2$  value increased to .127. The *Year of First Visit* (-.036) and *Fees* (1.056) were once again the only significant ( $p < .05$ ) unstandardized regression coefficients. The same issues of multicollinearity and heteroscedasticity existed because no corrections were made from the previously tested models. A comparison of the three models is presented in Table 15. Based on these

---

<sup>9</sup> Partial regression plots show the relationship between the residuals of the dependent variable and the residuals of a single independent variable and identifies influential observations

statistical results and substantive considerations, it was determined that a multiple regression model including both social factors and management actions was most appropriate for the data. Subsequently, the issues of multicollinearity and heteroscedasticity were addressed and the regression model respecified in an attempt to improve the model.

**Table 15: Summary of Comparative Multiple Regression Models<sup>a b</sup>**

Model	F-statistic ( <i>df</i> )	R <sup>2</sup>	Significant Coefficients (t-statistic)
Social Factors Model	2.026* (9)	.032	Year of First Visit (-3.673)*
Management Actions Model	9.684* (6)	.094	Fees (6.933)*
Combined Model	5.299* (15)	.127	Year of First Visit & Fees (-3.845)* (7.103)*

<sup>a</sup> N=564

<sup>b</sup> \* = significance at .05 level

Tolerance statistics for the Low and Medium Technology dummy variables suggested the presence of multicollinearity. It was not surprising that these variables were correlated due to the rather subjective nature of delineating the use of technology into several levels. To address this issue, the frequencies of each category were examined. The Low Technology category accounted for 68.8% (n=388) of the sample, while No Technology (1.8%) and High Technology (6.4%) were only small proportions. Because of the skewed distribution of these categories, it was determined that interpreting the relative influence of technology on wilderness relationship would be very difficult, if not insignificant. Therefore, it was decided that the use of technology variable would be removed from the multiple regression model.

Partial regression plots for the ecological events (*wildfires, blowdown storm*) suggested the possibility of heteroscedasticity. In addition, examination of descriptive statistics for these variables raised questions about their variability and importance. The mean scores for the effects of wildfires (1.018) and the blowdown storm (1.32) on respondent's experiences were very low. Standard deviations for both variables were also below 2.40. This would indicate that effect of either ecological event on experience was not greater on average than a score of 4 on a 10-point scale. Along with the issues of operationalizing these concepts, the absence of a more normal distribution of scores for these variables questions the importance of these issues to respondents. Thus, both ecological events variables were not used in the respecified multiple regression model.

Finally, the remaining heteroscedasticity issues were addressed by examining several outliers in the sample for the *Number of Previous Visits* and *DFH* variables. One respondent for the *Number of Previous Visits* reported having visited the BWCAW 3,000 previous times. This was extremely above the mean score of approximately 20 visits. For *DFH*, two individuals reported traveling 8,000 miles from home to visit the BWCAW. This distance was well above the mean score of approximately 489 miles. While these scores are valid responses, they were responsible for the skewed distribution of these two variables and the heteroscedasticity present in the partial regression plots. Using the most simple and direct approach, these cases were deleted from the multiple regression analysis. Following these revisions, an alternative regression model was hypothesized. This preferred model with the expected signs for regression coefficients is presented below:

**(4) Preferred Multiple Regression Model**

$$\text{RELATIONSHIP} = B_1 + B_2\text{AGE}_i + B_3\text{INCOME}_i + B_4\text{EDUCATION}_i + - B_5\text{DFH}_i + B_6\#\text{VISITS}_i - B_7\text{1stVISIT}_i + B_8\text{RESOURCE}_i + B_9\text{SOCIAL}_i - B_{10}\text{PERMITS}_i + B_{11}\text{FEES}_i + e_i$$

**Table 16: Regression Results for Preferred Model<sup>a b</sup>**

Independent Variables	Mean	Standard Deviation	Unstandardized Coefficients (t-statistic)
Age	44.43	13.46	-.019 (-1.938)
Income	88618.56	49291.53	.000 (-1.142)
Education	16.31	2.61	-.021 (-.474)
Distance From Home	463.49	421.88	.000 (1.312)
Number of Previous Visits	14.65	22.19	.013 (2.237)*
Year of First Visit	1990.60	13.96	-.031 (-3.052)*
Perception of Resources	1.57	1.11	-.156 (-1.379)
Social Conditions	.45	.40	.621 (2.021)*
Permits	2.30	1.92	-.052 (-.900)
Fees	4.17	.75	1.054 (7.177)*
Constant			58.130 (2.857)*
R <sup>2</sup>			.134
F-statistic			8.527*

<sup>a</sup> N=561

<sup>b</sup> \* = significance at .05 level

Results for the preferred model are presented in Table 16. Compared to the Combined model, the R<sup>2</sup> value increased modestly from .127 to .134. Tolerance statistics and partial

regression plots also show the absence of multicollinearity and heteroscedasticity issues. More importantly, a total of four regression coefficients were significant: *Number of Previous Visits*, *Year of First Visit*, *Social Conditions*, and *Fees*. The expected signs for these regression coefficients were also predicted correctly in the above hypothesized regression equation. While additional adjustments could have possibly been made to the regression model, it was decided that the risk of over fitting the model outweighed any marginal improvements. Further analysis might also be reserved for future investigations. Therefore, the model was accepted as the preferred model and the meaning of the significant regression coefficients were interpreted. This interpretation is presented in the following chapter.

### Limitations

Several limitations of this study are related to issues of measurement and data analysis. First, the 30 relationship scale measurement items could possibly have been analyzed as categorical variables. Although it is convention to use Likert-type scales as interval or continuous data, the argument can be made to treat a 5-point scale as categorical. Kline (2005) suggests indicators with a small number of categories (e.g. two to four) are generally not normally distributed. While continuous indicators can be adjusted using robust methods such as the Satorra-Bentler scaled statistic, special estimation methods are necessary to avoid biased estimates when using categorical indicators. Despite this possibility, a goal of this study's analysis was to balance having an accurate representation of the confirmatory factor model and the interpretation of results for external readers. Representing the relationship measurement items as continuous data was desirable to achieve this goal. However, the 5-point scale was a

limitation to the study and future research could benefit by expanding it to a 7- or 9-point scale, which could have the added benefit of documenting more of the variation in responses.

A second limitation of this study was the inability to analyze the data using a structural regression in SEM. A structural regression has the ability to consider both structural models (causal relationships) and measurement models simultaneously. Parameter estimates are derived based on the influence of all independent and dependent variables in the model. Such a model would provide the most holistic conceptualization of a wilderness relationship. However, a multiple regression analysis was utilized for ease of interpretation. This decision required the structural and measurement components of the relationship model to be analyzed and interpreted independent from each other.

Finally, the results of this study are not generalizable to all BWCAW users. As previously stated, the sampling frame was unable to effectively intercept day users. Therefore, the data collected and relationship represented are only those of overnight users. However, the goal of this study, and more specifically the sampling frame, was not to achieve a representative sample. Instead, hypothesizing and testing a relationship model in a wilderness context was the objective of this research. Generalizing the structure of the wilderness relationship model to other contexts and users is most appropriate as a recommendation for future research.

## CHAPTER FIVE: DISCUSSION AND CONCLUSIONS

This study posits the human experience of wilderness to be an evolving, enduring relationship. Its purpose was to explore the relationships with wilderness that users develop in the Boundary Waters Canoe Area Wilderness and how changes in use, users, and other external forces influence these relationships. This was achieved by addressing three research objectives. First, a conceptual and analytical framework for a relationship with wilderness was developed from philosophical commitments of close interpersonal relationships and relational marketing research. Second, a multidimensional model for a wilderness relationship was hypothesized and tested using structural equation modeling. Lastly, various external social factors and management actions were examined to determine their association with individual relationships.

Data was collected from a sample of 564 peak-season BWCAW users. Results of a second-order factor analysis supported a relationship model consisting of a single relationship factor measured by five underlying first-order factors. A subsequent multiple regression analysis suggested several external forces that were strongly associated with a respondent's relationship factor score. Interpretation of these results provides answers for the research objectives of this study.

This chapter provides further discussion and justification for the underlying structure of the preferred relationship model. It discusses the results of the multiple regression analysis as an application of the relationship model in the real world setting of the BWCAW. It also addresses the management implications of this study for wilderness management and the research implications for public purpose marketing and relationship-

based frameworks. Finally, this chapter concludes by suggesting several directions for future relationship research.

#### Factor Structure Interpretation

Results from testing several relationship models provided support for a multidimensional underlying structure to the data. While statistical arguments have been made for the preferred model with five first-order factors, additional explanation and interpretation of the removal of the Life Centrality factor is necessary. Life Centrality was operationalized along with Place Identity as contributing to the measurement of a Relationship to Self dimension. However, results as shown in Table 13 suggest the data did not support a relationship model that included a Life Centrality factor. In fact, examination of individual measurement items revealed several Life Centrality items to be problematic and cross loading on different factors. Thus, Life Centrality was removed from the model because its absence improved model fit and allowed for more clarity in the interpretation of results.

