

THESIS

FACILITATING SOLUTIONS TO CONSERVATION MANAGEMENT CHALLENGES
THROUGH AN UNDERSTANDING OF HUMAN PERCEPTIONS
OF NATURE AND WILDLIFE

Submitted by

Alia Dietsch

Department of Human Dimensions of Natural Resources

In partial fulfillment of the requirements

For the Degree of Master of Science

Colorado State University

Fort Collins, Colorado

Summer 2010

COLORADO STATE UNIVERSITY

July 14, 2010

WE HEREBY RECOMMEND THAT THE THESIS PREPARED UNDER OUR
SUPERVISION BY ALIA DIETSCH ENTITLED FACILITATING SOLUTIONS TO
CONSERVATION MANAGEMENT CHALLENGES THROUGH AN UNDERSTANDING OF
HUMAN PERCEPTIONS OF NATURE AND WILDLIFE BE ACCEPTED AS FULFILLING
IN PART REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE.

Committee on Graduate Work

Kimberly Henry

Advisor: Tara Teel

Co-Advisor: Michael Manfredo

Department Head: Michael Manfredo

ABSTRACT OF THESIS

FACILITATING SOLUTIONS TO CONSERVATION MANAGEMENT CHALLENGES THROUGH AN UNDERSTANDING OF HUMAN PERCEPTIONS OF NATURE AND WILDLIFE

Natural resource managers traditionally relying on biological expertise to understand and respond to today's conservation challenges (e.g., biodiversity loss, habitat fragmentation, climate change) are finding increased impetus for utilizing social sciences to inform decision-making. All too often, management decisions have been unsuccessful when they failed to address the polarizing values of stakeholders, the economic and political context of decisions, and the cultural significance of resources to local people. An understanding of these social considerations can be facilitated by an examination of human-nature and human-wildlife relationships, which often form the basis for conflict over management issues.

This thesis presents two manuscripts designed to contribute to this area of inquiry by considering how public opinion may be influenced by broader conceptions of the natural environment. Such perceptions of nature are further influenced by ideology, or the way people assess meaning to their lives through consensually-held beliefs. Drawing upon Cultural Theory and the Myths of Nature, Chapter II of this thesis explores how people think about nature in three distinct areas of the western United States. To better understand such human-nature relationships, we explored a new measurement approach for capturing the Myths of Nature. Consistent with our objectives, we tested such an approach and found that five distinct

perspectives regarding nature exist; that these perspectives are consistent with the Myths of Nature literature; and that results are stable across three study areas.

Chapter III outlines a need for natural resource agencies wanting to ensure continued public support to have a better understanding of the diverse publics they represent. Two social science approaches (i.e., wildlife value orientation theory and the Myths of Nature) explore the influence of ideology on conflicting beliefs related to wildlife and wildlife use. Consistent with hypotheses, wildlife value orientations were found to be related to the Myths of Nature, indicating they likely draw upon similar ideologies (e.g., egalitarianism). Additionally, results indicated that people believing in a myth of *Nature is Ephemeral* were significantly less accepting than others of lethal control of wildlife, whereas as those believing in a myth of *Nature is Benign* were more accepting of lethal control. Findings as a whole corroborate that ideology, as reflected in value orientations about wildlife and the Myths of Nature, influences human thought about wildlife use, and that human thought about the natural environment can be used to enhance our understanding of public attitudes and behaviors in a wildlife-related context.

Alia Dietsch
Department of Human Dimensions of Natural Resources
Colorado State University
Fort Collins, CO 80523
Summer 2010

ACKNOWLEDGEMENTS

During my preliminary visit to Colorado State University, Mike Manfredo suggested a graduate degree was a somewhat selfish endeavor. I originally balked at the idea, believing my quest for higher education was to contribute to objective science and circumvent the biases I observed in my professional experiences. I recognize now that necessary components of obtaining a masters degree include a desire for a finished product stamped with my name and a willingness to assert my knowledge regarding human dimensions. Here I am.

I would like to acknowledge that many people have helped to shape my understanding of the world, what I believe, and who I am. To all, I am thankful. To my parents, thank you for encouraging me to always be, do, and know more. Their ethics have helped establish my own and have guided me well. Throughout the four years of my graduate career, Esther Duke and Ch'aska Huayhuaca have provided much intellectual discussion, creative guidance, and moral support. I am not sure where I would be without their friendship.

A project of this scope (*Understanding People in Places*) would not have been possible without the support of Washington Department of Fish and Wildlife, South Dakota Game, Fish and Parks, and Arizona Game and Fish personnel. Thanks also to Valerie Miller for helping me survive our days in Tucson.

I would like to thank my committee, including Kim Henry and Mike Manfredo, for their insight on my thesis, and Mike for his various contributions to my graduate experience. Lastly, I must thank Tara Teel for the guidance she has provided, the encouragement she has given, and the time she has spent with me as a student and employee. Her diligence, enthusiasm, and compassion are a source of inspiration. I admire her personally and professionally for all that she is and strives to be.

Thank you.

TABLE OF CONTENTS

List of Tables and Figures	vii
I. Introduction	1
Thesis Organization and Approach	3
Literature Cited	4
II. Exploring an Approach for Measuring the Myths of Nature	6
Introduction	7
Methods	15
Results	19
Discussion	25
Literature Cited	30
III. The Influence of Myths of Nature and Wildlife Value Orientations on Acceptance of Invasive Wildlife Management Actions	41
Introduction	42
Methods	49
Results	53
Discussion	58
Literature Cited	62
IV. Conclusion	75
Literature Cited	80
APPENDIX A: Survey Instrument for Washington	81

LIST OF TABLES AND FIGURES

Figure 2.1	Social organization and the Myths of Nature as described by Cultural Theory.	34
Table 2.1	Goodness-of-fit results for clusters across five random orderings of data ($t1 - t5$).	35
Table 2.2	ANOVA results for clusters at $t5$.	36
Table 2.3	Specific beliefs about nature representing clusters and percent of people by study area at $t5$ agreeing with beliefs.	37
Table 2.4	Initial cluster centers for five Myths of Nature.	38
Table 2.5	Goodness-of-fit results for Myth of Nature clusters across five random orderings of data ($t1 - t5$).	38
Table 2.6	ANOVA Results for five Myths of Nature clusters at $t5$.	39
Table 2.7	Specific beliefs about nature representing Myths of Nature clusters and percent of people by study area at $t5$ agreeing with beliefs.	40
Figure 3.1	Social organization and the Myths of Nature as described by Cultural Theory.	66
Figure 3.2	Mean scores for Myths of Nature types on wildlife value orientation dimensions.	66
Table 3.1	Non-response check comparisons.	67
Table 3.2	ANOVA Results for five Myths of Nature clusters at $t5$.	68
Table 3.3	Reliability results for wildlife value orientation dimensions.	69
Table 3.4	Mean differences for Myths of Nature type on wildlife value orientation dimensions.	70
Table 3.5	Reliability results for lethal control scales.	71
Table 3.6	Reliability results for wolf items.	72
Table 3.7	Mean differences for Myths of Nature type on species-specific scales.	72
Table 3.8	Mean differences for wildlife value orientations by Myths of Nature type on computed scales for different wildlife species.	73
Table 3.9	Chi-square results for Myths of Nature type on wildlife-related recreation participation.	74

I. INTRODUCTION

Natural resource managers traditionally relying on biological expertise to understand and respond to today's conservation challenges (e.g., biodiversity loss, habitat fragmentation, climate change) are finding increased impetus for utilizing social sciences to inform their decision-making. All too often, management decisions have been unsuccessful when they failed to address the polarizing values of stakeholders, the economic and political context of decisions, and the cultural significance of resources to local people. Furthermore, solutions aimed at solving conservation problems rest on human-made decisions and public support for those decisions (Mascia, Brosius, Dobson, Forbes, Horowitz, McKean, & Turner, 2003). It is therefore important for natural resource agencies to understand the diversity of public opinion related to natural resource use. Such an understanding can be facilitated by an examination of human-nature and human-wildlife relationships. Manfredo (2008) suggests that an exploration of theories designed to examine these relationships, which capture ideology and different cultural perspectives, can help natural resource managers engage people through new conservation techniques, anticipate outdoor recreation trends, and attain a deeper understanding of public response to management issues, as well as ensure a diversity of solutions necessary in solving challenging conservation problems (Milton, 1996).

Standard demographic variables (e.g., sex, age, education) have often failed to help explain people's responses to conservation-related issues, whereas social science theories hold more promise (Van Liere & Dunlap, 1980). Wildlife value orientation theory, one such example from the social sciences, has helped agencies understand how different types of people think about wildlife and has proven useful in explaining differences in wildlife-related recreation (Fulton, Manfredo, & Lipscomb, 1996), preferences for management policies regarding such issues as trapping (Manfredo, Pierce, Fulton, Pate, & Gill, 1999), and support or opposition for management actions such as lethal control of wildlife (e.g., Manfredo, Teel, & Henry, 2009; Bright, Manfredo, & Fulton, 2000; Zinn, Manfredo, Vaske, & Wittman, 1998). This theory

indicates that specific orientations of mutualism and domination are reflective of broader cultural ideologies related to egalitarianism and domination. Ideology, or consensually-held beliefs, can provide meaning to one's life by helping people to define who they are as well as the groups to which they belong within society (Pratto, 1999). For example, a person influenced by an egalitarian ideology is likely to stress altruism and strive to work toward equality for all (Wildavsky, 1991); thus, he or she may advocate for social justice or world peace through job selection, donations to non-profits, volunteer opportunities, or daily conversation. Wildlife value orientation theory, which explores the influence of ideology on human thought about wildlife use, provides an understanding of diverse public opinions that are at the root of a variety of wildlife conservation challenges (e.g., declines in traditional wildlife-related recreation, the rise in social conflict over wildlife-related issues) (Manfredo, Teel, & Henry, 2009).

Milton (1996) suggests that Cultural Theory, which draws from the field of anthropology, can further help in understanding diverse public beliefs about natural resource use. Cultural Theory provides a basis for understanding competing and dependent cultural perspectives or ways of life that are reflective of broader-level cognitions such as ideology (Douglas & Wildavsky, 1982; Thompson, Ellis, & Wildavsky, 1990). Cultural Theory has additionally been linked to the Myths of Nature, or beliefs related to ecological stability, and are used to depict the ways in which human perceive nature and the risks associated with such beliefs (Douglas & Wildavsky, 1982; Thompson, Ellis, & Wildavsky, 1990). Some researchers advocate for Cultural Theory's utility because it can be used to link particular cultural perspectives to environmentalism (Grendstad & Selle, 1997; Marris, Langford, & O'Riordan, 1998) and responses to environmental risks and behavior (e.g., recycling, transportation); however, other studies have found current measurement approaches to have low explanatory power (Sjöberg, 1996) and to be too deterministic (Boholm, 1996). Carlisle and Smith (2005) indicate that particular ideologies have merit and continued research in this area is promising for understanding people's reactions to environmental issues. Because both Cultural Theory and wildlife value orientation theory

explore the influence of ideology on individual beliefs (e.g., both explore egalitarianism in relation to natural resource use), we set about exploring an integrated approach to using these two theories in a wildlife management context.

Purpose

The purpose of this thesis was to contribute to this area of inquiry by exploring how ideology as depicted by Cultural Theory and wildlife value orientation theory influences human thought regarding natural resource and wildlife use. In particular, we investigated how broad conceptions of nature that stem from such ideology can be captured with an exploratory approach not used in previous literature and, furthermore, how these varied perspectives regarding the natural environment relate to wildlife value orientations and responses to wildlife management issues. Information collected in the investigation was intended to expand prior applications of wildlife value orientation theory by placing the theory in a broader context and elaborating on the different types of wildlife-related interests that have been identified in past research.

THESIS ORGANIZATION AND APPROACH

This thesis presents two articles from a multi-state research project entitled *Understanding People in Places*. The overall purpose of the project was to improve the utility of human dimensions information by understanding the spatial context of human-nature and human-wildlife relationships in regards to specific management problems in each of three study areas; the Black Hills region of South Dakota, Tucson, Arizona, and the state of Washington.

The focus of Chapter II is on using the Myths of Nature to investigate the ways in which humans think about nature, which can facilitate managers' understanding of the diversity of public opinions regarding natural resource use. Specific objectives were to identify different perspectives that may exist regarding nature through an exploratory cluster analysis approach and to determine the extent to which those perspectives either change or are consistent across the three study areas. Chapter III applies the Myths of Nature as outlined in the previous chapter in conjunction wildlife value orientation theory to understand the basis for conflict on wildlife

management issues in the state of Washington. This paper specifically examines the relationship between the Myths of Nature and wildlife value orientations and the extent to which the two concepts can be used to explain variation in wildlife-related attitudes and behaviors.

LITERATURE CITED

- Boholm, A. (1996). Risk perception and social anthropology: Critique of Cultural Theory. *Ethnos*, 61, 64-84.
- Bright, A., Manfredo, M. J., & Fulton, D. (2000). Segmenting the public: An application of value orientations to wildlife planning in Colorado. *Wildlife Society Bulletin*, 28(1), 218-226.
- Carlisle, J., & Smith, E. R. A. N. (2005). Postmaterialism vs. egalitarianism as predictors of energy-related attitudes. *Environmental Politics*, 14(4), 527-540.
- Douglas, M., & Wildavsky, A. (1982). *Risk and culture: An essay on the selection of technical and environmental dangers*. Berkeley, CA: University of California Press.
- Fulton, D. C., Manfredo, M. J., & Lipscomb, J. (1996). Wildlife value orientations: A conceptual and measurement approach. *Human Dimensions of Wildlife*, 1(2), 24-47.
- Grendstad, G., & Selle, P. (1997). Cultural Theory, Postmaterialism, and environmental attitudes. In R. J. Ellis & M. Thompson (Eds). *Culture matters: Essays in honor of Aaron Wildavsky* (pp. 151-168). Boulder, CO: Westview Pres.
- Manfredo, M. J. (2008). *Who cares about wildlife? Social science concepts for exploring human-wildlife relationships and conservation issues*. New York: Springer.
- Manfredo, M. J., Pierce, C. L., Fulton, D., Pate, J., & Gill, B. R. (1999). Public acceptance of wildlife trapping in Colorado. *Wildlife Society Bulletin*, 27(2), 499-508.
- Manfredo, M. J., Teel, T. L., & Henry, K. L. (2009). Linking society and environment: A multi-level model of shifting wildlife value orientations in the western United States. *Social Science Quarterly*, 90(2), 407-427.
- Marris, C., Langford, I. H., & O'Riordan, T. (1998). A quantitative test of the Cultural Theory of risk perceptions: Comparison with the psychometric paradigm. *Risk Analysis*, 18(5), 635-647.
- Mascia, M. B., Brosius, J. P., Dobson, T. A., Forbes, B. C., Horowitz, L., McKean, M. A., & Turner, N. J. (2003). Conservation and the social sciences. *Conservation Biology*, 17(3), 649-650.

- Milton, K. (1996). *Environmentalism and Cultural Theory: Exploring the role of anthropology in environmental discourse*. New York: Routledge.
- Pratto, F. (1999). The puzzle of continuing group inequality: Piecing together psychological, social and cultural forces in social dominance theory. *Advances in Experimental Social Psychology*, 31, 191-263.
- Sjöberg, L. (1996). A discussion of the limitations of the psychometric and Cultural Theory approaches to risk perception. *Radiation Protection Dosimetry*, 68, 219-225.
- Thompson, M., Ellis, R., & Wildavsky, A. (1990). *Cultural Theory*. Boulder, CO: Westview Press.
- Van Liere, K. D., & Dunlap, R. E. (1980). The social bases of environmental concern: A review of hypotheses, explanations and empirical evidence. *Public Opinion Quarterly*, 44, 181-197.
- Wildavsky, A. B. (1991). *The rise of radical egalitarianism*. Washington, DC: The American University Press.
- Zinn, H. C., Manfredo, M. J., Vaske, J. J., & Wittmann, K. (1998). Using normative beliefs to determine the acceptability of wildlife management actions. *Society & Natural Resources*, 11, 649-662.