Several reasons may explain the misspecification of Life Centrality. First, this concept was borrowed from leisure activity involvement, which is defined as how we think about our recreation and its affects on our behavior (Havitz & Dimanche, 1997). However, the value of wilderness, and consequently wilderness relationships, is arguably much more than the recreation activities in which individuals participate. That is, the BWCAW is about more than just canoeing, fishing, and camping. Consequently, utilizing a concept where the focus is strictly on recreation and activities was probably inappropriate.

Second, this concept was intended to tap into how central a role the BWCAW plays in their lives and how that is expressed by their relationship with the place. However, the measured items selected to reflect this role, in retrospect, do not appear to adequately focus on this intent. Problematic items such as 5g and 5k focused on an individual's friends and their shared connection to the BWCAW. While these measurement items may be sufficient when discussing various types of activities (e.g. fishing), they do not appear to translate well when a place like the BWCAW was the subject. This may be because opportunities other than the BWCAW exist for friends to share in activities such as fishing, especially across Minnesota. Also, the BWCAW is not the only thing that connects individuals to their friends (e.g. work, neighborhood, family). Therefore, attempting to operationalize life centrality in terms other than activities seemed inappropriate.

Third, it is arguable that the concept of "life centrality" was already present in the model. As previously described, life centrality was borrowed from the leisure activity involvement literature. This literature is different from that of place identity, which is grounded in social and environmental psychology. It is possible that both life centrality and place identity are the same concept, but utilize different language given the different origins in the literature. This redundancy could be responsible for the cross loading measurement items in the model and the reason why goodness of fit indices improved with the removal of the factor. In future research, respecification of the Life Centrality factor could be an important objective if it is determined to be sufficiently different from place identity. The life centrality of a wilderness area and wilderness in general may

communicate something important about the visitor. Tapping into this concept could provide further insight into wilderness relationships.

In further interpreting the factor structure of the model, examination of the second-order factor analysis results raises the question of whether the hypothesized model is merely a reconceptualization of sense of place. Standardized factor loadings for Place Identity (.935) and Place Dependence (.944) suggested the proposed relationship factor was highly influenced by the traditional elements of place attachment. While understanding how an individual functionally and emotionally connects with the BWCAW appeared to have an important role in the relationships that exists with that place, this researcher has argued that a need exists to move beyond the functional (Place Dependence) and emotional (Place Identity) bonds described by place-based research. Thus, a more holistic conceptualization of human experiences with places (e.g. wilderness) that includes dimensions of meanings, trust, and commitment as proposed by this research is preferable.

Testing of several alternative models indicated that place factors were not the sole measures of a wilderness relationship. Comparatively, a model that included the factors of Trust and Commitment exhibited better goodness of fit statistics for the data than those without these factors. Therefore, the interactions individuals have with the agency (e.g. Forest Service) responsible for managing that place play a role in relationships that they develop. Arguably, these interactions represent the human element of a relationship with wilderness, the interdependent entities as described by Berscheid and Peplau (1983). These human interactions move beyond focusing strictly on the characteristics of the physical context to understanding the emotions and shared values present in a social

context. They provide insight to how the image of the BWCAW is socially constructed between managers and visitors. Thus, to sufficiently capture the wilderness relationship, the concepts of Trust and Commitment need to be included.

However, it is important not to overemphasize the contributions of Trust and Commitment factors to a wilderness relationship. It is hard to separate the place as experienced and the relationship that is formed from the management of the place. Obviously, users do not visit the BWCAW strictly to interact with Forest Service employees. They come for the escape, friendships with others, and a wilderness experience. Yet, opinions still exist regarding the management of this place. Interactions still occur between permit officers and backcountry staff. Educational and interpretative messages are still present during trip planning, entry, and exit. Although these factors may contribute less to the overall picture of a wilderness relationship than the functional and emotional elements of the place, they still constitute a significant proportion of that picture and should not be ignored by managers. Ultimately, each of these factors is necessary for a holistic perspective of wilderness relationships.

#### Multiple Regression Interpretation

Interpreting the regression coefficients relative to the dependent variable, relationship factor scores, presented a challenge. While the factor scores were assumed to be linear and ranged from approximately -9 to 4, the practical meaning of any change relative to a significant regression coefficient was essentially arbitrary (i.e. what does a .34 change in factor score represent?). This was because the relationship factor score does not describe the valence of the relationship. Individuals cannot be described as having a “positive” or “negative” relationship since the factor scores have no associated scale with

defined anchors. Instead, the relationship factor scores can only be interpreted as the continuum of relationships with the BWCAW. Thus, a positive regression coefficient was described as “more of a relationship” and a negative coefficient as “less of a relationship”.

Based on these limitations for interpretations, regression coefficients from the preferred multiple regression model (Table 16) were examined strictly for significance and the sign of the coefficient. A total of four regression coefficients were significant: *Number of Previous Visits*, *Year of First Visit*, *Social Conditions*, and *Fees*. The sign of each of these coefficients agreed with the predicted sign in the hypothesized regression equation. For *Number of Previous Visits*, an increase of one visit increased the presence of a relationship. This came as no surprise since number of visits describes an individual’s experience with the BWCAW. Wilderness experiences are complex transactions between people and their internal states, the activities they participate in, and the social and natural environment in which they are located (Borrie & Roggenbuck, 1998). As previously argued, a series of wilderness experiences result in an accumulation of values or meaning for place. Thus, as number of visits increase to the BWCAW and users accumulate experiences, the presence of the relationship increases as a result of more substance to construct that relationship.

Conversely, as the *Year of First Visit* increased (e.g. closer to 2007), the presence of a relationship decreased. Similar to the number of visits, this independent variable defined the range of experience possible for the user. First-time and relatively new users have had less opportunities to experience the BWCAW. In addition, they have also had less time to undergo the process of developing the meanings and values they associated

with the BWCAW. This is not to say that relatively new users cannot develop intense, emotional bonds to the BWCAW over a brief time period. Instead, they have had fewer opportunities to negotiate their relationships than those individuals with more time for reflection.

As *Social Conditions* were evaluated as more of a problem, the presence of the relationship increased. This included items addressing large groups, too many day users, congestion, privacy, and noise. A possible explanation of the *Social Conditions* results is that as BWCAW users encounter large groups and more day users, individuals evaluate social conditions as more of a problem. These problematic conditions may be incongruent with the values, meanings, and previous experiences they have associated with the BWCAW. Thus, individuals who evaluated social conditions more negatively were those with more of a relationship present. In contrast, those individuals who took less issue with social conditions would not have developed as much of a relationship with the BWCAW. The meanings, values, and experiences they attribute to the BWCAW are more preliminary and not interpreted in a way where large groups and too many day users create conflict.

For the *Fees* regression coefficient, as respondent's attitudes towards the fee program was more agreeable, the presence of a relationship increased. More simply, it is suggested that an understanding of the reasons behind and significance of a fee program (and therefore presumed support of the fees) and its effects on the BWCAW and users is associated with the increased presence of a relationship. Arguably, attitude towards fees is resonating with the Trust and Commitment factors operationalized in the relationship model. If users understand why fees are a component of managing the BWCAW, they

may be more trusting and accepting of the Forest Service as the acting managing agency or vice versa. Conversely, if they disagree with fees as appropriate in the BWCAW context, they may be distrustful of the Forest Service and the justifications it makes for instituting fees and other management actions. This distrust may lead to loss of the trust and commitment aspects of a wilderness relationship.

For the four independent variables with significant regression coefficients, the standardized coefficients were also examined to determine which variable had the greatest association with relationship factors scores relative to the other variables. *Fees* had the largest standardized coefficient (.289). *Number of Previous Visits* (.107) and *Year of First Visit* (.158) had lower coefficients, but of similar magnitude to one another. *Social Conditions* had the lowest standardized coefficient (.091), which may not have practical significance despite statistical significance.

As previously described, one of the research objectives of this study was to determine whether indicators and standards of quality could be developed from external forces of change for use in current planning frameworks. However, as the research progressed, it became apparent that striving for such recommendations was premature and inappropriate. Future research is necessary to refine the conceptualization and measurement of a wilderness relationship before management recommendations can confidently be made. More importantly, the value of testing a relationship model is not in its application to managing external forces and setting attributes, but in the ability to understand and measure a wilderness relationship itself. This goal alone is worthy of attention and effort from researchers and managers.

Despite this realization, the interpretation of the multiple regression results did provide valuable insight. Finding external forces that demonstrated a significant association with the relationship factor, in a sense, provide a check of the face validity of the relationship model. It presented evidence that the relationship model was applicable in a real world setting because associations were found between the model and “on the ground” attributes and issues. Although further conclusions and recommendations regarding the associations of *Number of Previous Visits*, *Year of First Visit*, *Social Conditions*, and *Fees* to the relationship model would be overreaching, these results are encouraging to the argument that wilderness relationships are real and do exist.

### Management Implications

#### A Relationship Focus

Kaplan (2000) argues that despite more than 30 years of structural equation modeling application in the behavioral sciences, it is rare that results are used in policy studies. Although it is too early in the development of a wilderness relationship framework to immediately apply the results of this study to management applications, a foundation has begun for incorporating the concept of a relationship into management strategies. Part of this foundation is the insight that examining and understanding the relationship itself is valuable. Previous research has examined concepts, such as solitude, where indirect indicators have become the predominant measure of quality. This development of this study and a relationship framework also began with the assumption that indirect indicators (e.g. external forces) would be necessary to evaluate the wilderness relationship. However, through the process of the research, it became evident that a wilderness relationship represents something more than the setting attributes or

external forces present in a wilderness setting. If these forces are insufficient to measure what visitors bring to a wilderness experience, relationships provide a holistic view that attempts to incorporate much more about the visitor and their human experiences in wilderness.

For a shift in focus to managing relationships directly, future study is needed in measuring and characterizing relationships. Specifically, the ability to explain the strength of the relationship could be useful. Do individuals demonstrate a strong, enduring relationship to the wilderness area, or is their connection weak or indifferent? How is the strength of this relationship reflected in the five underlying factors proposed in the relationship model? Answers to these questions could assist in the development of management recommendations that aim to foster enduring relationships in wilderness visitors.

#### Building Trust and Commitment

This researcher has argued that managers should strive to foster a human relationship with wilderness. Results from this study suggest that trust and commitment are important and significant parts of such a human relationship. Thus, directing management efforts to building trust and commitment with users can encourage and foster these relationships. Looking to the trust and commitment literature can also yield further insights for wilderness managers.

Trust is based on shared values, goals, and direction. Commitment is a belief that the relationship warrants maximum effort to maintain. These factors can be promoted through open communication between the Forest Service and users and through a transparent decision-making process. Barnes (1994) believes that creating a relationship

leads to the consumer taking more ownership in the company. In this case, a relationship could lead to BWCAW users taking more ownership in the place and the management decisions and actions being implemented. This increased level of involvement could be through the public participation process for forest planning, volunteering, or in educational efforts. With increased commitment, it is likely BWCAW managers would have increased support for their management decisions. In effect, building trust and commitment through wilderness relationships becomes a way to build a constituency of advocates for the protection and maintenance of the wilderness.

Building trust and commitment begins not with policy makers and upper level managers, but with the front line Forest Service employees. Just as Illingworth (1991) referenced the company sales persons, as far as visitors are concerned the front line staff are the face of the Forest Service and more specifically the Superior National Forest and BWCAW. It is their interactions with the public that may most directly influence the user's relationship to the agency and the BWCAW. Therefore, communication effectiveness is a key component of these exchanges (Sharma & Patterson, 1999). Permit staff and law enforcement must be trained to effectively explain rules and regulations and to some extent the rationale behind policy and management decisions. The information they provide the public is going to be taken as the authoritative source. This is not to say that all employees have to only "tow the party line", but staff should be made aware of the amount of responsibility and influence they have in affecting individual's trust and commitment to the Forest Service and their relationship with the BWCAW.

While fostering the trust and commitment of a wilderness constituency is key, it is important to note that serving all users is not feasible (Sheth & Parvatiyar, 1995).

Wilderness and specifically the BWCAW is a national resource, providing benefits and values to individuals merely by its existence. Therefore, accommodating all meanings, values, and uses is extremely difficult. This is most clearly demonstrated by the relationship with the Forest Service, or lack thereof, that some local residents of the BWCAW express. During onsite contact, some local residents expressed that the Forest Service has done a disservice to local interests. Historical uses and access have been lost due to wilderness designation and management action. While these arguments are valid, little can be done to change congressional decisions that legally constrain Forest Service managers. However, current managers can continue to reach out to local and outside interests by providing opportunities for comment and participation. By developing avenues to interact, Forest Service staff can have more opportunities to foster trust, commitment, and wilderness relationships.

#### Research Implications

An important research objective of this study was to operationalize and test a conceptual model of a wilderness relationship. While previous literature had examined relationships with specific places or argued for relationships between federal land management agencies and the public, a holistic conceptualization of a wilderness relationship had not been hypothesized and tested. The results of this study provided a plausible model for a multidimensional dynamic wilderness relationship. It built upon previous understandings of sense of place and experiences to apply a relationship metaphor to a wilderness and natural resource setting.

An important outcome of this research was the successful operationalization and integration of concepts from the fields of close interpersonal relationships and relational

marketing into a wilderness context. While each of these fields has individually provided their own insights, their combination provides a new trajectory for relationship research beyond previous work. Integrating both of these disciplines into the relationship model corroborates such concepts as relationships existing in a social context between interdependent partners and the importance of trust and commitment. It moved thinking beyond the consumer-buyer aspects of relationships to a more intimate and interpersonal connection between individuals. Also, while public purpose marketing research had begun applying consumer and relational marketing concepts to federal land management agencies and natural resource management, the social psychological aspects of relationships derived from close interpersonal relationship research had not been fully explored. This research just began to incorporate this literature and much room still exists for further investigation and application of this discipline to natural resource and wilderness management in future research.

Along with supporting the concepts of trust and commitment developed in public purpose marketing, this research has also provided a new direction for relationship to place research. To a certain extent, recent place research had become stagnant, with researchers and managers struggling to apply this concept into natural resource and wilderness planning frameworks. Theoretically, place is a very viable direction for social science research, but practically it has not achieved the status as opportunities-based or benefits-based management approaches. This research has emphasized the importance that place and a wilderness context play in individual relationships. The place is more than the physical setting attributes, but a social construction that represents meanings, values, and personal experiences. It is influenced by external social, political, and

managerial forces that affect the connections between the person, the place, and the individuals responsible for its management and protection. This understanding encourages further investigation into the role that sense of place plays in interpersonal relationships for a natural resource management and wilderness context.

The results of this research have also provided preliminary procedures for the modeling and measurement of a plausible wilderness relationship. While relationships are latent concepts, a traditional psychometric measurement approach was able to produce results with acceptable approximation of the underlying structure of the data. From a more theoretical perspective, this research has been able to “focus” on the picture of what a wilderness relationship looks like. Using a foundation grounded in the literature and tested in a real world setting, this study puts forward a model that include multiple dimensions that are important in explaining a wilderness relationship. Finding the “true” structure of a relationship is theoretically impossible to achieve, but these results have helped created a platform for future theoretical and conceptual research into wilderness relationships. Additional refinement of scale items and the measurement model are necessary, but the model can be confidently retested and applied to other contexts due to the development of a sound conceptual and analytical framework.

Finally, this research approach represents an evolution in protected area management. It is an attempt to find new ways to address and implement actions that influence experience quality and foster ongoing connections between people, places, and management. By using relationships as a metaphor for understanding the human experience of wilderness, progress may be made in continuing to understand how individuals interact with wilderness settings and prescribe meaning to them. With this

knowledge, managers may be better able to incorporate these meanings associated with the landscape and provide better protection of wilderness character and quality.

### Future Research

This study has laid the foundation for a research agenda based on a relationship framework. Within this framework, there are several important directions that social science research can follow in the future. As previously described, the external variables examined and tested in this study were adapted to be applicable to the BWCAW context. However, a continuing research program that investigates relationships needs to be applicable to other wilderness and protected areas. Therefore, future research should strive to test and validate a more general relationship with wilderness model. This includes external variables that address the most common social and cultural forces applicable to wilderness relationships, along with those issues of most interest and importance to local management and stakeholders. To improve on the current study, the relationship scale items must also be further examined to demonstrate their reliability and construct validity. As suggested, items should be tested with 7- and 9-point scales to determine if psychometric issues of normality have been addressed.

As future research improves the measurement and modeling of wilderness relationships, it may be possible to classify users into relationship segments (e.g. new relationships, veterans, disgruntled users) similar to previous public purpose marketing and trust studies (see Borrie et al., 2002; Liljeblad, 2005). These segments could possibly be used by wilderness managers to prioritize management actions where relationships are threatened and to continue to facilitate strong relationships where present. Other actions related to resource and social conditions could also be influenced by the spectrum of

relationship segments that are present across a wilderness landscape. In addition to classifying relationship, future research should continue to investigate how relationships change over time. While this study posited relationships as ebbing and flowing over a life course, it was not sufficiently operationalized or measured in the current model. Changes over time were more assumed and tangentially addressed through age and experience use history. True longitudinal studies that tracked changes in individual wilderness relationships would provide great insight to how external forces influence the internal dimensions of a relationship. Ideally, a cohort study would be conducted that included a diversity of wilderness relationships within a context similar to the BWCAW. While such a research project is difficult to conduct and fund, it still represents a future goal of relationship research.