II. EXPLORING AN APPROACH FOR MEASURING THE MYTHS OF NATURE

Alia Dietsch

Department of Human Dimensions of Natural Resources
Warner College of Natural Resources
Colorado State University

INTRODUCTION

Habitat destruction, biodiversity loss, and climate change all have the potential to drastically alter ecosystems on which lives depend (IUCN, 2008; Millennium Ecosystem Assessment, 2005). Solutions aimed at solving such large-scale as well as local conservation problems rest on human-made decisions and public support for those decisions (Mascia, Brosius, Dobson, Forbes, Horowitz, McKean, & Turner, 2003). For these reasons, natural resource managers are increasingly recognizing the need to enhance their understanding of biological systems with an understanding of equally complex social systems. All too often, natural resource decisions have been ineffective when they failed to address the polarizing values of the stakeholders involved, the economies and political structures affected by the decisions, or the cultural significance of resources to local people. For example, some past efforts to protect biodiversity have resulted in the closing off of lands on which indigenous cultures subsist. Individuals refusing to acknowledge restrictions limiting use of these lands and resources on which they depend face legal consequences when caught or “protected” resources continue to be depleted (Bruner, Gullison, Rice, & da Fonseca, 2001). New efforts to incorporate local beliefs in the decision-making process have been found to be more successful than past efforts (e.g., Ghimire & Pimbert, 1997; Gbadegesin & Ayileka, 2000). Social science theory that explores human beliefs about natural resource use can help with these efforts and further facilitate the development of solutions to conservation challenges (Ewert, 1996).

Although some people may believe they are far removed from the natural environment, all are constantly depending on and affecting it. If culture is the mechanism by which we understand our place in the world, then an understanding of culture and different cultural perspectives can additionally provide insight into our understanding of nature. As an example, in cultures steeped in dualistic traditions influenced by Descartes (1596-1650), the word “nature” itself indicates a belief that humans are separate from and therefore *not* nature (Taliaferro, 2001).

Cronon (1996) further elucidates on culture's influence on human-nature relationships in arguing that western societies entrenched in monotheistic religion helped give rise to the wilderness preservation movement. If the Garden of Eden is symbolic of pristine nature, then there is a perceived need to have untrammelled land devoid of disease and havoc wrecked by iniquitous humans. However, such preservation *is* a form of human influence on natural environments. Because humans strive to guarantee the existence of that which is appreciated, valued, and depended on through shaping of ecosystems and cultivation of land, it is imperative to consider how culture influences the way in which humans perceive nature and natural resource use. Milton (1996) acknowledges different ways that cultures think about nature (e.g., nature as a provider, as reciprocal, as fragile, as dangerous) based on the work of many anthropologists, all of which has implications for how people use natural resources. She further suggests that there is a need to determine the variety of beliefs in existence regarding nature, because cultural diversity, as much as ecological diversity, is likely to ensure human survival in the face of global conservation challenges. Berkes (2007) corroborates that such diversity encourages dynamic thinking, which can influence the success of decisions by ensuring multiple perspectives are considered and weighed in formulating practical solutions.

The way people perceive nature can additionally influence how people in managed ecosystems expect entrusted institutions to respond to different ecological disturbances (Timmerman, 1986). How people think about nature will largely determine *who* people think should manage natural resources as well as *how* those resources should be managed. For example, some people may rely on the expert opinion of government entities for solving conservation problems, while others may prefer local level or collaborative management. In addition, conflicts over species preservation and other management issues may arise between people who think differently about nature (e.g., those who believe nature is plentiful versus those who think nature is headed for catastrophe). An understanding of different perceptions of nature

can help managers plan for the future, understand the types of social conflict they are likely to face, and inform efficacious solutions to solving a myriad of natural resource problems.

Natural resource issues in the United States have a wide-range of stakeholders involved; thus, there is a need to explore the diversity of ways in which Americans think about nature. Such thoughts are influenced by specific cultural perspectives. In this sense, a cultural perspective is similar to how some have used the term ideology (consensually-held beliefs), which provides meaning to an individual's life by helping to define who they are and the groups to which they belong within society (Milton, 1996; Pratto, 1999). Different people within a nation can hold different cultural perspectives, or "myths," related to nature (Douglas & Wildavsky, 1982; Thompson, Ellis, & Wildavsky, 1990). The term "myths" is used to emphasize that each perspective can only be partially true. If one perspective accurately depicted nature exactly as it is, the other perspectives would lose meaning. Groups (e.g., organizations, governments) holding the "correct" perspective would flourish as people flocked to the group whose beliefs were manifest; however, when each myth is proved right, group membership waxes, and when proved wrong, group membership wanes. People effectively define themselves by believing in a certain way of life is *the* way of life and by acting according to that particular cultural perspective. In an effort to understand the diverse ways in which people think about nature and the influence such perspectives have on natural resource use, this paper explores two similar approaches to the Myths of Nature; one draws from the field of ecology (i.e., myths of equilibrium) while the other draws from anthropology (i.e., Myths of Nature as applied to Cultural Theory).

Myths of Equilibrium

Timmerman (1986) explores Myths of Nature as they relate to the idea of ecological equilibrium. The first of these myths is the *myth of stability*, which draws from economic theorist Adam Smith's (1723-1790) notion that markets are best regulated when individuals work in their

own self-interest (Stiglitz, 2002). This myth relies on a belief that systems are continually brought back to a stable resting place regardless of disturbances (e.g., a ball at the bottom of a U-shaped bowl). Nature has and will always correct itself without the need for human help. This myth relies on the perception that nature is benign and resources are plentiful. Any variability across time is averaged out and trials and mistakes become meaningless once the system resumes homeostasis (Holling, 1986). The *myth of stability* encourages large-scale, market-driven development of natural resources. If a particular resource is depleted to a point of diminishing returns, it will be left alone (i.e., it is no longer financially worthwhile to extract) and will therefore recover on its own. The second equilibrium myth, *myth of instability*, is in complete opposition to the first. Rather than a ball at the bottom of a U-shaped bowl, this myth assumes an inverted bowl with the ball on top. Any disturbance will send the system downward into inevitable catastrophe. This myth relies on the idea that nature is intolerant and must be saved. Maintaining the status quo is mandatory, as the system currently works (even if constantly threatening to fail) and needs to stay that way for life to function.

The third myth, *myth of cyclical renewal*, introduces a more complex understanding of nature that considers periodic fluctuations and disturbances (e.g., seasonal variation, predator-prey dynamics). It is evident that such fluctuations and disturbances will occur; however, the length and severity of them are not predictable. When viewed from one point in time, ecological processes may appear in disequilibrium. As examples, leaves fall off trees and some wildlife species lose mass during winter; increases in a particular predator population will cause a decrease in its symbiotic prey population. Over time, such disturbances and fluctuations balance out. Spring will return; decreases in the aforementioned prey population will lead to a decrease in the predator population, which eventually leads to increases in the prey base once the predatory pressure is removed. This myth has two variations associated with it: *myth of multiple stability* and *myth of resilience*. The *myth of multiple stability* indicates that nature is full of peaks and

valleys (rather than being depicted by a bowl) that can escalate and descend; thus, nature must be engineered to stay within acceptable levels (Holling, 1986). The *myth of resilience* assumes a system that is constantly changing and adapting, as are people. Whereas all other equilibrium myths assume separation of humans and nature, this myth does not.

Myths of Nature as Applied to Cultural Theory

The notion of “Myths of Nature” has been popularized by proponents of Douglas’ Cultural Theory of risk. Cultural Theory asserts that organizational or societal-level structure affects individuals’ thought and action. This theory further provides a basis for understanding how individuals know their world based on different competing and dependent ideologies that can be mapped along a grid-group axis (Figure 1) (Douglas, 1992, 1997; Douglas & Wildavsky, 1982; Thompson, Ellis, & Wildavsky, 1990). The *grid* axis relates to the level of control used to maintain and regulate group membership through rules or taboos. High grid is exemplified by hierarchical control (e.g., heavy bureaucracy, caste systems, or “top-down” management), whereas low grid is represented by individuals free of prescriptions (e.g., true democracies, participatory control). The *group* axis relates to the level of exclusion (individual interests) or inclusion (collective interests) people experience with established social organizations. High group indicates inclusion in the social structure (whether hierarchical or voluntary), whereas low group indicates exclusion (whether forced or not).

Thomson, Ellis, and Wildavsky (1990) define five socially-viable ways of life that stem from the grid/group approach described by Cultural Theory: hierarchy, fatalism, egalitarianism, individualism, and autonomy (or the hermit) (Figure 1). Hierarchists (high grid, high group) work toward tightly controlled collective interests and rely on rules, laws, and taboos to maintain order. For those in charge, a life of hierarchy allows an assured lofty position in life. Fatalists (high grid, low group) work toward their own self-interests, but are bound by the rules and decisions of those in charge; thus, Fatalists generally perceive life as happening *to* them rather

than believing they can actively influence it. Fatalists are additionally considered the “risk-absorbers,” who are cause for new policies and products deemed by others to make their lives better (Schwarz & Thompson, 1990). Egalitarians (low grid, high group) work toward collective interests with little or no control over their efforts. Guided by a sense of altruism, Egalitarians overlook conflict among their own and, if necessary, focus on conflicts with others (particularly the “establishment”). Individualists (low grid, low group) work toward their own self interests and are free to follow any path they choose. Although Individualists appear to lack any type of control *from* others, they will often assert control *over* others to get ahead in life. The fifth way of life is one of autonomy. Autonomists were not originally included in the “social map” (Douglas & Wildavsky, 1982), but have more recently been placed in the middle of the grid-group typology (Figure 1). Autonomists choose minimize their social position; they are not interested in, nor influenced by, the competition or social-vying inherent in the other ways of life. Such an autonomous way of life has largely been ignored outside of theoretical musings, yet is “livable, reproducible, and [worth] the proper study of social science” (Thompson, Ellis, & Wildavsky, 1990, p. 32).

Each of these five ways of life adopts a particular myth of nature (Figure 1; Douglas, 1992, 1997; Douglas & Wildavsky, 1982; Schwarz & Thompson, 1990; Thomson, Ellis, & Wildavsky, 1990). Hierarchists believe in a myth of *Nature is Tolerant*, where nature is durable only to a point; thus, heavy regulation will ensure that it is kept within acceptable limits and not abused (and that Hierarchists stay in charge of the regulation). Only experts know the controllable limits of nature; thus, experts should be in charge of protecting nature. Fatalists believe in a myth of *Nature is Capricious*, where nature cannot be predicted and people are subject to its whims. Fatalists are not interested in predicting what will happen to the world’s resources with continued human use, because they do not believe they can have any control over it. Egalitarians believe in a myth of *Nature is Ephemeral*, where nature is precariously balanced

and set for inevitable decline if any wrong move is forced upon it by human abuse. Humans must control their needs and behaviors, as resources are finite. Individualists believe in a myth of *Nature is Benign*, where resources are in constant supply and readily available for human use. Nature does not need human protection. Conversely, people should take advantage of what nature has to offer, or else they will lose out on profits that could be gained from nature's bounty. Autonomists believe in a myth of *Nature is Resilient*, where the overall durability of nature exceeds the immediate needs and desires of man. Nature is continually adapting; change is inevitable, yet unpredictable. Autonomists transcend the other ways of life by viewing nature as non-dualistic; man is just as much a part of nature as nature is a part of man. To this way of life, managing institutions supported by the other myths of nature are constantly being proved "right" and "wrong" and no particular social organization or managing institution fully captures or can understand the complexity of nature.

The Myths of Nature as described by cultural theorists are similar to the myths of equilibrium. For example, the *myth of instability* as described by Timmerman (1986) is related to a myth of nature is ephemeral; the *myth of stability* is related to a myth of nature is benign; the *myth of resilience* and *myth of cyclical renewal* are related to a myth of nature is resilient; and the *myth of multiple stabilities* is related to a myth of nature is tolerant. A myth of nature is capricious is not typically discussed by ecologists such as Timmerman and Holling, as Fatalists are not likely to lead the state, national, and international agencies typically in charge of natural resource and conservation issues (Thomson, Ellis, & Wildavsky, 1990). Cultural theorists have popularized these various myths in order to provide a foundation for understanding how social organizations justify their particular social position in life as well as how each way of life will relate to environmental surprises or risks. For example, if nature is truly benign, Individualists will have reaped the benefits of a bountiful nature, while others will have "lost out" by having

reserved approaches to natural resource use. Alternatively, if nature is truly ephemeral, Individualists would be the surprise holders and have risked all for short-term profit.

Current approaches to measuring the concepts outlined in Cultural Theory have some limitations that may misconstrue the original intent of the theory. For example, respondents may answer all agree/disagree statements intended to capture different ways of life in a manner of acquiescence or dissent, and these statements may function as psychological indices rather than the ways of life they are meant to represent (Grendstad & Selle, 1997; Tansey, 2004). In addition, these operationalizations measure tenets of hierarchy, fatalism, egalitarianism, and individualism (Dake, 1992), but they ignore the autonomous way of life. Furthermore, many suggest such measures are not adequate due to their low explanatory power (e.g., Bouyer, Bagdassarian, Chaabanne, & Mullet, 2001; Brenot, Bonnefous, & Marris, 1998; Marris, Langford, & O’Riordan, 1998; Sjöberg, 1997, 2000). Rippl (2002) argues that quantitatively-collected individual level data can give insight into Cultural Theory’s proposed ways of life when measuring broader theoretical concepts (e.g., values, ideology) rather than specific phenomena such as risk perceptions. Still others suggest cluster analysis rather than continuous variables can be used to explore such cultural adherences (Oltedal & Rundmo, 2007). Due to limitations discussed in the literature, new approaches may help in exploring the applicability of Cultural Theory and the related Myths of Nature to understanding how humans think about nature.

Study Purpose and Objectives

In an attempt to expand the application of the Myths of Nature and consider its relevance for natural resource management, this paper reports on results of a study designed to explore the ways in which people think about nature in three unique areas of the western United States. Is nature perceived as fragile or durable, accessible or remote, predictable or not? Are resources thought of as abundant or limited in supply? Is nature viewed as in need of protection or able to take care of itself? These questions stem from the prior literature and have been used to help

define human-nature relationships. An examination of such relationships can inform natural resource management by enhancing understanding of the diversity of public opinion (and the basis for that diversity) regarding natural resource use. Specific objectives of this study were to identify different perspectives regarding nature and to determine the extent to which those perspectives either change or are consistent across the three study areas through an exploratory approach that identifies and defines different groups of people on their beliefs about nature.

METHODS

Study Area

Data collected were part of a larger, multi-state project entitled *Understanding People in Places* which was conducted cooperatively between Colorado State University (CSU) researchers and three state wildlife agencies (South Dakota Department of Game, Fish and Parks; Arizona Game and Fish Department; Washington Department of Fish and Wildlife). Residents were sampled in each of three study sites: the Black Hills region of South Dakota, Tucson, Arizona, and the state of Washington. Although all study areas are located in the western United States, each exhibit differences in biodiversity, species composition, land cover, and human demographics. The three study areas are briefly described below.

The Black Hills of South Dakota are generally home to older, mostly retired Caucasians (U. S. Census, 2002). Mining and timber were the primary economic drivers in the area before tourism took hold. To a lesser degree, ranching is still important to the local economy. Housing density is sparse, with the largest congregation (other than the annual Sturgis Motorcycle Rally) of approximately 125,000 people found in Rapid City. The Black Hills are largely comprised of federal, state and county public lands. The predominately Ponderosa pine-spruce forests have intermittent swaths of grasslands ideal for large grazing wildlife such as bison (*Bison bison*), elk (*Cervus canadensis*), deer (*Odocoileus virginianus* and *O. hemionus*), and pronghorn (*Antilocapra americana*). Mountain lion (*Puma concolor*) are also abundant in the Black Hills.