With continued relationship research, the occurrence of relationship dissolution will become an additional topic to investigate. Berscheid (1994) has described how jealousy and other similar factors lead to relationship dissolution. These factors become predictors of marital quality and ultimately divorce. Can individuals “divorce” themselves from a wilderness context? This concept is theoretically different from temporal and spatial displacement. Individuals can chose to visit at different times or move to different areas, but can they eliminate the meanings and values associated with a place? The accumulation of experiences in a given context arguably remains with a user long after their visit is completed. Therefore, the possibility of relationship dissolution and the factors that influence it would be of interest to social science researchers and managers.

Finally, several specific related to wildland fire issues in the BWCAW were discovered during onsite data collection. First, Forest Service staff, cooperators, and users were interested about how burn areas from recent wildland fires are perceived and utilized by users. Some individuals questioned whether users stay away from these areas because they perceive the area as destroyed. Others suggest that users with long relationships associated with particular destinations in the BWCAW are curious to see how the area has changed and the effects of natural forces. While several questions were included in this study's questionnaire to examine effects of wildfires on planning and experiences, a deeper understanding of this topic would be beneficial to BWCAW managers and researchers. Insights would assist managers with communicating to the public the effects of wildland fire and the changes in experiences, meanings, and values that might be associated with these ecological events.

A second issue noted in the course of data collection was the importance users place on the ability to have campfires in the BWCAW. Future research could investigate whether the ability to have campfires is an important factor that influences wilderness relationships. Due to dry and hazardous conditions, campfire bans are common in the BWCAW and Superior National Forest during the peak summer season. These bans can be forest-wide or specific to the areas affected by the blowdown storm in 1999. During onsite data collection, instances occurred where users altered their travel route in the wilderness to avoid those areas affected by campfire bans and some even cancelled trips altogether. Some individuals contacted described how a trip is not a wilderness experience without the ability to sit by a campfire during the evening. Thus, further investigation specific to the BWCAW context is warranted. Changing routes due to fire

bans and cancelled trips can have significant implications for the travel model used by the Forest Service in permit quota allocation. If travel patterns dramatically change during period of fire bans, issues related to crowding, social conditions, and the wilderness experience may also be changing. This is important information to the Forest Service as they attempt to be responsive to conditions on the ground.

### Concluding Remarks

Just as in consumer marketing and business, it is much easier to retain current customers than constantly searching for new ones. Part of what keeps individuals coming back to wilderness areas like the BWCAW are the values and meanings they associate with the landscape. It is an accumulation of values through a series of experiences. This study has characterized the human experience of wilderness as an evolving, enduring relationship. It has suggested a plausible relationship to wilderness model that was adapted and tested in the BWCAW context. This relationship model is a conglomeration of trust, commitment, meanings, and sense of place. If wilderness managers can learn how to foster these relationships and retain a wilderness constituency, they may be more successful in achieving user compliance and protecting wilderness experiences, quality, and character.

## REFERENCES

- Andersen, S. M., & Chen, S. (2002). The Relational Self: An Interpersonal Social-Cognitive Theory. *Psychological Review*, 109(4), 619-645.
- Babbie, E. (2004). *The Practice of Social Research* (10th ed.). Belmont, CA: Thomson/Wadsworth.
- Bank, B. J., Biddle, B. J., Keats, D. M., & Keats, J. A. (1977). Normative, preferential, and belief modes in adolescent prejudice. *The Sociological Quarterly*, 18, 574-588.
- Barnes, J. G. (1994). Close to the Customer: but is it Really a Relationship? *Journal of Marketing Management*, 10, 561-570.
- Bentler, P. M. (1990). Comparative Fit Indexes in Structural Models. *Psychological Bulletin*, 107(2), 238-246.
- Bentler, P. M. (2000). Rites, Wrongs, and Gold in Model Testing. *Structural Equation Modeling*, 7(1), 82-91.
- Bentler, P. M. (2004). *EQS Structural Equations Program Manual*. Encino, CA: Multivariate Software, Inc.
- Bentler, P. M. (2006a). *EQS 6 Structural Equations program manual*. Encino, CA: Multivariate Software, Inc.
- Bentler, P. M. (2006b). *EQS 6.1 for Windows*. Encino, CA: Multivariate Software, Inc.
- Berry, L. L. (1995). Relationship marketing of services: Growing interest, emerging perspectives. *Journal of the Academy of Marketing Science*, 23(4), 236-245.
- Berscheid, E. (1994). Interpersonal Relationships. *Annual Review of Psychology*, 45, 79-129.
- Berscheid, E. (1999). The Greening of Relationship Science. *American Psychologist*, 54(4), 260-266.
- Berscheid, E., & Peplau, L. A. (1983). The Emerging science of relationships. In H. K. Harold & et al. (Eds.), *Close Relationships* (pp. 1-19.). New York: W. H. Freeman.
- Borrie, W. T., & Birzell, R. M. (2001). Approaches to measuring quality of the wilderness experience. In W. A. Freimund & D. N. Cole (Eds.), *Visitor use density and wilderness experience: proceedings; 2000 June 1-3; Missoula, MT* (pp. 29-38). Ogden, UT: USDA Forest Service, Rocky Mountain Research Station.
- Borrie, W. T., Christensen, N., Watson, A. E., Miller, T. A., & McCollum, D. W. (2002). Public Purpose Recreation Marketing: A focus on the relationships between the

- public and public lands. *Journal of Park and Recreation Administration*, 20(2), 49-68.
- Borrie, W. T., & Roggenbuck, J. W. (1998). Describing the wilderness experience at Juniper Prairie Wilderness using experience sampling methods. In D. L. Kulhavy & M. H. Legg (Eds.), *Wilderness and natural areas in the eastern North America: research, management, and planning* (pp. 165-172). Nacogdoches, TX: Stephen F. Austin State University, Arthur Temple College of Forestry, Center for Applied Studies.
- Borrie, W. T., & Roggenbuck, J. W. (2001). The dynamic, emergent, and multi-phasic nature of on-site wilderness experiences. *Journal of Leisure Research*, 33(2), 202-228.
- Bright, A. D. (2000). The role of social marketing in leisure and recreation management. *Journal of Leisure Research*, 32(1), 12-17.
- Brooks, J. J., Wallace, G. N., & Williams, D. R. (2006). Place as relationship partner: An alternative metaphor for understanding the quality of visitor experience in a backcountry setting. *Leisure Sciences*, 28, 331-349.
- Buttimer, A. (1993). *Geography and the Human Spirit*. Baltimore/London: Johns Hopkins University Press.
- Byrne, B. M. (1994). *Structural Equation Modeling with EQS and EQS/Windows: Basic concepts, applications, and programming*. Thousand Oaks, CA: Sage Publications.
- Casey, E. S. (2001). Between geography and philosophy: What does it mean to be in the place-world? *Annals of the Association of American Geographers*, 91(4), 683-693.
- Celsi, R. L., Rose, R. L., & Leigh, T. W. (1993). An exploration of high-risk leisure consumption through skydiving. *Journal of Consumer Research*, 20(1), 1-23.
- Chaudhuri, A., & Holbrook, M. B. (2001). The Chain of Effects from Brand Trust and Brand Affect to Brand Performance: The Role of Brand Loyalty. *Journal of Marketing*, 65(April), 81-93.
- Churchill, G. A. J. (1979). A paradigm for developing better measures of marketing constructs. *Journal of Marketing Research*, 16, 64-73.
- Clark, R. N., & Stankey, G. H. (1979). *The Recreation Opportunity Spectrum: A framework for planning, management, and research* (No. General Technical Report PNW-98). Portland, OR: U. S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station.
- Cole, D. N. (2001). Visitor use density and wilderness experiences: A historical review or research. In W. A. Freimund & D. N. Cole (Eds.), *Visitor use density and wilderness*