Due in part to its complex geology and biology, the Black Hills region was prime hunting territory for Native American tribes. The Lakota Sioux were in control of the area by the time white settlers arrived to mine gold and silver. Some of the last Native American wars were fought between the U. S. government and the Lakota over the Black Hills, which resulted in extensive legal battles over the United States' taking of the Black Hills (Geoges, 1996).

In contrast to the Black Hills' low human density, Tucson, Arizona, is a booming metropolitan area with over a million inhabitants (U. S. Census, 2002). Tucson is part of the Sonoran desert ecosystem, largely represented by the saguaro cactus, and is surrounded by the Rincon, Santa Catalina, Tortolina, Tucson, and Santa Rita mountain ranges. Wildlife such as javelina (*Tayassu tajacu*), coyotes (*Canis latrans*), bobcat (*Lynx rufus*), and mountain lion (*Puma concolor*) are common. Outdoor opportunities are plentiful in Saguaro National Park, Coronado National Forest, and Tucson Mountain Park, as well as many smaller city and county parks. While a refuge for many retirees, Tucson also has a growing population of Mexican immigrants seeking the plentiful work and education opportunities supplied by the city. The economy is largely supported by the University of Arizona, the Davis-Monthan Air Force Base, and high-tech businesses such as Raytheon Missile Systems, Texas Instruments, and IBM. Due to many of these factors, Tucson is experiencing extensive human development.

From metropolitan cities such as Seattle, Tacoma, and Vancouver in the evergreen west to extensive agricultural production in the east, the state of Washington is diverse in both its people and landscape. Approximately 10% of its population is foreign-born and almost half of all Washington residents live in or near the capital of Seattle (U.S. Census, 2002). A predominate uprising of volcanic mountains in the Cascade Range creates unique weather patterns on either side of its divide. Rainfall ranges from more than 160 inches in the state's northwest Hoh Rainforest to less than 10 inches in the eastern deserts. Washington's sundry landscapes include rolling hills of sage and bunchgrass, dense forests of conifers, beaches of pebbles and larger rock

outcroppings, and steep, glacier-capped mountains. Water is vital to this coastal state, which hosts the nation's largest ferry system and offers ideal ports for shipping trade with Asia, Canada, and Alaska (WSDOT, 2007). Rivers such as the Columbia, Snake, and Yakima are major sources of energy and income, including hydroelectric power, recreation and scenery, subsistence and commercial fishing, and water diversions for agriculture (e.g., vineyards, orchards, cattle grazing). Washington is also home to renowned American companies such as Starbucks, Microsoft, Boeing, Amazon.com, Nintendo, and Weyerhaeuser.

Sampling and Data Collection

We administered a mail survey to a sample of residents 18 years of age or older in the Black Hills region of South Dakota during the fall of 2008 and in the state of Washington during the fall of 2009. Samples were purchased primarily from Marketing Systems Group/GENESYS Sampling Systems (Fort Washington, PA), with additional records purchased from Survey Sampling, Inc. (Shelton, CT) where necessary. We used a modified Dillman (2007) approach to survey administration that included two mailings of the survey and cover letter and a reminder postcard. To test for nonresponse bias, we phoned a sample of nonrespondents in both study areas following data collection. The phone survey contained several questions pertinent to each state's mail survey effort, including items to assess participation in wildlife-related recreation, beliefs regarding wildlife use and management, and sociodemographics.

Residents in Tucson, Arizona were sampled from October, 2008 through January, 2009 with a door-to-door approach intended to enhance response from minority audiences that are typically under-represented by quantitative mail-back questionnaire approaches. Surveys were hand-delivered to residents 18 years of age or older who answered the door on afternoons, evenings, and weekends during data collection. Spanish-speaking residents of Tucson were further accommodated by the availability of a Spanish version of the survey. Residents were instructed to leave the surveys in a mutually-agreeable location (e.g., under the doormat, in the

screen door), allowing survey administrators to retrieve completed surveys. To test for non-response bias, residents refusing to participate in the paper survey were asked four quick questions assessing general wildlife-related beliefs as part of the door-to-door approach.

Prior to data collection, a pre-test of each state-specific survey was conducted in the respective study area to evaluate the effectiveness of survey items and survey administration procedures. In order to test a geographically-explicit approach, which was an important goal of the overall *Understanding People in Places* project, samples were stratified by census block group in the Black Hills, counties in Washington, and urban core and fringe census block groups in Tucson, Arizona. We attempted to obtain a minimum of 68 completed surveys per sampling unit (i.e., census block group and county) to allow for population estimates within $\pm 10\%$ at the 90% confidence level. Results reported in this paper are at the *study area* level; thus, assuming maximum variation on a dichotomous variable, the margin of error was within $\pm 3\%$ at the 99% confidence level.

Measurement of Key Concepts

A quantitative self-administered questionnaire for each of the three study areas was developed cooperatively by human dimensions researchers at CSU and the respective state agency. Survey item development was guided by overall research objectives pertinent to the multi-state project, including item sets of regional interest and those covering state-specific management issues. Perceptions of nature items were developed in accordance with conceptual approaches outlined by the Myths of Nature literature described above, with additional input from the literature on categorizations of nature and place (e.g., Relph, 1980; Tuan, 1974). Items were measured using a two-part approach. First, respondents were asked to circle one phrase out of each of five pairs that best represented how they think about nature. Pairs of phrases included “durable” or “fragile”, “unlimited/abundant” or “limited/scarcely”, “unpredictable/chaotic” or “predictable/ordered”, “remote/uninviting” or “accessible/inviting”, and “[nature] can take care of

itself” or “[nature] needs to be protected”. Second, respondents recorded the degree (1= ‘Slightly’, 2 = ‘Moderately,’ or 3 = ‘Extremely’) to which the phrase they circled represented how they think about nature.

Data Analysis

Data were entered and analyzed using SPSS/PASW 18.0. Consistent with the measurement procedures outlined above, perceptions of nature items were recorded with a two part method; new variables were then computed ranging from -3 to +3 by multiplying the corresponding value indicating whether they circled the first word (-1) or second word (+1) by the extent to which the word represented their belief (e.g., “moderately chaotic/unpredictable” would equal “-2”). Respondents who did not fill out one or both parts of the measurement were excluded from analysis in this paper. A cluster analysis was then conducted separately for each study area with the five computed variables. To fully explore the character of the clusters occurring in each study area in relation to the Myths of Nature literature, a K-means clustering approach was used with three, four, and five cluster solutions. Cluster analysis is sensitive to ordering of data (Jain, Murty, & Flynn, 1999); thus, analyses were run with five different randomizations ($t1 - t5$) to determine if resulting clusters were consistent with each randomization. Pearson chi-square tests and Cramer’s V statistics (an indicator of effect size) were used to assess the goodness-of-fit of each randomization (Cohen, 1986). Analysis of variance (ANOVA) and post hoc tests were used to determine differences in cluster means across individual variables. In order to more fully explore the reliability and external validity of resulting clusters, results were also compared across all three study areas for generalizability across geography (Milligan & Cooper, 1987).

RESULTS

Response Rates and Non-Response Comparisons

Mail survey efforts

In the Black Hills region of South Dakota, a total of 9,250 surveys were sent out by mail, of which 749 were non-deliverable. A total of 4,544 were returned, resulting in a 54% response rate. A total of 396 people completed the nonrespondent survey.

In Washington, a total of 18,333 addresses were obtained from a sampling firm, of which 5,198 were non-deliverable. A total of 4,182 surveys were returned, resulting in a response rate of 32%. A total of 2,024 people completed the nonrespondent survey.

Door-to-door survey efforts

A total of 18,686 households were approached during the door-to-door data collection efforts in Tucson, Arizona, of which 10,851 were unavailable, 1,242 were gated residences, 553 were vacant, 941 failed to return a survey upon initial agreement, 1,606 refused at the door, and 3,493 households responded. This resulted in a 58% overall response rate, with 79% of those agreeing to participate actually returning a survey. Twenty completed surveys were discarded due to the following: respondents not residing in the census block group in which they were surveyed, too much missing data, or the respondent being underage. A total of 594 people completed the on-site nonrespondent survey.

Data weighting

Based on results of respondent-nonrespondent comparisons as well as comparisons with U.S. Census information, the decision was made to weight the data in each study area. Males were generally overrepresented (particularly with the mail survey approach in Washington and South Dakota); thus, weighting was applied to represent the true proportions of males and females at the sampling unit (census block group or county) level. For reporting at the overall study area level, data were additionally weighted to accurately reflect the true proportions of the population represented by each sampling unit within the respective study area. In Tucson, because census block groups were equally selected at random from researcher-defined urban core and fringe strata (core represented areas with human densities > 922 people/km²; fringe areas had

population densities of 200-922 people/km²), data were weighted to accurately reflect population proportions for each stratum. To ensure correct classification of individuals on their specific beliefs about nature, *unweighted* data were used to determine cluster membership. To reflect the respective study areas, *weighted* data were then used to report all descriptive results as well as in all other statistical analyses in this paper (e.g., reporting means, ANOVA and chi-square tests).

Clusters

Clusters were identified separately through K-means cluster analysis for each dataset using three, four, and five cluster solutions. Five was selected as the appropriate number of final groupings based on the assumption that each perception of nature item (as indicated by each item's *F*-value) contributes uniquely to the cluster solutions; the clusters are relatively distinct as determined by comparisons among clusters on mean scores for each item; the clusters stay relatively consistent across multiple random orderings of the data ($t1 - t5$); the variance between clusters versus within clusters is significant as indicated by the overall cluster *F*-values; and the clusters are meaningful relative to the literature on Myths of Nature.

Themes for the resulting clusters were identified utilizing a four-step process. First, mean scores for the perceptions of nature items were calculated individually at each of five random orderings of the data ($t1 - t5$). Clusters with similar means across $t1 - t5$ were assigned the same cluster number. Second, goodness-of-fit tests for all randomizations were found to be statistically significant at the $p < 0.001$ level, with Cramer's V statistics on average greater than 0.690 (Table 2.1). Results indicate that clusters were stable across randomizations. Third, ANOVA and post-hoc tests were conducted to determine differences in the clusters at $t5$. This randomization was selected because it exhibited the greatest minimum Euclidian distances for initial cluster centers in both the Washington and South Dakota study areas, indicating the most divergent, and thus robust, cluster solutions by maximizing between-group (randomizations) differences and minimizing within-group (clusters) distances (Mirkin, 1996). Post hoc test results

for all individual perception of nature items were significant at the $p < 0.001$ level (Table 2.2). Fourth, the percent of people in each study area at $t5$ by cluster solution agreeing with specific statements about nature were displayed to determine the face validity of cluster differences (Table 2.3).

For the final five-cluster solution, results were as follows: Cluster 1 individuals (11% of Washington; 10% of Arizona, 15% of South Dakota) thought nature was durable, unlimited/abundant, accessible/inviting, and able to take care of itself; Cluster 2 individuals (27% of Washington; 25% of Arizona, 24% of South Dakota) viewed nature as durable, accessible/inviting, and in need of protection; Cluster 3 individuals (27% of Washington; 28% of Arizona, 45% of South Dakota) viewed nature as fragile, limited/scarce, predictable/ordered (except in Tucson), accessible/inviting, and in need of protection; Cluster 4 individuals (5% of Washington; 6% of Arizona, 2% of South Dakota) thought nature was fragile, limited/scarce, unpredictable/chaotic, remote/inaccessible, and in need of protection; and Cluster 5 individuals (31% of Washington; 30% of Arizona, 15% of South Dakota) viewed nature as fragile, limited/scarce, unpredictable/chaotic, accessible/inviting, and in need of protection. Cluster 5 in the South Dakota dataset indicated that residents in this cluster thought nature was more durable than the other study areas and were not clear whether nature was limited/scarce or unlimited/abundant. Results in the Washington and Arizona study areas indicated similar cluster profiles for Clusters 3 and 5 (i.e., the only difference was on the predictable/ordered or unpredictable/chaotic variable. Overall results supported the existence of four and five distinct perceptions of nature that had similarities across three study areas; however, some clusters were similar on individual perceptions of nature items, as indicated by ANOVA results. These clusters differed when considering overall cluster profiles and belief strength as reflected in the cluster means (e.g., Clusters 3 and 4 across all three study areas thought nature was fragile and in need of

protection; however, Cluster 4 individuals thought nature was less fragile and in need of less protection than Cluster 3 individuals).

Following these basic comparisons of item scoring across the five clusters, initial cluster centers were set according to the literature on the Myths of Nature (Table 2.4). Analyses were then rerun across all three study areas, again with five random orderings of the data ($t1 - t5$). Goodness-of-fit tests were again found to be statistically significant at the $p < 0.001$ level, with Cramer's V statistics on average greater than 0.790 (Table 2.5). Cramer's V statistics obtained using initial cluster centers based on the Myths of Nature literature were higher than those obtained without setting initial cluster centers for both the South Dakota and Washington datasets. In contrast, Cramer's V statistics obtained without setting initial cluster centers were higher for the Arizona study area, which suggests that clusters were more consistent in the first analysis that did not set initial cluster centers. ANOVA and post-hoc tests were then repeated at $t5$ to ensure clusters maintained their distinctness; tests on all perception of nature items were significant at the $p < 0.001$ level (Table 2.6). Finally, the percent of people in each study area at $t5$ by Myths of Nature clusters who agree with specific beliefs about nature were displayed to enhance interpretation in considering the face validity of cluster differences (Table 2.7). Overall, results of the analyses based on the literature were significant across all three study sites, with large Cramer's V statistics, indicating that five distinct Myths of Nature could be identified in each study area and that setting initial cluster centers provided solutions with more intuitive meaning in relation to the literature than solutions obtained through a more exploratory approach.

For the five-cluster solutions based on the Myths of Nature literature, results were as follows: *Nature is Benign* individuals (6% of Washington; 13% of Arizona, 10% of South Dakota) thought nature was durable, unlimited/abundant, predictable/ordered, accessible/inviting, and able to take care of itself; *Nature is Tolerant* individuals (16% of Washington; 18% of Arizona, 24% of South Dakota) viewed nature as durable, predictable/ordered,

accessible/inviting, and in need of protection; *Nature is Ephemeral* individuals (56% of Washington; 56% of Arizona, 46% of South Dakota) viewed nature as fragile, limited/scarce, accessible/inviting, and in need of protection; *Nature is Capricious* individuals (4% of Washington; 6% of Arizona, 2% of South Dakota) thought nature was unpredictable/chaotic and remote/uninviting; and *Nature is Resilient* individuals (17% of Washington; 8% of Arizona, 19% of South Dakota) thought nature was durable, unpredictable/chaotic, accessible/inviting, and in need of protection.

Nature is Capricious individuals were inconsistent in their beliefs, with results varying by study area on three of the five items; however, these myth holders consistently believed that nature was unpredictable/chaotic and remote/inaccessible and the Myths of Nature literature indicates these myth holders are not likely to differ from other myth holders. Only one other item indicated residents classified as believing in a particular myth differed across the study areas. In the South Dakota dataset, only 47% of people classified as *Nature is Tolerant* believed nature to be limited/scarce; whereas 61% and 100% of residents in the Washington and Arizona datasets had this belief (Table 2.7). Otherwise, cluster solutions were more consistent over different randomizations and across study areas when setting cluster centers based on the Myths of Nature literature, compared to cluster solutions resulting from a more exploratory approach. The largest percentage of respondents in all three study areas believed in a myth of *Nature is Ephemeral* (approximately half of respondents in all study areas). Results for Washington and South Dakota indicated that more people believed in myths of *Nature is Resilient* and *Tolerant* than in a myth of *Nature is Benign*. Results in the Arizona study area indicated that more people believed in myths of *Nature is Tolerant* and *Benign* than in a myth of *Nature is Resilient*. All study areas had a very small percentage of people (2-6%) who believed in a myth of *Nature is Capricious*.

DISCUSSION

At the outset of this article, we suggest that an understanding of human-nature relationships can contribute to the success of natural resource decision-making by providing a foundation for exploring differences in human thought regarding natural resource use. To better understand these human-nature relationships, we investigated the utility of a new approach intended to capture distinct beliefs about nature. We created individual survey items to measure specific beliefs and further explored these items through cluster analysis to determine the extent to which they capture different perspectives that have been referred to in both the anthropological and ecological literature as the Myths of Nature (e.g., Douglas & Wildavsky, 1982; Thomson, Ellis, & Wildavsky, 1990; Timmerman, 1986). These Myths of Nature have been popularized in the anthropological literature due to their link to specific “ways of life” described by Douglas’ grid/group approach (Douglas & Wildavsky, 1982; Douglas, 1992). The grid/group approach, discussed more thoroughly in the literature on Cultural Theory, is a heuristic device depicting how differing levels of social control (grid) and social cohesion (group) outline four ways of life; Hierarchy, Egalitarianism, Individualism, and Fatalism (Figure 2.1). Each of these four ways of life is hypothesized to hold a distinct myth about nature; Nature is Tolerant, Ephemeral, Benign, and Capricious (Douglas & Wildavsky, 1982). Our approach indicated that residents in three different study areas hold beliefs representative of these four myths; however, results also suggested the need to consider a myth of *Nature is Resilient*. This myth has been linked in Cultural Theory to the “autonomist” way of life, which has largely been ignored in social science research as autonomists are believed to avoid the social vying and competition inherent in the other ways of life (Thompson, Ellis, & Wildavsky, 1990).

We wish to be clear in stating that we did not measure the broad tenets of Cultural Theory; therefore, we cannot say that an individual holding one of the myths captured by our approach will necessarily support or belong to specific forms of social organization as proposed

by Douglas and her colleagues. For example, it is unclear whether believers in our *Nature is Ephemeral* classification would indicate a preference for sectarian forms of management; similarly, those believing in a *Nature is Tolerant* myth may not necessarily advocate for hierarchical forms of management. Our approach can still benefit from a discussion of what these myths and the broader ideologies they purportedly represent may mean for managing institutions. For example, Timmerman (1986) suggests that those holding a myth of instability (related to the myth of *Nature is Ephemeral*) would likely be Fatalists, or “lost individuals,” unable to cope with the perceived inevitable decline of nature. However, it is this very myth of instability that others argue has fueled the growth of environmentalism and non-profits dedicated to natural resource conservation in America (Douglas & Wildavsky, 1982; Milton, 1996). Our results are presented in relation to this discussion and how this approach can inform natural resource managers.

We found through an exploratory classification approach to capturing people’s beliefs about nature that at least four distinct groups of people could be identified in the Washington and Arizona study areas and five distinct beliefs could be similarly identified in the South Dakota study area. It is important to note that both the Washington and Arizona datasets had very similar results for Clusters 3 and 5; the only difference between these groups was that residents in Cluster 3 thought nature was predictable/ordered while residents in Cluster 5 thought nature was unpredictable/chaotic. This could indicate that the particular variable used may have been interpreted differently than we anticipated. We expected those in Cluster 3, which appeared to correspond to the myth of *Nature is Ephemeral*, to view nature as slightly unpredictable/chaotic on the basis that they don’t know exactly what will force nature into decline, when it will happen, or how bad things might be; however, people believing in such a myth may also consider ephemeral nature to be predictable (e.g., it *will* end in catastrophe) and thus advocate for protection. Findings may indicate that an exploratory classification scheme such as cluster analysis could have masked particular beliefs in the Arizona and Washington study areas by

grouping people due to this difference in interpretation rather than on the basis of actual variability in the overall myth (i.e., results across the five items used to explore the myths).

We next used an approach guided by literature to investigate whether beliefs represented in South Dakota by Cluster 5 (which appear to be related to a myth of *Nature is Resilient*) also occur in the other three study areas. This next step in our investigation included setting initial cluster centers according to the Myths of Nature literature. When results obtained from setting initial cluster centers were compared to the more exploratory approach, cluster membership for the *Nature is Ephemeral* group (most closely resembling Clusters 3 and 5 in Washington and Arizona) greatly increased. Furthermore, the *Nature is Ephemeral* and *Resilient* cluster means on individual items were more consistent across all three study areas with what we would expect based on the literature. However, results on individual items did differ in a few cases. For example, those exhibiting a myth of *Nature is Tolerant* in Tucson, Arizona were more likely to consider nature as more limited/scarcely and less predictable/ordered than residents holding this same myth in Washington or the Black Hills region of South Dakota. Also, those in Tucson believing in a myth of *Nature is Benign* saw nature as less durable and less able to take care of itself than the same myth holders in the other study areas. There are several plausible explanations for this, including possible differences in methodologies (i.e., door-to-door vs. mail survey) across study sites as well as the different ethnicities represented in each area (e.g., Tucson had approximately 17% of residents reporting they were of Hispanic origin). Differences may also be explained by the physical characteristics of the location itself. Tucson is a desert ecosystem, which is likely to be perceived as having somewhat limited resources and in need of more protection than other environments. For example, a footprint in a dry area may result in a long soil recovery time, whereas the same footprint in a humid area rife with leaf detritus will quickly disappear. Overall, results indicate that five distinct myths of nature do exist in all three study areas and guidance from the literature can help in exploring distinct cluster solutions.

Using our results, we consider two, more specific implications of this information for natural resource management. First, our study indicates that a large percentage of people in the western United States believe in a myth of *Nature is Ephemeral* (i.e., 56% in Washington, 56% in Arizona, and 46% in South Dakota). These results suggest a very concerned public who wants protection of a fragile and limited nature. Agencies may be more likely to receive support from believers of this myth for actions resulting in the careful consideration and protection of resources; however, other groups with conflicting beliefs may be less supportive of certain protective measures. In the Black Hills of South Dakota, a combined majority of all other myth holders indicated that nature was durable and unlimited; thus, “protection” is likely to be a contentious issue in the region. As an illustration of this potential for conflict, Gigliotti, Fecske, and Jenks (2002) found that some South Dakota residents feel that mountain lions are too abundant and it is therefore necessary to reduce their population through lethal control techniques, while other residents think mountain lion are a positive sign of a healthy ecosystem and humans should learn to live with them. It is important for agencies to consider how they frame such contentious issues that deal largely with the debate over whether human needs and interests should take precedence over resource protection. An understanding of people’s beliefs about nature can help agencies better understand the foundation for conflicting opinions and develop effective communication plans for informing a diversity of publics about their decisions.

A second possible implication of our findings is regarding public preference for different management styles. Timmerman (1986) suggests that agencies may want to consider a move toward smaller, local-level control to be effectively adaptive to nature. According to Cultural Theory, the large number of *Nature is Ephemeral* believers in our study would suggest a preference among many for egalitarian forms of management (e.g., stakeholder involvement groups, public opinion surveys) to address conservation problems. Milton (1996) suggests that Cultural Theory does not fully explain whether social change influences particular ways of life or

particular ways of life influences social change. For example, did environmentalism in America during the 1960s and 70s grow because people with higher levels of education and less dependence on industry were tired of “the establishment” or did distrust in the establishment encourage the growth of an egalitarian way of life? It is therefore important to understand that our approach is not intended to give “correct” answers for how managing agencies should do things (i.e., natural resource decisions should be informed by a variety of social and biological information sources), but to help managers anticipate levels of public support and the potential for controversy over possible management solutions.

Our approach could be expanded by linking it to an understanding of people’s behaviors when they are faced with perceived ecological instability (e.g., do nothing, support government or non-profit organizations, continue to utilize resources, use technology to solve problems). Such actions could be modeled after those in the risk literature; however, our approach may have greater utility in addressing the question of whether people believing in different myths are likely to support or join ranks with the current infrastructure for solving conservation challenges. For instance, what will it take to convince *Nature is Capricious* and *Nature is Durable* myth holders to change their behavior, assuming that a disbelief in one’s own ability to “make a difference” or that there even is a “problem” encourages one to perform behaviors perceived by others as negatively affecting the environment? To address these types of questions, future research should explore how beliefs in the different myths may affect individual behavior and support or opposition to managing institutions. Inclusion of additional variables (e.g., can nature be controlled, from who/what does nature need protection, who is best suited for managing that protection) can help in this endeavor. Our approach for exploring the Myths of Nature, with additional modifications, may offer a useful tool to agencies seeking to incorporate information about human-nature relationships in their management efforts and thereby improve their ability to address conservation challenges through an understanding of diverse public opinions.

LITERATURE CITED

- Anderberg, M. R. (1973). *Cluster analysis for applications*. New York: Academic Press.
- Berkes, F. (2007). Community-based conservation in a globalized world. *PNAS*, *104*(39), 15188–15193.
- Bouyer, M., Bagdassarian, S., Chaabanne, S., & Mullet, E. (2001). Personality correlates of risk perception. *Risk Analysis*, *21*(3), 457–465.
- Brenot, J., Bonnefous, S., & Marris, C. (1998). Testing the Cultural Theory of risk in France. *Risk Analysis*, *18*(6), 729–739.
- Bruner, A. G., Gullison, R. E., Rice, R. E., & da Fonseca, G. A. B. (2001). Effectiveness of parks in protecting tropical biodiversity. *Science*, *291*, 125-128.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Cronon, W., ed. (1996). *Uncommon ground: Rethinking the human place in nature*. New York: W. W. Norton and Company.
- Dake, K. (1991). Orienting dispositions in the perception of risk: An analysis of contemporary worldviews and cultural biases. *Journal of Cross-Cultural Psychology*, *22*(1), 61-82.
- Dake, K. (1992). Myths of nature: Culture and the social construction of risk. *Journal of Social Issues*, *48*(4), 21-37.
- Dillman, D. A. (2007). *Mail and internet surveys: The tailored design method* (2nd ed. – 2007 update). New York: John Wiley & Sons.
- Douglas, M., & Wildavsky, A. (1982). *Risk and culture: As essay on the selection of technical and environmental dangers*. Berkeley, CA: University of California Press.
- Douglas, M. (1992). *Risk and blame: Essays in Cultural Theory*. London: Routledge.
- Douglas, M. (1997). The depoliticization of risk. In R. J. Ellis & M. Thompson (Eds.), *Culture matters: Essays in honor of Aaron Wildavsky* (pp. 121-32). Boulder, CO: Westview Press.
- Ewert, A. W. (1996). *Natural resource management: The human dimension*. Boulder, CO: Westview Press.

- Gbadegesin, A., & Ayileka, O. (2000). Avoiding the mistakes of the past: Towards a community oriented management strategy for the proposed National Park in Abuja-Nigeria. *Land Use Policy*, 17, 89-100.
- Geoges, M. (1996). *Common ground: The struggle for ownership of the Black Hills*. London: Rowman and Littlefield Publishers.
- Ghimire, K. B., & Pimbert, M. P., eds. (1997). *Social change and conservation*. London: Earthscan Publications Limited.
- Gigliotti, L. M., Fecske, D., & Jenks, J. (2002). *Mountain lions in South Dakota: A public opinion survey*. (Project Rep. No. HD-9-02.AMS). Pierre, SD: South Dakota Game, Fish and Parks.
- Holling, C. S. (1986). The resilience of terrestrial ecosystems; local surprise and global change. In W. C. Clark & R. E. Munn (Eds.), *Sustainable development of the biosphere* (pp. 292-317). Cambridge, UK: University of Cambridge.
- IUCN. (2008). *The 2008 IUCN red list of threatened species*. Gland, Switzerland: IUCN.
- Jain, A. K., Murty, M. N., & Flynn, P. J. (1999). Data clustering: A review. *ACM Computing Surveys*, 31(3), 264-323.
- Mascia, M. B., Brosius, J. P., Dobson, T. A., Forbes, B. C., Horowitz, L., McKean, M. A., & Turner, N. J. (2003). Conservation and the social sciences. *Conservation Biology*, 17(3), 649-650.
- Marris, C., Langford, I. H., & O'Riordan, T. (1998). A quantitative test of the Cultural Theory of risk perceptions: comparison with the psychometric paradigm. *Risk Analysis*, 18(5), 635-647.
- McNeely, J. A., ed. (1995). *Expanding partnerships in conservation*. Washington, DC: Island Press.
- Milligan, G. W., & Cooper, M. C. (1987). Methodology review: Clustering methods. *Applied Psychological Measurement*, 11(4), 329-354.
- Millennium Ecosystem Assessment. (2005). *Ecosystems and human well-being: Synthesis*. Washington, DC: Island Press.
- Milton, K. (1996). *Environmentalism and Cultural Theory: Exploring the role of anthropology in environmental discourse*. New York: Routledge.
- Mirkin, B. (1996). *Mathematical classification and clustering*. Dordrecht, the Netherlands: Kluwer Academic Publishers.

- Oltedal, S., & Rundmo, T. (2007). Using cluster analysis to test the Cultural Theory of risk perception. *Transportation Research*, 10, 254–262.
- Orr, D. W. (1993). The problem of disciplines/The discipline of problems. *Conservation Biology*, 7(1), 10-12.
- Pratto, F. (1999). The puzzle of continuing group inequality: piecing together psychological, social and cultural forces in social dominance theory. *Advances in Experimental Social Psychology*, 31, 191-263.
- Relph, E. (1980). *Place and placelessness*. London: Pion Limited.
- Rippl, S. (2002). Cultural Theory and risk perception: a proposal for a better measurement. *Journal of Risk Research*, 5(2), 147–165.
- Scheaffer, R. L., Mendenhall, W., & Ott, L. (1996). *Elementary survey sampling*. (5th ed.). Belmont, California: Wadsworth.
- Schwarz, M., & Thompson, M. (1990). *Divided we stand: Redefining politics, technology, and social choice*. Philadelphia, PA: University of Pennsylvania Press.
- Sjöberg, L. (1997). Explaining risk perception: an empirical evaluation of Cultural Theory. *Risk Decision and Policy*, 2(2), 113–130.
- Sjöberg, L. (2000). Factors in risk perception. *Risk Analysis*, 20(1), 1–11.
- Stiglitz, J. E. (2002). Information and the change in the paradigm in economics. *American Economic Review*, 92(3), 460–501.
- Taliaferro, C. (2001). Early modern philosophy. In D. Jamieson (Ed.), *A Companion to Environmental Philosophy* (pp. 130-145). Oxford, UK: Blackwell.
- Tansey, J., & O’Riordan, T. (1999). Cultural Theory and risk: A review. *Health, Risk and Society*, 1(1), 71-90.
- Tansey, J. (2004). Risk as politics, culture as power. *Journal of Risk Research*, 7(1), 17–32.
- Timmerman, P. (1986). Mythology and surprise in the sustainable development of the biosphere. In W. C. Clark & R. E. Munn (Eds.), *Sustainable development of the biosphere* (pp. 435-453). Cambridge, UK: University of Cambridge.
- Thompson, M., Ellis, R., & Wildavsky, A. (1990). *Cultural Theory*. Boulder, CO: Westview Press.

- Tuan, Y. (1974). *Topophilia: a study of environmental perception, attitudes, and values*. Englewood Cliffs, NJ: Prentice-Hall.
- WSDOT. (2007). *Washington State Department of Transportation: Key facts*. Washington: Department of Printing.
- Zimmerer, K. S. (2006). Cultural ecology: At the interface with political ecology – the new geographies of environmental conservation and globalization. *Progress in Human Geography*, 30(1), 63-78.

Figure 2.1. Social organization and the Myths of Nature as described by Cultural Theory.