- experience; proceeding; 2000 June 1-3; Missoula, MT. Proc. RMRS-P-20* (pp. 11-20). Ogden, UT: USDA, Forest Service, Rocky Mountain Research Station.
- Cole, D. N., & McCool, S. F. (1997). The Limits of Acceptable Change process: Modifications and clarifications. In S. F. McCool & D. N. Cole (Eds.), *Proceedings - Limits of Acceptable Change and related planning processes: progress and future directions; 1997 May 20-22: Missoula, MT* (pp. 61-68). Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.
- Cole, D. N., Watson, A. E., & Roggenbuck, J. W. (1995). *Trends in wilderness visitors and visits: Boundary Waters Canoe Area, Shining Rock, and Desolation Wildernesses* (No. INT-RP-483). Ogden, UT: USDA Forest Service, Intermountain Research Station.
- Cronon, W. (1996). The trouble with wilderness: or getting back to the wrong nature. In W. Cronon (Ed.), *Uncommon Ground: Rethinking the Human Place in Nature* (pp. 69-90). New York: W. W. Norton and Company.
- Cvetkovich, G., & Winter, P. L. (2003). Trust and Social Representations of the Management of Threatened and Endangered Species. *Environment and Behavior*, 35(2), 286-307.
- Cvetkovich, G. T., & Winter, P. L. (2004). Seeing Eye-to-Eye on Natural Resource Management: Trust, Value Similarity, and Action Consistency/Justification. *Proceedings of the Fourth Social Aspects and Recreation Research Symposium*, 46-50.
- Davenport, M. A., & Anderson, D. H. (2005). Getting from sense of place to place-based management: An interpretive investigation of place meanings and perceptions of landscape change. *Society and Natural Resources*, 18, 624-641.
- Dawson, C. P., Newman, P., & Watson, A. (1998). Cognitive dimensions of recreational user experiences in wilderness: an exploratory study in Adirondack Wilderness areas. In H. G. Vogelson (Ed.), *Proceedings of the 1997 northeastern recreation research symposium; 1197 April 6-9; Bolton Landing, NY. GTR-NE-241*. (pp. 257-259). Radnor, PA: USDA Forest Service, Northeastern Forest Experiment Station.
- DeVellis, R. F. (2003). *Scale development: Theory and applications*. Thousand Oaks, CA: Sage Publications.
- Dwyer, F. R., Schurr, P. H., & Oh, S. S. (1987). Developing Buyer-Seller Relationships. *Journal of Marketing*, 51(2), 11-27.
- Earle, T. C., & Cvetkovich, G. T. (1995). *Social trust: Toward a cosmopolitan society*. West Port: CT: Praeger.
- Fishbein, M., & Ajzen, I. (1975). *Belief, Attitude, Intention, and Behaviour: An Introduction to Theory and Research*. London: Addison-Wesley.

- Fournier, S. (1998). Consumer and their brands: Developing relationship theory in consumer research. *Journal of Consumer Research*, 24(4), 343-373.
- Fournier, S., & Mick, D. G. (1999). Rediscovering Satisfaction. *Journal of Marketing*, 63(October), 5-23.
- Freimund, W. A., & Cole, D. N. (2001). Use density, visitor experience, and limiting recreation use in wilderness: Progress to date and research needs. In W. A. Freimund & D. N. Cole (Eds.), *Visitor use density and wilderness experience: proceedings; 2000 June 1-3; Missoula, MT. Proc. RMRS-P-20* (pp. 3-8). Ogden, UT: USDA Forest Service, Rocky Mountain Research Station.
- Gable, S. L., & Reis, H. T. (1999). Now and then, them and us, this and that: Studying relationships across time, partner, context, and person. *Personal Relationships*, 6, 415-432.
- Gagne, P., & Hancock, G. R. (2006). Measurement Model Quality, Sample Size, and Solution Propriety in Confirmatory Factor Models. *Multivariate Behavioral Research*, 41(1), 65-83.
- Gerber, J. (1997). Beyond dualism- the social construction of nature and the natural and social construction of human beings. *Progress in Human Geography*, 21(1), 1-17.
- Giorgi, A. (1997). The theory, practice, and evaluation of the phenomenological method as a qualitative research procedure. *Journal of Phenomenological Psychology*, 28(2), 235-260.
- Glacken, C. J. (1967). *Traces on the Rhodian Shore*. Berkeley: University of California Press.
- Glaspell, B., Watson, A., Kneeshaw, K., & Pendergrast, D. (2003). Selecting indicators and understanding their role in wilderness experience stewardship at Gates of the Arctic National Park and Preserve. *The George Wright Forum*, 20(3), 59-71.
- Greider, T., & Garkovich, L. (1994). Landscapes: The social construction of nature and the environment. *Rural Sociology*, 59(1), 1-24.
- Grimm, L. G., & Yarnold, P. R. (Eds.). (1995). *Reading and Understanding Multivariate Statistics*. Washington, D.C.: American Psychological Association.
- Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). *Multivariate Data Analysis* (5th ed.). Upper Saddle River, NJ: Prentice Hall.
- Halcoussis, D. (2005). *Understanding Econometrics*. Kingsport, TN: Thomson South-Western.
- Hart, J. F. (1975). *The look of the land*. Englewood Cliffs, NJ: Prentice-Hall, Inc.

- Havitz, M. E., & Dimanche, F. (1997). Leisure involvement revisited: Conceptual conundrums and measurement advances. *Journal of Leisure Research*, 29, 245-278.
- Hazan, C., & Shaver, P. R. (1994). Attachment as an Organizational Framework for Research on Close Relationships. *Psychological Inquiry*, 5(1), 1-22.
- Hinde, R. A. (1995). A suggested structure for a science of relationships. *Personal Relationships*, 2, 1-15.
- Hu, L., & Bentler, P. M. (1999). Cutoff Criteria for Fit Indexes in Covariance Structure Analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, 6(1), 1-55.
- Hu, L., Bentler, P. M., & Kano, Y. (1992). Can Test Statistics in Covariance Structure Analysis Be Trusted? *Psychological Bulletin*, 112(2), 351-362.
- Hull, R. B., Stewart, W. P., & Yi, Y. K. (1992). Experience patterns: Capturing the dynamic nature of a recreation experience. *Journal of Leisure Research*, 24(3), 240-252.
- Illingworth, J. D. (1991). Relationship Marketing: Pursuing the Perfect Person-To-Person-Relationship. *The Journal of Services Marketing*, 5(4), 49-52.
- Jackson, D. L. (2003). Revisiting Sample Size and Number of Parameter Estimates: Some Support for the N:q Hypothesis. *Structural Equation Modeling*, 10(1), 128-141.
- Jackson, J. B. (1997). *Landscape in Sight*. New Haven, PA: Yale University Press.
- Joreskog, K. G., & Sorbom, D. (1988). *Lisrel 7: A guide to the program and application* (2nd ed.). Chicago: SPSS Inc.
- Jorgensen, B. S., & Stedman, R. C. (2001). Sense of place as an attitude: Lakeshore owners attitudes toward their properties. *Journal of Environmental Psychology*, 21, 233-248.
- Kaplan, D. (2000). *Structural equation modeling*. Thousand Oaks, CA: Sage.
- Kelley, H. H., Berscheid, E., Christensen, A., Harvey, J. H., Huston, T. L., Levinger, G., et al. (1983). *Close relationships*. New York: Freeman.
- Kennedy, P. (2003). *A guide to econometrics* (5th ed.). Cambridge, MA: The MIT Press.
- Kline, R. B. (2005). *Principles and practice of structural equation modeling* (2nd ed.). New York: The Guilford Press.
- Kotler, P., & Zaltman, G. (1971). Social Marketing: An approach to planned social change. *Journal of Marketing*, 35(3), 3-12.

- Kyle, G., Absher, J. D., & Graefe, A. R. (2003). The moderating role of place attachment on the relationship between attitudes toward fees and spending preferences. *Leisure Sciences, 25*, 33-50.
- Kyle, G., Graefe, A., Manning, R., & Bacon, J. (2003). An examination of the relationship between leisure activity involvement and place attachment among hikers along the Appalachian Trail. *Journal of Leisure Research, 35*(3), 249-273.
- Kyle, G., Graefe, A., Manning, R., & Bacon, J. (2004a). Effect of activity involvement and place attachment on recreationists' perceptions of setting density. *Journal of Leisure Research, 36*(2), 209-231.
- Kyle, G., Graefe, A., Manning, R., & Bacon, J. (2004b). Effects of place attachment on users' perceptions of social and environmental conditions in natural settings. *Journal of Environmental Psychology, 24*, 213-225.
- Laursen, B., & Bukowski, W. M. (1997). A Developmental Guide to the Organisation of Close Relationships. *International Journal of Behavioral Development, 21*(4), 747-770.
- Liljeblad, A. (2005). *Towards a more comprehensive understanding of trust: Exploring the public's trust in natural resource management*. Unpublished master's thesis, University of Montana, Missoula.
- Liljeblad, A., & Borrie, W. T. (2006). Trust in wildland fire and fuel management decisions. *International Journal of Wilderness, 12*(1), 39-43.
- MacCallum, R. C., & Austin, J. T. (2000). Applications of structural equation modeling in psychological research. *Annual Review of Psychology, 51*, 201-226.
- Manfredo, M. J., Driver, B. L., & Tarrant, M. A. (1996). Measuring leisure motivation: A meta-analysis of the recreation experience preference scale. *Journal of Leisure Research, 28*(4), 188-213.
- Manning, R. (1999). *Studies in Outdoor Recreation* (2nd ed.). Corvallis: Oregon State University Press.
- Manning, R. E. (2000). Defining and establishing indicators and standards of quality. In D. C. Fulton, D. H. Anderson & D. W. Lime (Eds.), *Human dimensions of natural resource management: Emerging issues and practical applications*. St. Paul, MN: Cooperative Park Studies Program, University of Minnesota, Department of Forest Resources.
- Manning, R. E., & Lime, D. W. (2000). Defining and managing the quality of wilderness recreation experiences. In D. N. Cole, S. F. McCool, W. T. Borrie & J. O'Loughlin (Eds.), *Wilderness science in a time of change conference - Volume 4: Wilderness visitors, experiences, and visitor management; 1999 May 23-27; Missoula, MT*.