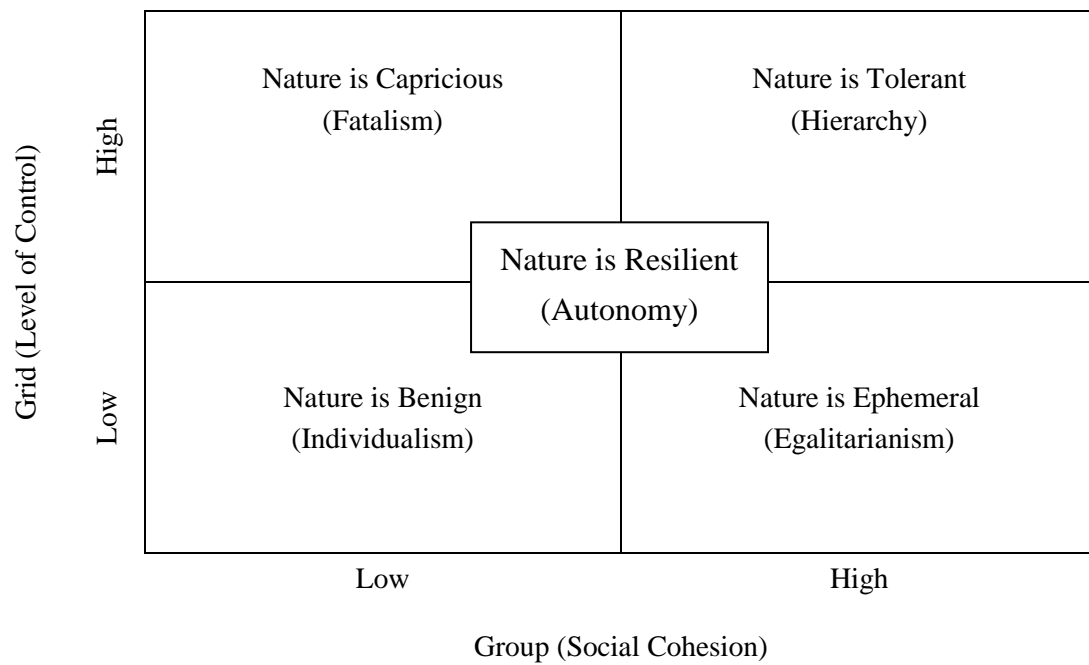


Table 2.1. Goodness-of-fit results for clusters across five random orderings of data ($t1 - t5$).¹

	Washington		Arizona		South Dakota	
	χ^2	Cramer's V	χ^2	Cramer's V	χ^2	Cramer's V
$t1$ v. $t2$	9564.98	0.824	11368.00	1.000	5987.84	0.637
$t1$ v. $t3$	7611.10	0.735	7667.06	0.821	5752.88	0.625
$t1$ v. $t4$	6689.34	0.689	7831.26	0.830	5569.71	0.615
$t1$ v. $t5$	7514.48	0.731	7574.72	0.816	8498.62	0.910
$t2$ v. $t3$	6588.29	0.684	7667.06	0.821	8199.95	0.742
$t2$ v. $t4$	6825.78	0.696	7831.26	0.830	9920.23	0.821
$t2$ v. $t5$	6198.01	0.663	7574.72	0.816	6269.81	0.654
$t3$ v. $t4$	7046.56	0.707	8022.64	0.840	6638.37	0.671
$t3$ v. $t5$	3876.97	0.525	7992.60	0.839	6652.36	0.672
$t4$ v. $t5$	6713.67	0.691	7939.42	0.836	4499.63	0.553
MEANS	6862.92	0.695	8146.87	0.845	6798.94	0.690

¹ All results for Pearson's chi-squares and Cramer's Vs were significant at $p < 0.001$.

Table 2.2. ANOVA results for clusters at $t5$.¹

		Cluster					<i>F</i> -value ²	<i>Eta</i> Squared ³
		1	2	3	4	5		
	%	11	27	27	5	30		
Washington	Durable	2.42 ^a	2.18 ^b	-2.33 ^c	-0.86 ^d	-2.27 ^c	6998.70	0.888
	Limited/ Scarce	-1.22 ^a	0.29 ^b	1.98 ^c	0.52 ^b	1.88 ^c	401.86	0.314
	Predictable/ Ordered	0.32 ^a	0.44 ^a	2.15 ^b	-1.43 ^c	-2.13 ^d	1155.04	0.568
	Accessible/ Inviting	2.29 ^{ab}	2.26 ^a	2.39 ^b	-1.94 ^c	2.35 ^{ab}	1403.65	0.615
	Needs to be protected	-2.07 ^a	2.14 ^b	2.61 ^c	1.91 ^d	2.63 ^c	2906.35	0.768
	%	10	25	28	6	30		
Arizona	Durable	2.06 ^a	2.09 ^a	-2.36 ^b	-1.74 ^c	-2.45 ^b	5484.65	0.885
	Limited/ Scarce	-0.72 ^a	0.71 ^b	1.76 ^c	1.73 ^{cd}	2.05 ^d	201.31	0.221
	Predictable/ Ordered	0.63 ^a	0.47 ^a	2.11 ^b	-0.99 ^c	-2.09 ^d	912.86	0.563
	Accessible/ Inviting	1.80 ^a	2.30 ^b	2.39 ^b	-1.97 ^c	2.33 ^b	1293.56	0.646
	Needs to be protected	-2.08 ^a	2.25 ^b	2.64 ^c	2.33 ^b	2.62 ^c	2167.69	0.753
	%	15	24	45	2	15		
South Dakota	Durable	2.17 ^a	1.88 ^b	-2.38 ^c	-1.68 ^d	1.96 ^b	5598.79	0.859
	Limited/ Scarce	-1.53 ^a	-0.24 ^b	1.87 ^c	1.47 ^c	0.14 ^d	562.08	0.379
	Predictable/ Ordered	0.72 ^a	2.09 ^b	-0.32 ^c	-1.17 ^d	-2.01 ^e	560.66	0.379
	Accessible/ Inviting	1.97 ^a	2.40 ^b	2.42 ^b	-1.99 ^c	2.21 ^d	649.47	0.414
	Needs to be protected	-2.14 ^a	2.12 ^b	2.55 ^c	1.94 ^{bd}	1.82 ^d	3103.56	0.771

¹ Differing superscripts indicate significant differences at $p < 0.05$ using a Sheffe post hoc test. In most cases, significant differences were at the $p < 0.001$ level. Cell entries are means ranging from -3 to +3. A positive number indicates slight (1), moderate (2), or extreme (3) agreement with the phrase listed out of a pair of phrases, whereas a negative number indicates agreement with the opposite phrase in the pair (not listed).

² All *F*-values are significant at $p < 0.001$.

³ Eta squared, a measure of effect size, indicates the amount of variance explained.

Table 2.3. Specific beliefs about nature representing clusters and percent of people by study area at *t*5 agreeing with beliefs.

	Washington	Arizona	South Dakota
<i>Cluster 1</i>			
Durable	98	92	96
Unlimited/Abundant	78	63	84
Predictable/Ordered	53	64	66
Accessible/Inviting	96	88	91
Can take care of itself	100	98	100
<i>Cluster 2</i>			
Durable	100	100	94
Limited/Scarce	60	69	47
Predictable/Ordered	59	61	100
Accessible/Inviting	99	99	99
Needs to be protected	99	100	99
<i>Cluster 3</i>			
Fragile	100	100	100
Limited/Scarce	92	88	91
Predictable/Ordered	100	100	43
Accessible/Inviting	99	100	100
Needs to be protected	99	98	98
<i>Cluster 4</i>			
Fragile	68	87	82
Limited/Scarce	60	87	81
Unpredictable/Chaotic	80	72	76
Remote/Uninviting	100	100	99
Needs to be protected	89	96	86
<i>Cluster 5</i>			
Fragile	98	100	5
Limited/Scarce	92	93	45
Unpredictable/Chaotic	100	100	100
Accessible/Inviting	100	100	98
Needs to be protected	99	98	93

Table 2.4. Initial cluster centers for five Myths of Nature.¹

	Nature is... ²				
	Benign	Tolerant	Ephemeral	Capricious ³	Resilient
Durable	3	2	-3	0	2
Limited/ Scarce	-3	1	3	0	1
Predictable/ Ordered	3	1	-1	-3	-2
Accessible/ Inviting	2	2	2	-3	2
Needs to be protected	-3	1	3	0	-1

¹ Adapted from Thompson, Ellis, and Wildavsky, 1990.

² Cell entries are means ranging from -3 to +3. A positive number indicates slight (1), moderate (2), or extreme (3) agreement with the phrase listed out of a pair of phrases, whereas a negative number indicates agreement with the opposite phrase in the pair (not listed).

³ A cell entry of zero indicates that the literature does not suggest a belief on a particular measure.

Table 2.5. Goodness-of-fit results for Myth of Nature clusters across five random orderings of data (*t1* – *t5*).¹

	Washington		Arizona		South Dakota	
	X^2	Cramer's V	X^2	Cramer's V	X^2	Cramer's V
<i>t1</i> v. <i>t2</i>	12846.54	0.995	7116.86	0.791	13483.93	0.957
<i>t1</i> v. <i>t3</i>	11639.99	0.909	7973.58	0.837	7936.61	0.734
<i>t1</i> v. <i>t4</i>	5794.23	0.641	8057.04	0.842	10146.44	0.830
<i>t1</i> v. <i>t5</i>	13039.33	0.962	3916.99	0.587	14092.12	0.978
<i>t2</i> v. <i>t3</i>	11962.03	0.922	10153.44	0.945	8011.95	0.737
<i>t2</i> v. <i>t4</i>	5838.51	0.644	6984.10	0.784	9460.37	0.801
<i>t2</i> v. <i>t5</i>	12336.48	0.936	6803.17	0.773	13717.56	0.965
<i>t3</i> v. <i>t4</i>	5093.31	0.602	7924.90	0.835	6977.93	0.688
<i>t3</i> v. <i>t5</i>	11018.28	0.885	6242.60	0.741	8062.18	0.740
<i>t4</i> v. <i>t5</i>	6264.57	0.667	6592.08	0.761	10278.94	0.835
MEANS	9583.33	0.816	7176.48	0.790	10216.80	0.827

¹ All results for Pearson's chi-squares and Cramer's Vs were significant at $p < 0.001$.

Table 2.6. ANOVA results for five Myths of Nature clusters at $t5$.¹

		Nature is...					<i>F</i> -value ²	<i>Eta Squared</i> ³
		Benign	Tolerant	Ephemeral	Capricious	Resilient		
	%	6	16	56	4	17		
Washington	Durable	2.51 ^a	2.16 ^b	-2.32 ^c	-1.79 ^d	2.11 ^b	8320.18	0.904
	Limited/ Scarce	-1.68 ^a	0.34 ^b	1.95 ^c	1.29 ^d	-0.18 ^e	447.70	0.338
	Predictable /Ordered	2.43 ^a	1.95 ^b	-0.12 ^c	-0.98 ^d	-2.06 ^e	486.03	0.356
	Accessible/ Inviting ⁴	2.41 ^a	2.21 ^b	2.40 ^a	-1.84 ^c	1.98 ^d	939.62	0.517
	Needs to be protected	-1.83 ^a	2.12 ^b	2.63 ^c	1.99 ^b	0.84 ^d	916.72	0.511
Arizona	%	13	18	56	6	8		
	Durable	1.73 ^a	2.04 ^b	-2.43 ^c	-1.92 ^d	1.63 ^a	3469.61	0.885
	Limited/ Scarce	-1.31 ^a	1.96 ^b	2.07 ^b	1.78 ^b	-1.53 ^a	930.23	0.221
	Predictable /Ordered	2.19 ^a	0.50 ^b	-0.03 ^c	-1.02 ^d	-2.13 ^e	203.86	0.563
	Accessible/ Inviting	2.14 ^{ab}	2.24 ^{ab}	2.36 ^b	-1.97 ^c	1.95 ^a	1132.03	0.646
South Dakota	Needs to be protected	-0.05 ^a	2.26 ^b	2.64 ^c	2.23 ^b	0.31 ^d	436.80	0.753
	%	10	24	46	2	19		
	Durable	2.19 ^a	1.86 ^b	-2.38 ^c	1.44 ^d	1.98 ^b	5372.41	0.854
	Limited/ Scarce	-1.37 ^a	-0.25 ^b	1.89 ^c	-1.59 ^a	-0.20 ^b	521.68	0.362
	Predictable /Ordered	2.10 ^a	2.09 ^a	-0.34 ^b	-0.82 ^b	-2.06 ^c	895.66	0.493
	Accessible/ Inviting ⁴	2.39 ^a	2.38 ^a	2.28 ^{ab}	-1.90 ^c	2.18 ^b	426.27	0.317
	Needs to be protected	-2.11 ^a	2.13 ^b	2.56 ^c	-1.74 ^a	1.03 ^d	1626.34	0.639

¹ Differing supercripts indicate significant differences at $p < 0.05$ using a Sheffe post hoc test. In most cases, significant differences were at the $p < 0.001$ level. Cell entries are means ranging from -3 to +3. A positive number indicates slight (1), moderate (2), or extreme (3) agreement with the phrase listed out of a pair of phrases, whereas a negative number indicates agreement with the opposite phrase in the pair (not listed).

² All *F*-values are significant at $p < 0.001$.

³ Eta squared indicates the amount of variance explained.

⁴ Due to violating the homogeneity of variance assumption, Dunnett's T3 post hoc test was conducted.

Table 2.7. Specific beliefs about nature representing Myths of Nature clusters and percent of people by study area at *t5* agreeing with beliefs.

	Washington	Arizona	South Dakota
<i>Nature is Benign</i>			
Durable	99	86	97
Unlimited/Abundant	87	79	80
Predictable/Ordered	100	100	99
Accessible/Inviting	97	94	100
Can take care of itself	89	51	100
<i>Nature is Tolerant</i>			
Durable	99	100	94
Limited/Scarce	61	100	47
Predictable/Ordered	95	62	100
Accessible/Inviting	98	98	98
Needs to be protected	97	99	100
<i>Nature is Ephemeral</i>			
Fragile	100	100	100
Limited/Scarce	92	94	92
Unpredictable/Chaotic	53	51	58
Accessible/Inviting	100	100	97
Needs to be protected	99	98	99
<i>Nature is Capricious</i>			
Fragile	88	91	18
Limited/Scarce	79	89	14
Unpredictable/Chaotic	68	73	74
Remote/Uninviting	100	100	93
Needs to be protected	69	94	12
<i>Nature is Resilient</i>			
Durable	98	85	94
Unlimited/Abundant	53	85	53
Unpredictable/Chaotic	100	100	74
Accessible/Inviting	92	91	97
Needs to be protected	69	55	74

III. THE INFLUENCE OF MYTHS OF NATURE AND WILDLIFE VALUE ORIENTATIONS
ON ACCEPTANCE OF INVASIVE WILDLIFE MANAGEMENT ACTIONS

Alia Dietsch

Department of Human Dimensions of Natural Resources
Warner College of Natural Resources
Colorado State University

INTRODUCTION

Wildlife agencies have been historically successful in basing their management decisions on an understanding of wildlife biology. However, traditional biological expertise may not be enough to solve today's conservation challenges (e.g., biodiversity loss, habitat fragmentation, human-wildlife conflict). Managers are finding increased impetus for utilizing social sciences to inform their decision-making, encouraging a new paradigm of wildlife management that includes human thought about wildlife (Gigliotti, Shroufe, & Gurtin, 2009). Agencies dependent on public *support* for their decisions must consider public *opinion* to ensure management success (Mascia, Brosius, Dobson, Forbes, Horowitz, McKean, & Turner, 2003). For example, stakeholders can be instrumental or detrimental in implementation of urban wildlife management plans (Green, Askins, & West, 1997; Lauber & Knuth, 2000). In other illustrations, ballot initiatives have overturned conventional management approaches that use hunting and trapping of wildlife as control techniques (Minnis, 1998). Agencies in some cases also rely on public support through funding by the sale of fishing and hunting licenses, which has been affected by declining participation rates in traditional wildlife-related recreation (U. S. Fish and Wildlife Service, 2007). Reduced funding bases have forcing state wildlife agencies to determine alternative solutions to generating funds or face cutting back on the services they provide, further affecting their ability to be successful.