- Proc. RMRS-P-15-VOL-4* (pp. 128-133). Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.
- Manzo, L. C. (2003). Beyond house and haven: toward a revisioning of emotional relationships with places. *Journal of Environmental Psychology, 23*, 47-61.
- Manzo, L. C. (2005). For better or worse: Exploring multiple dimensions of place meaning. *Journal of Environmental Psychology, 25*, 67-86.
- Matsuoka, K., Miyamoto, Y., Ito, H., & Kurita, H. (2003). Relationship between behavioral disturbances and characteristics of patients in special units for dementia. *Psychiatry and Clinical Neurosciences, 57*, 569-574.
- McCracken, G. (1987). Advertising: meaning or information? *Advances in Consumer Research, 14*, 121-124.
- McFarlane, B. L. (2004). Recreation Specialization and Site Choice Among Vehicle-Based Campers. *Leisure Sciences, 26*(3), 309-322.
- McIntyre, N., & Pigram, J. J. (1992). Recreation specialization reexamined: The case of vehicle-based campers. *Leisure Sciences, 14*, 3-15.
- Merriam, L. C., & Smith, C. K. (1974). Visitor Impact on Newly Developed Campsites in the Boundary Waters Canoe Area. *Journal of Forestry, 627-630*.
- Moorman, C., Zaltman, G., & Deshpande, R. (1992). Relationships between Providers and Users of Market Research: The Dynamics of Trust within and between Organizations. *Journal of Marketing Research, 29*(3), 314-328.
- Morgan, R. M., & Hunt, S. D. (1994). The commitment-trust theory of relationship marketing. *Journal of Marketing, 58*(3), 20-38.
- Nash, R. (1982). *Wilderness and the American Mind* (3rd ed.). New Haven: Yale University Press.
- National Park Service. (1997). *VERP: The Visitor Experience and Resource Protection (VERP) Framework - A handbook for planners and managers*. Denver, Colorado: Denver Service Center.
- Patterson, M. E., Watson, A. E., Williams, D. R., & Roggenbuck, J. R. (1998). A hermeneutic approach to studying the nature of wilderness experiences. *Journal of Leisure Research, 30*(4), 423-452.
- Patterson, M. E., & Williams, D. R. (1998). Paradigms and problems: The practice of social science in natural resource management. *Society and Natural Resources, 11*, 279-295.

- Patterson, M. E., & Williams, D. R. (2005). Maintaining research traditions on place: Diversity of thought and scientific progress. *Journal of Environmental Psychology*, 25, 361-380.
- Pierskalla, C. D., Lee, M. E., Stein, T. V., Anderson, D. H., & Nickerson, R. (2004). Understanding Relationships Among Recreation Opportunities: A Meta-Analysis of Nine Studies. *Leisure Sciences*, 26, 163-180.
- Proctor, J. D. (1998). The social construction of nature: Relativist accusations, pragmatist and critical realists responses. *Annals of the Association of American Geographers*, 88(3), 352-376.
- Proshansky, H. M. (1978). The city and self-identity. *Environment and Behavior*, 10, 147-169.
- Relf, T. (1977). Humanism, phenomenology, and geography. *Annals of the Association of American Geographers*, 67(1), 177-179.
- Roggenbuck, J. W., & Watson, A. E. (1989). Wilderness recreation use: the current situation. In *Outdoor recreation benchmark 1988: proceedings of the National Outdoor Recreation Forum; 1988 January 13-14: Tampa, Florida* (pp. 394-398). Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station.
- Rudzitis, G. (1996). *Wilderness and the Changing American West*. New York: John Wiley & Sons, Inc.
- Samdahl, D. M. (1991). Issues in the measurement of leisure: A comparison of theoretical and connotative meanings. *Leisure Sciences*, 13, 33-49.
- Schreyer, R., Lime, D., & Williams, D. R. (1984). Characterizing the influence of past experience on recreation behavior. *Journal of Leisure Research*, 16, 34-50.
- Sharma, N., & Patterson, P. G. (1999). The impact of communication effectiveness and service quality on relationship commitment in consumer, professional services. *The Journal of Services Marketing*, 13(2), 151-170.
- Sheth, J. N., & Parvatiyar, A. (1995). Relationship Marketing in Consumer Markets: Antecedents and Consequences. *Journal of the Academy of Marketing Science*, 23(4), 255-271.
- Soule, M. E. (1995). The social siege of nature. In M. E. Soule & G. Lease (Eds.), *Reinventing Nature? Responses to postmodern deconstruction* (pp. 137-170). Washington, D. C.: Island Press.
- Soule, M. E., & Lease, G. (1995). *Reinventing Nature? Responses to postmodern deconstruction*. Washington D. C.: Island Press.

- Stankey, G. H., Cole, D. N., Lucas, R. C., Petersen, M. E., & Frissell, S. S. (1985). *The Limits of Acceptable Change (LAC) system for wilderness planning* (No. General Technical Report INT-176). Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station.
- Stedman, R. C. (2002). Toward a social psychology of place: Predicting behavior from place-based cognitions, attitude, and identity. *Environment and Behavior*, *34*(5), 561-581.
- Stedman, R. C. (2003a). Is it really just a social construction? The contribution of the physical environment to sense of place. *Society and Natural Resources*, *16*, 671-685.
- Stedman, R. C. (2003b). Sense of place and forest science: Toward a program of quantitative research. *Forest Science*, *49*(6), 822-829.
- Stewart, W. P. (1998). Leisure as Multiphase Experiences: Challenging Traditions. *Journal of Leisure Research*, *30*(4), 391-400.
- Sutter, P. S. (2002). *Driven wild: How the fight against automobiles launched the modern wilderness movement*. Seattle: University of Washington Press.
- Tuan, Y.-F. (1974). *Topophilia*. New York: Columbia University Press.
- US Forest Service. (2004). *Land and Resource Management Plan: Superior National Forest*. Milwaukee, WI: Eastern Region, US Department of Agriculture (USDA), Forest Service.
- Watson, A. E. (1995). Opportunities for solitude in the Boundary Waters Canoe Area Wilderness. *Northern Journal of Applied Forestry*, *12*(1), 12-18.
- Watson, A. E., & Borrie, W. T. (2003). Applying Public-Purpose Marketing in the USA to Protect Relationships with Public Lands. In C. P. R. Buckley, & D. B. Weaver (Ed.), *Nature-based Tourism, Environment, and Land Management* (pp. 25-31): CAB International.
- Watson, A. E., & Borrie, W. T. (2004). Monitoring the relationship between the public and public lands: Applications to wilderness stewardship in the U.S. In C. Aguirre-Bravo, et al. (Ed.), *Monitoring science and technology symposium: Unifying knowledge for sustainability in the Western hemisphere; 2004 September 20-24; Denver, CO. Proceedings RMRS-P-37-CD*. Ogden, UT: USDA, Forest Service, Rocky Mountain Research Station.
- Watson, A. E., & Cronn, R. (1994). How previous experience relates to visitors' perceptions of wilderness conditions. *Trends*, *31*(3), 43-46.
- Watson, A. E., Roggenbuck, J. W., & Williams, D. R. (1991). The Influence of Past Experience on Wilderness Choice. *Journal of Leisure Research*, *23*(1), 21-36.