As agencies explore ways to address the imminent challenges of finding new funding opportunities and managing wildlife populations on reduced budgets, it is important to consider how declines in traditional forms of wildlife-related recreation and greater social conflict on wildlife issues may be reflective of broader societal changes affecting how people perceive wildlife use (Teel & Manfredo, 2009; Manfredo, Teel, & Henry, 2009). It was generally accepted in the United States during the early half of the twentieth century to take wildlife for sustenance and to generate income. Such acceptance may be due to the traditional values Americans held

that emphasize domination and mastery (Kluckhohn & Strodtbeck, 1961; Schwartz, 2006). American wildlife agencies were in congruence with such culturally held beliefs which promoted a utilitarian view of the wildlife resource, measuring management success, for example, by an abundance of game populations available for hunting and fishing (Gigliotti, Shroufe, & Gurtin, 2009). Many social factors have changed over the last century, which may impact whether or not people believe such management is acceptable today. For example, rapid human population growth in the western United States has had enormous effects on the management of wildlife in that region (Peterson, Allison, Peterson, Peterson, & Lopez, 2004). Increasing urbanization and changes in demographics have further encouraged agencies to reconsider what they know about their publics as well as the specific beliefs people have regarding wildlife and their management.

In an effort to provide a foundation for wildlife agencies desiring an understanding of the diverse publics they represent, the purpose of this study was to investigate the influence of broader-level cognitions (i.e., ideology) on wildlife-related attitudes and behavior. Ideology is defined as a set of consensually-held beliefs, which help individuals assign meaning to their lives, to who they are as individuals within society, and to the groups to which they belong (Pratto, 1999). Milton (1996) suggests that different ideologies, or cultural perspectives, can affect how humans interact with their environment and are necessary to explore in determining solutions to environmental issues. Drawing upon this literature, Manfredi, Teel, and Henry (2009) have advanced the notion that ideologies of domination and egalitarianism are reflected in wildlife value orientations, or the ways in which people orient their values and assign personal meaning to those values in relation to wildlife. These orientations in turn affect how people respond to wildlife management issues and the behaviors they exhibit toward wildlife, including participation in wildlife-related recreation. Similarly, the Myths of Nature, which have been applied in the anthropology and risk literature, offer a framework in which to examine the influence of ideology on human thought about *nature*. To expand the application of wildlife

value orientation theory by placing it in the broader context of human-nature relationships, we explore the connection between wildlife value orientations and the Myths of Nature as articulated by cultural theorists. Such an approach was designed to enhance understanding of the factors affecting public opinion and public controversy on wildlife and natural resource issues.

Wildlife Value Orientations

Manfredo, Teel, and Henry (2009) propose that societal-level modernization in the United States is causing a shift away from the traditional domination-oriented view of wildlife toward a mutualism view of the resource. Wildlife value orientations, according to this theory, are reflective of ideology and consist of beliefs about wildlife and wildlife management that form the basis for an individual's wildlife-related attitudes and behaviors (Manfredo, Teel, & Bright, 2004; Manfredo, Teel, & Henry, 2009). This approach draws from the value-attitude-behavior framework, or cognitive hierarchy (Homer & Kahle, 1988; Maio, Olson, Bernard, & Luke, 2003), in which values are thought to influence attitudes which in turn influence behaviors. Values are affect-laden, enduring beliefs that are few in number and act as guiding principles throughout one's life (Abramson & Inglehart, 1995; Homer & Kahle, 1988; Rokeach, 1973). Attitudes are the faster-forming, evaluative cognitions (e.g., rating an issue or entity as good or bad) that more directly affect behavior (Eagly & Chaiken, 1993). Teel and Manfredo (2009) suggest that two people holding a similar value of "humaneness toward all living things" can have different attitudes toward wildlife issues based on their value orientations. For example, one person may find it completely unacceptable to kill wildlife in any situation, whereas the other may find it acceptable as long as human purposes necessitate it and the animal does not experience unusual pain and suffering.

A mutualism value orientation draws from an egalitarian ideology, where equality for all individuals is a necessary part of a just life. An egalitarian ideology implies altruism and that people work toward the good of all (Wildavsky, 1991). In addition to modernization, factors

believed to have contributed to the rise of a mutualism view, which deems wildlife as capable of relationships of trust with humans, is the tendency to associate “human-like” qualities with animals (anthropomorphism) and a reduction in human dependence on animals for material needs (Teel, Manfredo, & Stinchfield, 2007). For those holding a mutualism value orientation, wildlife are viewed as deserving of caring and compassion, as life forms having rights like humans, and as part of an extended family; management actions deemed harmful to wildlife are found to be less acceptable for these individuals (Manfredo, Teel, & Henry, 2009). In contrast, a *domination value orientation* draws from an ideology of domination and mastery, where people clearly take precedence over animals. Manfredo, Teel, & Henry (2009) define this orientation as one in which human well-being is prioritized over that of wildlife. Intrusive management actions related to wildlife control (including harm or death) and treatment of wildlife in utilitarian terms (e.g., hunting) are likely to be more acceptable for those with a domination orientation.

Wildlife value orientations are one way in which social science theories have helped agencies understand how different types of people think about wildlife and wildlife management. For example, wildlife value orientations have been used to explain differences in wildlife-related recreation (Fulton, Manfredo, & Lipscomb, 1996), preferences for management policies regarding such issues as trapping (Manfredo, Pierce, Fulton, Pate, & Gill, 1999), and support or opposition for management actions such as lethal control (e.g., Manfredo, Teel, & Henry, 2009; Bright, Manfredo, & Fulton, 2000; Zinn, Manfredo, Vaske, & Wittman, 1998). Cultural Theory, which draws from the field of anthropology, provides a broader format for understanding the influence of ideology on human thought about natural resources (Douglas & Wildavsky, 1982; Thompson, Ellis, & Wildavsky, 1990). The next section begins to explore how Cultural Theory can be utilized in a wildlife management context.

Cultural Theory and the Myths of Nature

Cultural Theory provides a basis for understanding how individuals know their world based on different, competing ideologies that can be mapped along a grid-group axis (Douglas, 1992, 1997; Douglas & Wildavsky, 1982). Thomson, Ellis, and Wildavsky (1990) further define five socially-viable ways of life that depend on such ideologies: hierarchy, fatalism, egalitarianism, individualism, and autonomy (Figure 1). Hierarchists (high grid, high group) work toward tightly controlled collective interests and rely on rules, laws, and taboos to maintain order. Fatalists (high grid, low group) work toward their own self-interests, but are bound by the rules and decisions of the collective; thus, Fatalists generally perceive life as happening *to* them rather than believing they can actively influence it. Egalitarians (low grid, high group) choose to work toward collective goals with little or no control over their efforts; if necessary, they will focus on conflicts with others (particularly the “establishment”). Egalitarianism has been linked to the rise of environmentalism in American culture (Milton, 1996; Wildavsky, 1991), as well as to a mutualism value orientation as stated previously (Manfredo, Teel, & Henry, 2009). Individualists (low grid, low group) work toward their own self interests and are free to follow any path they choose. Autonomists choose to ignore social involvement by minimizing their social position. They are simply not interested in the competition, dependence, or social-vying inherent in the other ways of life.

Each of these five ways of life adopts a particular Myth of Nature (Figure 1; Douglas, 1992, 1997; Douglas & Wildavsky, 1982; Schwarz & Thompson, 1990; Thomson, Ellis, & Wildavsky, 1990). Hierarchists believe in a myth of *Nature is Tolerant*, where nature is durable and resources are limited; thus, heavy regulation will ensure that nature is kept within limits and not abused (and that Hierarchists stay in charge of the regulation). Only experts know the controllable limits of nature; thus, experts should regulate natural resource use. Fatalists believe in a myth of *Nature is Capricious*, where nature cannot be predicted and people are subject to its whims. Fatalists are not interested in predicting what will happen to resources with continued

human use, because they don't believe they have any control over it. Egalitarians believe in a myth of *Nature is Ephemeral*, where nature is precariously balanced and set for inevitable decline if any wrong move is forced upon it by human abuse. Humans must control their needs and behaviors, as resources are finite. Individualists believe in a myth of *Nature is Benign*, where resources are in constant supply and readily available for human use. Nature does not need human protection according to this view. Conversely, people should take advantage of what nature has to offer or they will lose out on profits that could be gained from nature's bounty. Autonomists believe in a myth of *Nature is Resilient*, where the overall durability of nature exceeds the immediate needs and desires of man. Nature is continually adapting; thus, change is inevitable, yet unpredictable. Autonomists transcend the other ways of life by viewing nature as non-dualistic (rather than separating man from nature). To this way of life, no particular social organization or managing institution fully captures or can understand the complexity of life.

Current approaches to measuring the tenets of Cultural Theory have some methodological limitations that may misconstrue the original intent of the theory. For example, respondents may answer all agree/disagree statements intended to capture different cultural perspectives in a manner of acquiescence or dissent, and these statements may function as psychological indices rather than the perspectives they are meant to represent (Grendstad & Selle, 1997; Tansey, 2004). In addition, these operationalizations measure tenets of hierarchy, fatalism, egalitarianism, and individualism (Dake, 1992), but they ignore the autonomous way of life. Furthermore, many suggest such measures are not adequate due to their low explanatory power (e.g., Bouyer, Bagdassarian, Chaabanne, & Mullet, 2001; Brenot, Bonnefous, & Marris, 1998; Marris, Langford, & O'Riordan, 1998; Sjöberg, 1997, 2000). Other researchers indicate that particular ideologies have merit and continued research in this area is promising for understanding people's reactions to environmental issues (Carlisle & Smith, 2005; Grendstad & Selle, 1997; Marris, Langford, & O'Riordan, 1998). In conjunction with wildlife value

orientations, we investigated how the Myths of Nature can help gauge individual beliefs regarding how the natural world, including wildlife, should be managed.

Study Purpose and Objectives

In an attempt to expand the application of wildlife value orientation theory and the Myths of Nature, the purpose of this paper was to explore the effect of broader-level cognitions (i.e., ideology) on wildlife-related attitudes toward invasive wildlife management actions. This investigation was part of a multi-state project titled *Understanding People in Places*; however, the focus of this paper is primarily on data collected in the state of Washington. One objective was to utilize an exploratory approach that identifies and defines groups of people based on the Myths of Nature. A second objective was to determine the relationship between the Myths of Nature types (or groups of people) and wildlife-related belief dimensions as outlined by the theory of wildlife value orientations (Manfredo, Teel, & Henry, 2009). A third objective was to explore the influence of Myths of Nature and wildlife value orientations on the wildlife-related attitudes and behaviors of Washington residents.

Hypotheses

Hypotheses of interest to this study were as follows:

H₁: The Myths of Nature are related to wildlife value orientations. Mutualism is positively associated with a myth of *Nature is Ephemeral*, whereas domination is positively associated with myths of *Nature is Benign, Tolerant, and Resilient*. A myth of *Nature is Capricious* will not have a strong orientation.

H₂: Myths of Nature types will differ on their attitudes toward invasive wildlife management actions. *Nature is Ephemeral* myth holders will be less supportive; *Nature is Benign, Tolerant, and Resilient* myth holders will be more supportive; and *Nature is Capricious* myth holders will not be statistically different from the other types in their responses to these actions.

H₃: Due to context-specificity (i.e., “wildlife” is more specific than “nature”), wildlife value orientations will have a stronger influence than the Myths of Nature on wildlife-related attitudes. Within each Myth of Nature type, individuals with a mutualism orientation will be less accepting of invasive wildlife management actions than those with a domination orientation.

H₄: People believing different Myths of Nature will participate in different types of wildlife-related recreation. More specifically, *Nature is Ephemeral* myth holders will be more likely to participate in wildlife-viewing and less likely to participate in fishing and hunting. *Nature is Benign, Tolerant*, and *Resilient* myth holders will be more likely to participate in hunting and fishing. *Nature is Capricious* myth holders will not differ from the other myth types on wildlife-related recreation behavior.

METHODS

Washington Study Area

From metropolitan cities such as Seattle, Tacoma, and Vancouver in the evergreen west to extensive agricultural production in the east, the state of Washington is diverse in both its people and landscape. Approximately 10% of its population is foreign-born and almost half of all Washington residents live in or near the capital of Seattle (U.S. Census, 2002). A predominate uprising of volcanic mountains in the Cascade Range creates unique weather patterns on either side of its divide. Rainfall ranges from more than 160 inches in the state’s northwest Hoh Rainforest to less than 10 inches in the eastern deserts. Washington’s sundry landscapes include rolling hills of sage and bunchgrass, dense forests of conifers, beaches of pebbles and larger rock outcroppings, and steep, glacier-capped mountains. Water is vital to this coastal state, which hosts the third largest ferry system in the world and offers ideal ports for shipping trade with Asia, Canada, and Alaska (WSDOT, 2007). Rivers such as the Columbia, Snake, and Yakima are major sources of energy and income, including hydroelectric power, recreation and scenery,

subsistence and commercial fishing, and water diversions for agriculture (e.g., vineyards, orchards, cattle grazing). Washington is also home to renowned American companies such as Starbucks, Microsoft, Boeing, Amazon.com, Nintendo, and Weyerhaeuser.

Sampling and Data Collection

We administered a mail survey to a sample of Washington residents 18 years of age or older in the fall of 2009. Survey administration was preceded by a pre-test in May and June of 2009 ($n = 261$). We obtained resident contact information from Marketing Systems Group/GENESYS Sampling Systems (Fort Washington, PA). The sample was stratified by county to test a geographically-explicit approach as part of the larger multi-state project. We attempted to get 68 completed surveys per county, allowing for population estimates within $\pm 10\%$ at the 90% confidence level. Results reported in this paper are at the *state* level ($n = 4,183$); thus, assuming maximum variation on a dichotomous variable, the margin of error is within $\pm 3\%$ at the 99% confidence level.

We used a modified Dillman (2007) approach to survey administration that included two mailings of the survey and cover letter and a reminder postcard. To test for nonresponse bias, we phoned a sample of nonrespondents in each county following data collection. The phone survey contained several questions from the mail survey, including items designed to assess participation in outdoor and wildlife-related recreation, beliefs about wildlife and wildlife management, and key demographics such as age, sex, and length of residence.

Measurement of Key Concepts

The quantitative self-administered questionnaire was developed cooperatively by human dimensions researchers at Colorado State University (CSU) and the Washington Department of Fish and Wildlife (WDFW). Survey item development was guided by overall research objectives pertinent to the *Understanding People in Places* project, including item sets of regional interest and those covering state-specific management issues. Appendix A contains the mail survey used

in the Washington study area.

Myths of Nature

Items intended to measure the Myths of Nature were developed in accordance with conceptual approaches outlined by the literature described above, with additional input from the literature on categorizations of nature and place (e.g., Relph, 1980; Tuan, 1974). Items were measured with a two-part approach. First, respondents were asked to circle one phrase out of each of five pairs that best represented how they think about nature. Pairs of phrases included “durable” or “fragile”, “unlimited/abundant” or “limited/scarce”, “unpredictable/chaotic” or “predictable/ordered”, “remote/uninviting” or “accessible/inviting”, and “[nature] can take care of itself” or “[nature] needs to be protected”. Second, respondents recorded the degree (1 = ‘Slightly’, 2 = ‘Moderately,’ and 3 = ‘Extremely’) to which the phrase they circled represented their thoughts about nature.

Wildlife Value Orientations

Items from Teel, Dayer, Manfredo & Bright (2005) that measure domination and mutualism wildlife value orientations were reduced to a scale of 14 items for use in this study. A domination orientation was indicated by beliefs about hunting and the appropriate uses of wildlife, whereas a mutualism orientation was indicated by beliefs about caring and social affiliation with wildlife and animals. Response scales for belief items ranged from 1 = ‘Strongly disagree’ to 7 = ‘Strongly agree’ (Table 3.3).

Wildlife-Related Attitudes

Respondents rated their level of acceptability for different management actions of interest identified by WDFW. First, respondents were asked to indicate the level of acceptability for lethal control of coyotes and black bears across a range of hypothetical human-wildlife interaction situations that could occur near their homes (i.e., the animal is observed, has created a nuisance, has a disease, attacks a pet, attacks a human). Next, respondents were asked to rate

their level of acceptability regarding management actions linked to the probable wolf recolonization of Washington (i.e., allow recolonization to happen naturally, assist with recolonization by moving wolves from one area where they have reached a certain population size to other areas in Washington to establish new populations, limit wolves in certain areas if causing localized declines in deer and elk populations, lethally remove wolves if causing loss of livestock, allow a recreational hunt once wolves have exceeded WDFW recovery goals). Item response scales ranged from 1 = 'Highly unacceptable' to 7 = 'Highly acceptable'.