- Watson, A. E., Williams, D. R., Roggenbuck, J. W., & Daigle, J. J. (1992). *Visitor Characteristics and Preferences for Three National Forest Wildernesses in the South* (No. INT-RP-455). Ogden, UT: USDA Forest Service, Intermountain Research Station.
- Wieselquist, J., Rusbult, C. E., Foster, C. A., & Agnew, C. R. (1999). Commitment, Pro-Relationship Behavior, and Trust in Close Relationships. *Journal of Personality and Social Psychology*, 77(5), 942-966.
- Willers, B. (2001). The postmodern attack on wilderness. *Natural Areas Journal*, 21(3), 259-265.
- Williams, D. R. (1989). Great expectations and the limits to satisfaction: A review of recreation and consumer satisfaction research. In A. E. Watson (Ed.), *Outdoor Recreation Benchmark 1988: Proceedings of the National Outdoor Recreation Forum* (pp. 422-438): USDA Forest Service General Technical Report SE-52.
- Williams, D. R. (2000). Personal, societal, and ecological values of wilderness  
Constructing and contesting places in a global village. In A. E. Watson & G. H. Aplet (Eds.), *Personal, societal, and ecological values of wilderness: Sixth World Wilderness Congress proceedings on research, management, and allocation, volume II; 1998 October 24-29; Bangalore, India. Proc. RMR-P-14* (pp. 77-82). Ogden, UT: USDA Forest Service, Rocky Mountain Research Station.
- Williams, D. R., & Patterson, M. E. (2007). Snapshots of What, Exactly? A Comment on Methodological Experimentation and Conceptual Foundations in Place Research. *Society and Natural Resources*, 20(10), 931-937.
- Williams, D. R., Patterson, M. E., Roggenbuck, J. W., & Watson, A. E. (1992). Beyond the commodity metaphor: Examining emotional and symbolic attachment to place. *Leisure Sciences*, 14, 29-46.
- Williams, D. R., & Vaske, J. J. (2003). The measurement of place attachment: Validity and generalizability of a psychometric approach. *Forest Science*, 49(6), 830-840.
- Winter, P. L., Palucki, L. J., & Burkhardt, R. L. (1999). Anticipated responses to a fee program: The key is trust. *Journal of Leisure Research*, 31(3), 207-226.

APPENDIX A: ON SITE CONTACT FORM

Boundary Waters Wilderness Study 2007, 1991, 1969 OMB #0596-0208

Entry Point Name and Number: \_\_\_\_\_ Group ID Number: \_\_\_\_\_

Date of Entry: \_\_\_\_ / \_\_\_\_ /2007 Permit Issuing Location/Office: \_\_\_\_\_

Interview Location: \_\_\_\_\_

Date of Interview: \_\_\_\_ / \_\_\_\_ /2007 Time of interview: \_\_\_\_\_ Interviewer (initials): \_\_\_\_\_

=====

1. How many people are in your party? \_\_\_\_\_

How many are under 5 years old? \_\_\_\_\_

How many are between 5 and 17 years old? \_\_\_\_\_

How many are female? \_\_\_\_\_

2. What type of group are you? (Circle one response)

- 1. Family (immediate family and relatives)
- 2. Friends
- 3. Family and Friends
- 4. Alone
- 5. Organization or club – please give type \_\_\_\_\_
- 6. Other

3. **HOW MANY** of each type of watercraft are you using on this trip? (Enter “0” where appropriate)

\_\_\_\_\_ Nonmotorized Watercraft \_\_\_\_\_ Motorized Watercraft  
(If **NOT** a motor route enter **N/A = Not Applicable**)

4. How many **NIGHTS** will /did you spend in the US (BWCAW) and Canada (Quetico Provincial Park)?  
(Enter “0” where appropriate)

\_\_\_\_\_ Nights in US \_\_\_\_\_ Nights in Canada

4a. If this is a day trip, will you/did you take another wilderness day trip on this visit to the Boundary Waters?

- 1. Yes
- 2. No

5. Did you use the services of an outfitter on this trip? (check only one)

- \_\_\_\_\_ No, not at all
- \_\_\_\_\_ Yes, for **ALL** (or nearly all) services or supplies
- \_\_\_\_\_ Yes, for **SOME** services or supplies (rented equipment, purchased food, used a shuttle / tow service)

Did you hire the services of a guide on this trip? (Circle one)

- 1. Yes
- 2. No

6. Please complete the following information for **each person in the party**:

- How many times, **excluding this visit**, has each person in the party visited the Boundary Waters Canoe Area Wilderness?
- What **Year** was each person’s first visit to BWCAW?

Please **print** the name and address of **each** party member on the back. We will be sending a questionnaire to each person to get their views about the management of the Boundary Waters.

**(OVER)**

**BOUNDARY WATERS WILDERNESS STUDY  
(PLEASE PRINT)**

Person	Previous Visits to <b>BWCAW</b>	Year of First Visit	Name	Mailing Address & Zip
<b>Permit Holder</b>	_____	_____	_____	_____
<b>Person #2</b>	_____	_____	_____	_____
<b>Person #3</b>	_____	_____	_____	_____
<b>Person #4</b>	_____	_____	_____	_____
<b>Person #5</b>	_____	_____	_____	_____
<b>Person #6</b>	_____	_____	_____	_____
<b>Person #7</b>	_____	_____	_____	_____
<b>Person #8</b>	_____	_____	_____	_____
<b>Person #9</b>	_____	_____	_____	_____



5. The Boundary Waters may play many different roles in people's lives. As you think about your association with the Boundary Waters, please indicate the extent to which you agree or disagree with each statement below.  
(Circle one number for each statement)

	Strongly disagree				Strongly agree
	1	2	3	4	5
a. I am very attached to the Boundary Waters.	1	2	3	4	5
b. The Boundary Waters is the best place for what I like to do.	1	2	3	4	5
c. I feel like the Boundary Waters is a part of me.	1	2	3	4	5
d. I identify strongly with the Boundary Waters.	1	2	3	4	5
e. I get more satisfaction out of visiting the Boundary Waters than any other.	1	2	3	4	5
f. I find a lot of my life organized around the Boundary Waters.	1	2	3	4	5
g. I enjoy discussing the Boundary Waters with my friends.	1	2	3	4	5
h. The Boundary Waters is very special to me.	1	2	3	4	5
i. The Boundary Waters means a lot to me.	1	2	3	4	5
j. Doing what I do at the Boundary Waters is more important to me than doing it in any other place.	1	2	3	4	5
k. Most of my friends are in some way connected with the Boundary Waters.	1	2	3	4	5
l. No other place can compare to the Boundary Waters.	1	2	3	4	5
m. Visiting the Boundary Waters says a lot about who I am.	1	2	3	4	5
n. The Boundary Waters has a central role in my life.	1	2	3	4	5
o. I wouldn't substitute any other area for doing the type of things I do at the Boundary Waters.	1	2	3	4	5
<i>The Boundary Waters Wilderness is</i>					
p. A place to escape from civilization.	1	2	3	4	5
q. The real "north woods."	1	2	3	4	5
s. A place of high environmental quality.	1	2	3	4	5
r. A pristine wilderness.	1	2	3	4	5

The US Forest Service is responsible for managing recreation use in the Boundary Waters. As you think about your interaction with the Forest Service please indicate the extent to which you agree or disagree with each statement below. (Circle one number for each statement)

	Strongly disagree				Strongly agree
aa. The Forest Service shares my values about how the Boundary Waters should be managed.	1	2	3	4	5
ab. I share the Forest Service's goals for the Boundary Waters.	1	2	3	4	5
ac. The Forest Service supports my views about the Boundary Waters.	1	2	3	4	5
ad. I trust the Forest Service in their efforts to manage the Boundary Waters.	1	2	3	4	5
<i>The connection I have with the Forest Service</i>					
ae... is something I really care about.	1	2	3	4	5
af... is something I intend to maintain indefinitely.	1	2	3	4	5
ag... deserves my maximum effort to maintain.	1	2	3	4	5
ah... is very important to me.	1	2	3	4	5
ai ... is something I am very committed to.	1	2	3	4	5
aj ... is very much like being family.	1	2	3	4	5
ak... is of very little significance to me.	1	2	3	4	5

---

EVALUATION OF SOCIAL CONDITIONS

---

6. This set of questions concerns the interactions with other groups on all your visits to the Boundary Waters. Please indicate whether they were a problem during your visits. If you don't know, indicate by circling the X for 'Don't Know.'

	Not a Problem	A Slight Problem	A Big Problem	Don't Know
a. Large groups of people	0	1	2	X
b. Too many day users	0	1	2	X
c. Too many people in area you visited	0	1	2	X
d. Congestion at portages	0	1	2	X
e. Not enough privacy in campsites	0	1	2	X
f. People making noise	0	1	2	X

PERCEPTIONS OF WILDERNESS CONDITIONS

7. This set of items relates to a variety of conditions you may have encountered during your visit to the Boundary Waters. Please indicate the extent to which you experienced these conditions during your visit. If you did not encounter the condition, or if you really don't know, indicate by circling the X for 'Don't Know.'

	Not at All	—————→								All the time	Don't Know
a. Poorly maintained portages	0	1	2	3	4	5	6	7	8	9	X
b. Opportunities to see wildlife	0	1	2	3	4	5	6	7	8	9	X
c. Destruction of vegetation at or around campsites	0	1	2	3	4	5	6	7	8	9	X
d. Litter	0	1	2	3	4	5	6	7	8	9	X
e. Improper disposal of human waste	0	1	2	3	4	5	6	7	8	9	X
f. Areas closed due to fire	0	1	2	3	4	5	6	7	8	9	X
g. Improper disposal of fish entrails	0	1	2	3	4	5	6	7	8	9	X
h. Fire grates full of trash	0	1	2	3	4	5	6	7	8	9	X
i. Fire grates full of charcoal & ash	0	1	2	3	4	5	6	7	8	9	X
j. Nuisance bears	0	1	2	3	4	5	6	7	8	9	X
k. Low flying aircraft	0	1	2	3	4	5	6	7	8	9	X
l. Pets	0	1	2	3	4	5	6	7	8	9	X
m. Shoreline erosion	0	1	2	3	4	5	6	7	8	9	X
n. Human-caused damage to trees	0	1	2	3	4	5	6	7	8	9	X
o. Wind-damaged trees	0	1	2	3	4	5	6	7	8	9	X
p. Excessive amounts of bare ground	0	1	2	3	4	5	6	7	8	9	X
q. Vandalism	0	1	2	3	4	5	6	7	8	9	X





12a. If you were visiting the Boundary Waters 5-10 years ago, which of these items did you bring along?

a. Gas Stove	YES	NO
b. Cellular/Satellite Phone	YES	NO
c. GPS unit	YES	NO
d. Electric Razor	YES	NO
e. MP3 player (iPod)	YES	NO
f. Radio	YES	NO
g. Rain gear	YES	NO
h. Portable Video Game	YES	NO
i. Flashlight	YES	NO
j. Water Filter	YES	NO
k. Bear/Pepper Spray	YES	NO
l. Knife	YES	NO
m. Matches	YES	NO

---

CHANGING TRIP CHARACTERISTICS

---

13. As you have been visiting the Boundary Waters over the years, you may now be visiting more or less often than before. What factors (if any) have influenced this change?

---

---

---

---

14. Over the years, the composition of your group that visits the Boundary Waters may have changed (e.g. fewer children, more family/friends). If so, why has this composition changed?

---

---

---

---

15. Over the years, your typical length of stay on Boundary Waters trips may have increased or decreased. If your length of stay is now different, please tell us how it has changed and what may have led to this change.

---

---

---

---

16. During your preparations for visiting the Boundary Waters, has the amount of time you spend planning changed over the years? Why might this change have occurred?

---

---

---

---

---

SOME INFORMATION ABOUT YOU

---

17. Your previous wilderness use:

- a. How many times have you visited the Boundary Waters Wilderness before this trip? \_\_\_\_\_ PREVIOUS VISITS
- b. What year did you first visit the Boundary Waters Wilderness? \_\_\_\_\_ YEAR
- c. How many other federal Wilderness areas have you visited, besides the Boundary Waters Wilderness? \_\_\_\_\_ OTHER WILDERNESS AREAS

18. How many miles did you travel from your residential home to visit the Boundary Waters this year? \_\_\_\_\_ MILES

18a. Has this distance changed over, say, the last 5-10 years? 1. Yes 2. No

If YES, how many miles was it then? \_\_\_\_\_ MILES

19. How has your amount of leisure time changed over, say, the last 5-10 years?

Much Less Leisure Time					Not Much Change					Much More Leisure Time
1	2	3	4	5	6	7	8	9		

19a. If it has changed, please explain why?

---

---

---

20. Have changes in the price of gas over, say, the last 5-10 years affected how you use the Boundary Waters?

1. Yes 2. No

20a. If Yes, please explain how?

---

---

---

21. What best describes your current residence? (Circle one number)

1. Urban
2. Suburban
3. Rural

22. How many times have you moved your residence in, say, the last 10 years?

\_\_\_\_\_ TIMES

23. Are you: (Circle one)

- 1. Female
- 2. Male

24. What is your age?

\_\_\_\_\_ YEARS

25. How would you best describe your marital/family status?

- 1. Never Married
- 2. Married
- 3. Divorced
- 4. Widowed
- 5. Other \_\_\_\_\_

25a. Has this status changed in the last 5-10 years? 1. Yes 2. No

26. How many related individuals live in your household (including children 16 years or younger)?

\_\_\_\_\_ INDIVIDUALS

27. Have any children (16 years or younger) been added to your family in the last 5 years?

- 1. Yes
- 2. No

28. What is the number of cars in your household? \_\_\_\_\_ CARS

29. Which best describes your current work status? (Circle one response)

- 1. Work Full Time
- 2. Work Part Time
- 3. Retired
- 4. Homemaker
- 5. Student (full time)
- 6. Student (part time)
- 7. Unemployed

30. What is the highest level of education in years you have attained? (Circle one number that best represents your education)

8	9	10	11	12	13	14	15	16	17	18	19	20	21
Less than a high				High school		Undergraduate			Graduate degree				
				school diploma		graduate or GED			college degree				(MS, PhD, MD, JD, etc.)
						(BS, BA, etc)							

31. Are you of Spanish, Hispanic, or Latino ethnic origin? (Circle one response)

- 1. Yes
- 2. No

32. Select one or more of the following categories that best describes your race. (Check all that apply)

- White
- American Indian/Alaska Native
- Asian
- Black/ African American
- Native Hawaiian or other Pacific Islander
- Other

33. What was your annual household income in the year 2006, before taxes? (Circle one number that best represents your income)

- |                           |                            |
|---------------------------|----------------------------|
| 1. Less than \$20,000     | 7. \$120,000 to \$139,999  |
| 2. \$20,000 to \$39,999   | 8. \$140,000 to \$159,999  |
| 3. \$40,000 to \$59,999   | 9. \$160,000 to \$179,999  |
| 4. \$60,000 to \$79,999   | 10. \$180,000 to \$199,999 |
| 5. \$80,000 to \$99,999   | 11. \$200,000 or more      |
| 6. \$100,000 to \$119,999 |                            |

Public reporting burden for this collection of information is estimated to average 20 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Agriculture, Clearance Officer, OIRM, Room 404-W, Washington, DC 20250; and to the Office of Management and Budget, Paperwork Reduction Project (OMB #0596-0208), Washington, DC 20503.

## Thank You!

PLEASE USE THE REMAINING SPACE TO MAKE ANY FURTHER COMMENTS.

APPENDIX C: ADDITIONAL DESCRIPTIVE STATISTICS

**Table 17: Group Type for Visitor Trend Study vs. Relationship Respondents<sup>a</sup>**

Group Type	Relationship Study (n=904)	Visitor Trend Study (n=903)
Family	32.0%	34.9%
Friends	22.9%	25.0%
Family & Friends	36.9%	31.7%
Alone	1.1%	1.7%
Organization or Club	7.1%	6.2%
Other	0%	< 1%

<sup>a</sup> Responses from on-site interview population

**Table 18: Descriptive Statistics of Relationship Scale Items <sup>ab</sup>**

Measurement Items	Mean	Standard Deviation
<i>Place Identity</i>		
5a. Attached	4.14	1.02
5c. Part	3.63	1.18
5d. Identity	3.82	1.13
5h. Special	4.19	.96
5i. Mean	4.17	.97
5m. Who	3.54	1.15
<i>Life Centrality</i>		
5f. Organized	2.43	1.08
5g. Discussing	4.01	.99
5k. Friends	2.35	1.06
5n. Central	2.64	1.12
<i>Trust</i>		
5aa. Values	3.90	.90
5ab. Goals	3.94	.91
5ac. Views	3.85	.90
5ad. Trust	3.95	.94
<i>Commitment</i>		
5ae. Care	2.94	.98
5af. Maintain	3.01	1.01
5ag. Maximum	3.04	1.10
5ah. Important	3.03	1.07
5ai. Committed	2.84	1.05
5aj. Family	2.37	1.01
5ak. Significance	3.32	1.16
<i>Place Meanings</i>		
5p. Escape	4.49	.83
5q. Real	4.30	.89
5r. Pristine	4.23	.92
5s. Quality	4.51	.77
<i>Place Dependence</i>		
5b. Best	3.81	1.00
5e. Satisfaction	3.56	1.10
5j. DOI	3.25	1.67
5l. Compares	3.58	1.21
5o. Substitute	3.18	1.26

<sup>a</sup>Full item wording is presented in Appendix B

<sup>b</sup> Likert-type scale: Strongly disagree (1) to Strongly Agree (5)