Data Analysis

Data were entered and analyzed using SPSS/PASW 18.0. Initial cluster centers were defined and cluster analyses were conducted across five randomizations ($t1 - t5$) on the items related to Myths of Nature. Cluster results from $t5$ were used for further analysis in this paper, as this randomization exhibited the maximum minimum Euclidean distance when data were run without setting initial cluster centers. Chapter II of this thesis presents the cluster analysis approach in more detail.

Reliability analyses were run on wildlife value orientation items to examine the internal consistency and structure of belief dimension and value orientation scales as outlined by the theory. Wildlife value orientations scales were computed in a two-part method. First, respondents were assigned a score on each of the four belief dimensions (i.e., use, hunting, social affiliation, caring) by computing the mean of all items within the dimension. Second, respondents were assigned a score on the two value orientations (i.e., domination, mutualism) by computing the mean of corresponding belief dimension scores. Myths of Nature types were then compared on belief dimension and value orientation scoring using analysis of variance (ANOVA) and post hoc tests (Hypothesis 1).

Acceptability scales were created for each wildlife species (coyote, black bear, and wolf) to represent wildlife-related attitudinal measures. Reliability analyses were conducted on each set

of items prior to calculating an individual's overall acceptance score (i.e., mean). ANOVA and post hoc tests were then used to examine the relationship between specific acceptance scales and the Myths of Nature types (Hypothesis 2).

Additional variables were created to determine the relationship between acceptance scales and wildlife value orientations within each of the Myths of Nature types (Hypothesis 3). Dichotomous variables indicating whether an individual who believes each of the five Myths of Nature also hold a domination (1) or mutualism (0) orientation were analyzed through a series of *t*-tests. A domination orientation was defined by a score of >4.5 on the domination scale, whereas a mutualism orientation was defined by a score of >4.5 on the mutualism scale. This 4.5 cutoff was identified as appropriate in previous analyses conducted by Teel et al. (2005). Eta values, which are indicators of effect size, are also displayed to more fully understand the relationship among variables.

Lastly, the Myths of Nature types were compared on their levels of participation in wildlife-related recreation using chi-square tests and through the use of Cramer's V statistics as measures of effect size (Hypothesis 4).

RESULTS

Response Rates and Non-Response Comparisons

A total of 14,799 surveys were mailed, of which 1,664 were returned as non-deliverable. An additional 3,534 addresses purchased were considered invalid for mailing by postal standards, resulting in a total of 5,198 non-deliverables. Four thousand, one hundred and eighty-three surveys were completed and returned, resulting in a response rate of 32%. A telephone non-response check was completed, consisting of 2,024 participants. Although all items except two (*I often participate in outdoor activities near my home* and *length of residence in current home*) were found to be statistically significant, effect size measures indicated only marginal variation between respondents and non-respondents (Table 3.1). One exception was the item, *I value the*

sense of companionship I receive from animals, which had a “moderate” to “large” effect size ($\eta^2 = .358$) (Cohen, 1988). We did not feel it was appropriate to weight data on this one variable, particularly given that it was the only belief measure out of the three wildlife value orientation items included on the non-response phone survey that revealed practically-significant differences between respondents and non-respondents. Therefore, data were not weighted based on results of the non-response check.

Data were further examined in relation to U.S. Census (2002) information and results of the National Survey on Fishing, Hunting, and Wildlife-Associated Recreation (U. S. Fish and Wildlife Service, 2007) to determine if data weighting was necessary. Data were adjusted following these comparisons to account for an underrepresentation of females in the sample and to account for the true proportions of the population represented by each county in Washington. Because the sample was comprised of adults, population estimates for weighting were calculated using 2008 projections for adults 20 years of age and older (U. S. Census, 2002). Except for comparisons between respondents and non-respondents, weighted data were used in all statistical analyses reported in this paper.

Myths of Nature Clusters

As discussed in Chapter II of this thesis, cluster results were validated through multiple randomizations of the data and through ANOVA and post hoc tests at the fifth randomization, t_5 (Table 3.2). Cluster solutions were as follows: *Nature is Benign* individuals (6% of Washington residents) thought nature was moderately to extremely durable, moderately unlimited/abundant, moderately predictable/ordered, moderately accessible/inviting, and can take care of itself; *Nature is Tolerant* individuals (16% of Washington residents) viewed nature as moderately durable, neither limited/scarce nor unlimited/abundant, moderately predictable/ordered, moderately accessible/inviting, and moderately in need of protection; *Nature is Ephemeral* individuals (56% of Washington residents) viewed nature as moderately fragile, moderately limited/scarce, neither

predictable/ordered nor unpredictable/chaotic, moderately accessible/inviting, and extremely in need of protection; *Nature is Capricious* individuals (4% of Washington residents) thought nature was slightly to moderately fragile, slightly limited/scarce, slightly unpredictable/chaotic, moderately remote/uninviting, and moderately in need of protection; and *Nature is Resilient* individuals (17% of Washington residents) believed nature was moderately durable, neither limited/scarce nor unlimited/abundant, moderately unpredictable/chaotic, moderately accessible/inviting and slightly in need of protection. Results indicated that five distinct perspectives about nature exist in Washington and that these beliefs remain consistent with the Myths of Nature literature.

Wildlife Value Orientations and Their Relationship with Myths of Nature

Reliability analyses indicated acceptable to high internal consistency for belief-dimension and value-orientation scales (Nunnally & Bernstein, 1994), with Cronbach's alpha's ranging from 0.66 to 0.87 (Table 3.3). Mean scoring on belief-dimension and value-orientation scales differed significantly across the five Myths of Nature types, as indicated by ANOVA tests. Eta values indicated a moderate effect size for the relationship between myths and value orientations (Table 3.4). Figure 3.2 presents a visual display representing the strengths of beliefs on the mutualism and domination orientations for each Myths of Nature type. *Nature is Benign* believers scored highest on the use and hunting dimensions and lowest of all the types on the social affiliation dimension. *Nature is Tolerant* believers scored high on the hunting dimension, but scored low on all the other dimensions. *Nature is Tolerant* myth holders did not differ statistically from the *Nature is Capricious* and *Resilient* types on the social affiliation dimension. *Nature is Resilient* believers were similar to *Nature is Tolerant* believers on all four dimensions. *Nature is Capricious* believers were similar to all the other myth holders on at least one of the belief dimensions. *Nature is Ephemeral* believers scored the lowest on the use dimension and highest on the social affiliation dimension compared to the other types. Consistent with Hypothesis 1, those

holding *Nature is Benign*, *Tolerant*, and *Resilient* myths were more likely than the other types to have a domination orientation, whereas *Nature is Ephemeral* myth holders were more likely to have a mutualism orientation. Also consistent with our prior expectations, the *Nature is Capricious* myth holders did not appear to have a strong tendency toward a particular wildlife value orientation. Even though the mean score suggests the lack of a tendency toward a particular orientation, some individuals in the *Nature is Capricious* group may have scored high on the domination or mutualism scale while others may have scored low (which would result in an average response in the middle). Overall results for the group should not indicate a strong belief on either dimension, because individuals who make up the group are described in the literature as having beliefs consistent with other myth holders.

Wildlife-Related Attitudes and Behaviors

Lethal control scales for both coyotes and black bears had high internal consistencies (Cronbach's alphas of 0.84 and 0.86, respectively; Table 3.5). Reliability results for the wolf scale also had moderate to high internal consistency (Cronbach's alpha = 0.72; Table 3.6). ANOVA tests revealed statistical differences for the Myths of Nature types on all three predator-related scales. Overall, tolerance of coyotes and black bears appeared relatively low, as all myth types were on average accepting of lethal control of coyotes and black bears (Table 3.7). It should be noted, however, that three of the five items in each scale were tied to situations involving high problem severity (e.g., animal has a disease, attacks a pet, attacks a human); thus, these scales are not necessarily indicative of overall attitudes toward coyote/bear control measures. *Nature is Ephemeral* myth holders scored the lowest of all groups on these scales, indicating a lower acceptance for lethal control. Although *Nature is Capricious* and *Resilient* myth holders had higher levels of acceptance for lethal control of black bears than they did for coyotes, post hoc tests indicated they were not statistically different from the other types on their acceptance of lethal control. For the wolf management scale, *Nature is Ephemeral* myth holders

were more likely to find invasive management techniques of wolves as unacceptable, whereas *Nature is Benign* myth holders were more likely to find them acceptable. The other three myth types were relatively neutral regarding wolf-related management actions. Results indicate support for Hypothesis 2.

Wildlife value orientations helped predict the level of acceptability for species-specific management actions among the Myths of Nature types, with “moderate” effect sizes (Table 3.8). For all myth types, except in two cases, those holding a domination orientation were more accepting of lethal control of coyotes and black bears and of reducing wolf numbers through invasive management techniques. The exceptions to this were for the *Nature is Benign* group on the coyote lethal control scale and the wolf management scale. Overall, results support Hypothesis 3.

Comparisons of Myths of Nature types on participation in wildlife-related recreation revealed statistical differences for past participation in hunting and wildlife-viewing; for current participation in hunting, fishing, and wildlife-viewing; and for future participation in hunting, fishing, and wildlife-viewing (Table 3.9). *Nature is Benign* myth holders were most likely to have participated in hunting and fishing in the past and most likely to indicate a future interest in hunting; however, current participation and future interest in fishing was similar to that of *Nature is Resilient* myth holders. *Nature is Ephemeral* myth holders were the least likely to have hunted in the past and had the lowest percentage of people indicating an interest in hunting in the future; these myth holders were more likely to indicate interest in wildlife-viewing. All myth types had a relatively high percentage of people indicating they had participated in fishing in the past; however, participation rates dropped sharply when only considering participation over the last 12 months (i.e., current participation). *Nature is Capricious* myth holders were the least likely to have participated in the last 12 months in both fishing and wildlife viewing; however their future

interest in these activities was similar to *Nature is Ephemeral* myth holders. Results from these analyses support Hypothesis 4.

DISCUSSION

From the outset of this investigation, we stressed that wildlife agencies needing to ensure continued public support in the future can benefit from an understanding of the diverse publics they represent. The theory of wildlife value orientations is one approach to understanding these publics and the basis for conflict related to wildlife and wildlife use (Teel, Manfredo, & Henry, 2009). Considering the influence of ideology on wildlife value orientations and their relation to wildlife-related attitudes and behaviors, we set about exploring how the Myths of Nature could be used to extend the application of this theoretical tradition by providing an understanding of the influence of ideology on people's thoughts about nature in a wildlife-related context. We introduced a new exploratory approach to measuring beliefs about nature (outlined in Chapter II) and examined its potential utility for wildlife management.

The five Myths of Nature types identified by our approach were found to be related to wildlife value orientations, which is consistent with the argument that the two concepts likely draw upon similar ideologies. For example, believers in the myth of *Nature is Benign* were shown to hold primarily a domination wildlife value orientation (reflective of a domination ideology). Cultural theorists suggest that Individualists would believe in this myth and are likely to view the utilization of natural resources (including wildlife) as a necessary part of "getting ahead." Schwartz's (2006) research, although not directly linked to beliefs about natural resource and wildlife use, suggests that such an ideology of mastery and domination is widespread in American culture; however, we found *Nature is Benign* myth holders to be a small percentage of Washington residents (6%). With the inclusion of *Nature is Resilient* and *Tolerant* myth holders, who also primarily held a domination orientation toward wildlife, results suggest that less than 40% of Washington residents are likely to be influenced by a domination ideology

in terms of their thinking about wildlife or natural resource use. It is important to note that these two myths were shown to have a domination orientation toward wildlife largely because of their scoring on the hunting belief dimension (rather than both the hunting and use belief dimensions). Such myth holders are thus likely to believe hunting is appropriate in certain situations, but that wildlife do not necessarily exist for human purposes only. Their high scoring on the hunting belief dimension (indicating an acceptance of some form of killing wildlife) may also help to explain why these myth holders were accepting of WDFW using lethal control and invasive management techniques to address problem predators.

We found another indication that broader cultural ideologies may be influencing beliefs about nature and wildlife in our results suggesting that *Nature is Ephemeral* myth holders have primarily a mutualism wildlife value orientation. Both the myth of *Nature is Ephemeral* and the mutualism orientation are thought to be linked to an egalitarian ideology. Our study also found that people believing in a myth of *Nature is Ephemeral* disagree with the idea that it is appropriate to use and manage wildlife for human purposes; however, the hunting belief dimensions indicated some level of acceptance, which differs from those who primarily hold a mutualism value orientation. This suggests that these myth holders believe wildlife have the right to exist outside of human purposes, but in some situations, hunting may be appropriate. An egalitarian ideology may also influence the beliefs of this group in other ways. For example, this group may think *everyone* (government included) should consider wildlife outside of material needs due to a belief that nature is fragile, limited, and in need of protection. If the myth of *Nature is Ephemeral* additionally represents support for egalitarian forms of wildlife management, then WDFW should consider continuing or perhaps expanding its efforts for more local level approaches (e.g., stakeholder involvement groups, public opinion surveys).

Results from our study indicate that certain management actions will be less acceptable to a large percentage of Washington's population. For example, people who believe in a myth of

Nature is Ephemeral were less accepting than any other myth types of lethal predator control actions. WDFW should not expect traditional management approaches to be acceptable in all cases to many Washington residents. It is important to consider that biologically-sound management decisions are not necessarily “wrong” and that lethal control may be appropriate in certain management situations. However, decisions in that context may gain greater public support if explained in ways that appeal to egalitarian concerns. For example, if a wolf continues to depredate on sheep in a particular location, and WDFW chooses lethal control as a management option, then the agency may be able to alleviate some of the social conflict that could potentially surround this situation by releasing a statement that explains why the animal was lethally removed in egalitarian terms (e.g., to give other non-livestock-depredating wolves a chance to recolonize; to ensure safety of pets, children, and livestock).

Results identified by our exploration of the Myths of Nature may also have implications related to trends noted by other researchers. The theory of wildlife value orientations as described by Manfredo, Teel, & Henry (2009) suggests that a rise in mutualism is occurring in response to modernization, alongside a societal-level shift toward post-materialist values as described by Inglehart (1997). Although we do not attempt to examine this shift in the current study, our investigation found that the majority of Washington residents believe in a myth of *Nature is Ephemeral*, which was further linked to a mutualism value orientation toward wildlife. This may indicate that Washington residents primarily hold beliefs representing protectionism and egalitarianism and focus less on domination and mastery in their thinking about wildlife and nature. If state-wide levels of education and income continue to increase (factors influenced by modernization), protectionist and egalitarian beliefs may have an even greater influence over people’s beliefs regarding the use of natural resources. The Myths of Nature approach could be expanded in future research to broaden our understanding of this shift that may be occurring in a natural resource context.

Our approach for exploring wildlife value orientations by Myths of Nature type can help to assess the utility of wildlife value orientations outside of previous applications. For example, past research has identified that wildlife value orientations can predict support or opposition for management actions such as lethal control of wildlife (e.g., Manfredo, Teel, & Henry, 2009; Bright, Manfredo, & Fulton, 2000; Zinn, Manfredo, Vaske, & Wittman, 1998). Consistent with this literature, we found across all Myths of Nature types that people with a domination orientation were more accepting of invasive management actions than were people with a mutualism orientation. However, our approach also helps to understand the variation that can occur within groups who have a particular wildlife value orientation. Results showed how some people with a domination orientation may believe in a myth of *Nature is Ephemeral* and be less accepting of lethal control of wildlife than other people with the same orientation but who believe in a different myth of nature. Similarly, some people with a mutualism orientation may believe in a myth of *Nature is Benign* and therefore be more accepting of lethal control of wildlife than others with the same wildlife value orientation. In this way, our results help to better understand how diverse publics may think differently about wildlife and wildlife management.

We used two social science theories that build upon the notion of ideology to provide a foundation for understanding how broader-level cognitions influence individuals' attitudes toward wildlife management actions. Although we also explored wildlife-related behaviors (i.e., hunting, fishing, wildlife viewing) in relation to the Myths of Nature and found differences among the myth types in their activities, we did not structure our investigation to examine the influence of myths on the full array of concepts outlined in the cognitive hierarchy. Future research using our approach could benefit from a more thorough assessment of the interrelationships among concepts across a host of wildlife-related issues. For example, if a particular management action found to be less acceptable was implemented by WDFW, how will residents react (e.g., complain to friends and family, stop purchasing fishing licenses, sue the

agency)? Our exploration of social science theories related to human-wildlife and human-nature relationships provided an opportunity to consider how different theoretical frameworks might be integrated to facilitate a broader understanding of the diversity of public opinion on wildlife management issues. We believe that continued efforts in this area of research and resulting findings from such efforts could be beneficial for improving agency response to complex social challenges in the future.

LITERATURE CITED

- Abramson, P. R., & Inglehart, R. (1995). *Value change in global perspective*. Ann Arbor, MI: University of Michigan Press.
- Bouyer, M., Bagdassarian, S., Chaabanne, S., & Mullet, E. (2001). Personality correlates of risk perception. *Risk Analysis*, 21(3), 457–465.
- Brenot, J., Bonnefous, S., & Marris, C. (1998). Testing the Cultural Theory of risk in France. *Risk Analysis*, 18(6), 729–739.
- Bright, A., Manfredo, M. J., & Fulton, D. (2000). Segmenting the public: An application of value orientations to wildlife planning in Colorado. *Wildlife Society Bulletin*, 28(1): 218-226.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Dake, K. (1992). Myths of nature: Culture and the social construction of risk. *Journal of Social Issues*, 48(4), 21-37.
- Dillman, D. A. (2007). *Mail and internet surveys: The tailored design method* (2nd ed. – 2007 update). New York: John Wiley & Sons.
- Douglas, M., & Wildavsky, A. (1982). *Risk and culture: An essay on the selection of technical and environmental dangers*. Berkeley, CA: University of California Press.
- Douglas, M. (1992). *Risk and blame: Essays in Cultural Theory*. London: Routledge.
- Douglas, M. (1997). The depoliticization of risk. In R. J. Ellis & M. Thompson (Eds.), *Culture matters: Essays in honor of Aaron Wildavsky* (pp. 121-32). Boulder, CO: Westview Press.
- Eagly, A. H., & Chaiken, S. (1993). *The psychology of attitudes*. Fort Worth, TX: Harcourt Brace Javanovich.

- Fulton, D. C., Manfredo, M. J., & Lipscomb, J. (1996). Wildlife value orientations: A conceptual and measurement approach. *Human Dimensions of Wildlife*, 1(2), 24-47.
- Gigliotti, L. M., Shroufe, D. L., & Gurtin, S. (2009). The changing culture of wildlife management. In M. J. Manfredo, J. J. Vaske, P. J. Brown, D. J. Decker & E. A. Duke (Eds.), *Wildlife and society: The science of human dimensions* (pp. 75-89). Washington, DC: Island Press.
- Green, D., Askins, G. R., & West, P. D. (1997). Public opinion: Obstacle or aid to sound deer management? *Wildlife Society Bulletin*, 25(2), 367-370.
- Grendstad, G., & Selle, P. (1997). Cultural Theory, Postmaterialism, and environmental attitudes. In R. J. Ellis & M. Thompson (Eds.), *Culture matters: Essays in honor of Aaron Wildavsky* (pp. 151-168). Boulder, CO: Westview Press.
- Homer, P. M., & Kahle, L. R. (1988). A structural equation test of the value-attitude-behavior hierarchy. *Journal of Personality Social Psychology*, 54(4), 638-646.
- Inglehart, R. (1997). *Modernization and postmodernization*. Princeton, NJ: Princeton University Press.
- Kluckhohn, F. R., & Strodtbeck, F. (1961). *Variations in value orientations*. Evanston, IL: Row, Peterson, and Co.
- Lauber, T. B., & Knuth, B. A. (2000). *Citizen participation in natural resource management: A synthesis of HDRU research* (No. HDRU Publication 00-7). Ithaca: Cornell University.
- Maio, G. R., Olson, J. M., Bernard, M. M., & Luke, M. A. (2003). Ideologies, values, and behavior. In J. Delamater (Ed.), *Handbook of social psychology* (pp. 283-308). London: Springer.
- Manfredo, M. J., Pierce, C. L., Fulton, D., Pate, J., & Gill, B. R. (1999). Public acceptance of wildlife trapping in Colorado. *Wildlife Society Bulletin*, 27(2), 499-508.
- Manfredo, M. J., Teel, T. L., & Henry, K. L. (2009). Linking society and environment: A multi-level model of shifting wildlife value orientations in the western United States. *Social Science Quarterly*, 90(2), 407-427.
- Manfredo, M. J., Teel, T. L., & Bright, A. D. (2004). Application of the concepts of values and attitudes in human dimensions of natural resources research. In M. J. Manfredo, J. J. Vaske, B. L. Bruyere, D. R. Field, & P. J. Brown (Eds.), *Society and Natural Resources: A Summary of Knowledge*. Jefferson, MO: Modern Litho.

- Marris, C., Langford, I. H., & O’Riordan, T. (1998). A quantitative test of the Cultural Theory of risk perceptions: comparison with the psychometric paradigm. *Risk Analysis*, 18(5), 635-647.
- Mascia, M. B., Brosius, J. P., Dobson, T. A., Forbes, B. C., Horowitz, L., McKean, M. A., & Turner, N. J. (2003). Conservation and the social sciences. *Conservation Biology*, 17(3), 649-650.
- Milton, K. (1996). *Environmentalism and Cultural Theory: Exploring the role of anthropology in environmental discourse*. New York: Routledge.
- Minnis, D. L. (1998). Wildlife policy-making by the electorate: An overview of citizen-sponsored ballot initiatives. *Wildlife Society Bulletin*, 26(1), 75-83.
- Nunnally, J. K., & Bernstein, I. H. (1994). *Psychometric theory* (3rd edition). New York: McGraw Hill.
- Peterson, M. N., Allison, S. A., Peterson, M. J., Peterson, T. R., & Lopez, R. R. (2004). A tale of two species: Habitat conservation plans as bounded conflict. *Journal of Wildlife Management*, 68(4), 743-761.
- Pratto, F. (1999). The puzzle of continuing group inequality: Piecing together psychological, social and cultural forces in social dominance theory. *Advances in Experimental Social Psychology*, 31, 191-263.
- Relph, E. (1980). *Place and placelessness*. London: Pion Limited.
- Rippl, S. (2002). Cultural Theory and risk perception: A proposal for a better measurement. *Journal of Risk Research*, 5(2), 147-165.
- Rokeach, M. (1973). *The nature of human values*. New York: Free Press.
- Schwartz, S. H. (2006). A theory of cultural value orientations: Explication and applications. *Comparative Sociology*, 5, 136-182.
- Schwarz, M., & Thompson, M. (1990). *Divided we stand: Redefining politics, technology, and social choice*. Philadelphia, PA: University of Pennsylvania Press.
- Sjöberg, L. (1997). Explaining risk perception: An empirical evaluation of Cultural Theory. *Risk Decision and Policy*, 2(2), 113-130.
- Sjöberg, L. (2000). Factors in risk perception. *Risk Analysis*, 20(1), 1-11.
- Tansey, J. (2004). Risk as politics, culture as power. *Journal of Risk Research*, 7(1), 17-32.

- Teel, T. L., Dayer, A. A., Manfredi, M. J., & Bright, A. D. (2005). *Regional results from the research project entitled "Wildlife Values in the West."* (Project Rep. No. 58). Project Report for the Western Association of Fish and Wildlife Agencies. Fort Collins, CO: Colorado State University, Human Dimensions in Natural Resources Unit.
- Teel, T. L., & Manfredi, M. J. (2009). Understanding the diversity of public interests in wildlife conservation. *Conservation Biology*, 24(1), 128-139.
- Teel, T. L., Manfredi, M. J., & Stinchfield, H. M. (2007). The need and theoretical basis for exploring wildlife value orientations cross-culturally. *Human Dimensions of Wildlife*, 12, 297-305.
- Thompson, M., Ellis, R., & Wildavsky, A. (1990). *Cultural Theory*. Boulder, CO: Westview Press.
- Tuan, Y. (1974). *Topophilia: A study of environmental perception, attitudes, and values*. Englewood Cliffs, NJ: Prentice-Hall.
- U. S. Census Bureau. (2002). *2000 Census of populations and housing*. Washington, DC: U. S. Department of Commerce.
- U. S. Fish and Wildlife Service. (2007). *2006 National Survey of fishing, hunting, and wildlife-associated recreation: National overview*. Washington, DC: U. S. Department of the Interior.
- WSDOT. (2007). *Washington State Department of Transportation: Key facts*. Washington: Department of Printing.
- Wildavsky, A. B. (1991). *The rise of radical egalitarianism*. Washington, DC: The American University Press.
- Zinn, H. C., Manfredi, M. J., Vaske, J. J., & Wittmann, K. (1998). Using normative beliefs to determine the acceptability of wildlife management actions. *Society & Natural Resources*, 11, 649-662.

Figure 3.1. Social organization and the Myths of Nature as described by Cultural Theory.

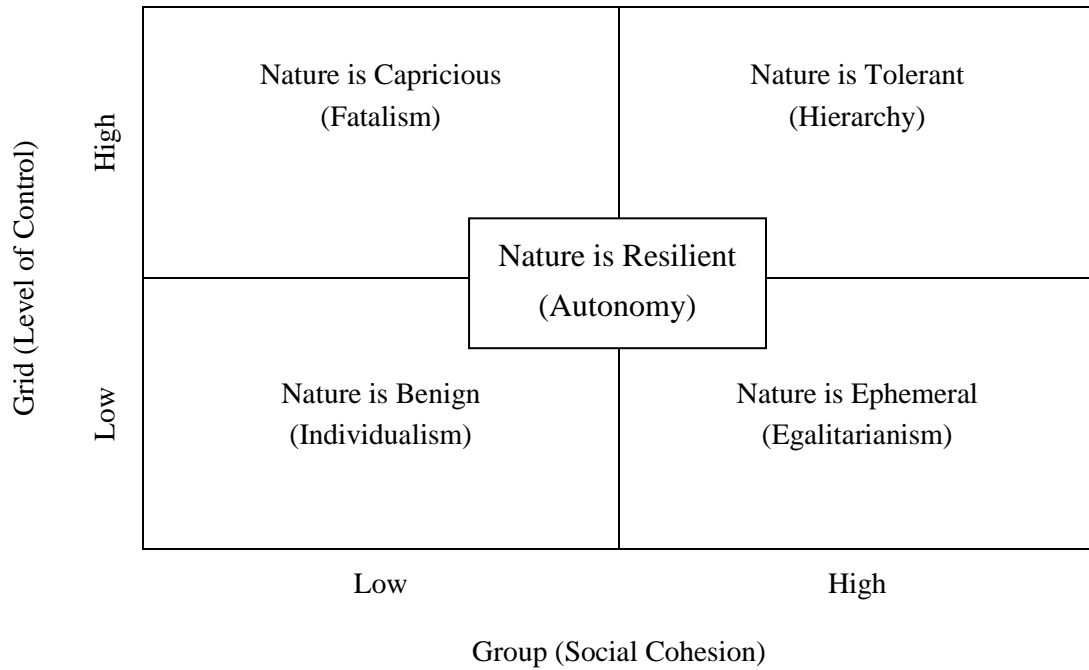
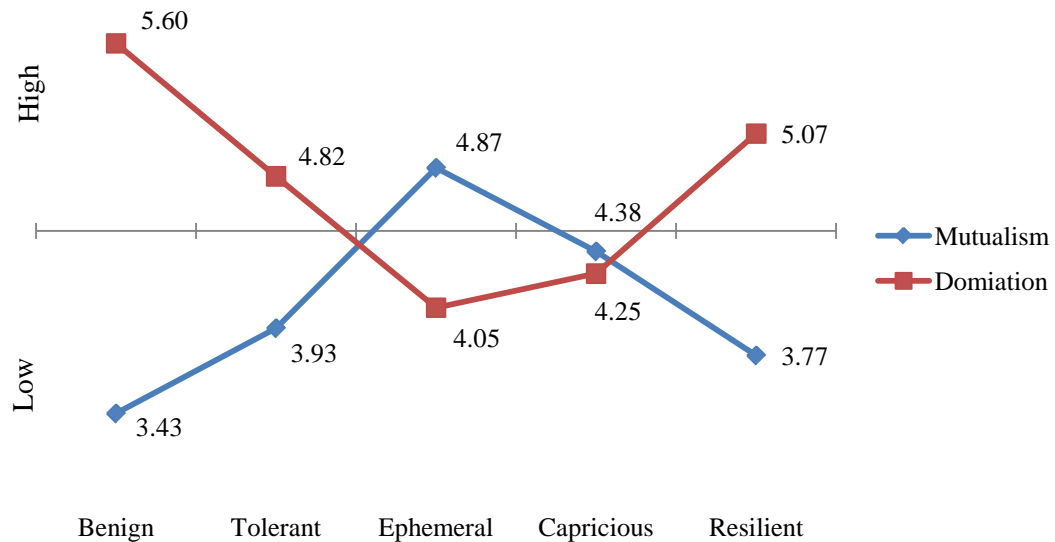


Figure 3.2. Mean scores for Myths of Nature types on wildlife value orientation dimensions.¹



¹ “High” indicates a score > 4.5, whereas “low” indicates a score ≤ 4.5 on the related orientation dimension.

Table 3.1. Non-response check comparisons.

Item		<i>N</i>	Mean	<i>Statistic</i>	<i>Significance</i>	<i>ES^l</i>
I often participate in outdoor activities near my home	RE ²	4103	5.84	-0.34	.733	.004
	NR	2011	5.86			
Animals should have rights like humans	RE	4118	3.27	-5.86	<.001	.075
	NR	1966	3.62			
The needs of humans should take priority over fish and wildlife protection	RE	4100	4.12	-15.84	<.001	.200
	NR	1935	5.01			
I value the sense of companionship I receive from animals	RE	4111	5.15	-29.94	<.001	.358
	NR	1996	6.41			
People who want to hunt should be provided the opportunity to do so	RE	4120	5.70	-6.36	<.001	.081
	NR	1991	5.97			
Wildlife are a nuisance	RE	4142	2.85	9.83	<.001	.125
	NR	1987	2.35			
Is it unacceptable or acceptable for WDFW to limit the number of wolves if they cause declines in deer and elk populations <i>in certain areas</i> ?	RE	4060	5.29	2.90	.004	.038
	NR	1892	5.13			
Would you like mountain lion populations to decrease in WA over the next 5 years?	RE	4056	2.75	-2.32	.020	.031
	NR	1690	2.82			
In the last 12 months, did you participate in hunting?	RE	3894	.26	68.13*	<.001	.107
	NR	2020	.17			
In the last 12 months, did you participate in fishing (non-commercial)?	RE	3992	.51	46.20*	<.001	.088
	NR	2019	.41			
In the last 12 months, did you participate in wildlife viewing?	RE	4020	.83	10.75*	.001	.042
	NR	2016	.80			
Respondent sex	RE	4135	.32	254.52*	<.001	.203
	NR	2024	.53			
Respondent age	RE	4102	59.57	11.83	<.001	.150
	NR	1987	54.82			

Table 3.1, *continued*. Non-response check comparisons.

Item		<i>n</i>	Mean	<i>Statistic</i>	<i>Significance</i>	<i>ES</i> ¹
Length of residence in WA (years)	RE	4143	40.47	3.54	<0.001	0.045
	NR	2006	38.42			
Length of residence in current home (years)	RE	3967	16.25	1.32	0.188	0.017
	NR	2005	15.75			

¹E.S. Effect size measures.²RE = respondents to the mail survey; NR = non-respondents, participating in the non-response check phone survey.* Test statistic is on the chi-square distribution, with a *Phi* listed for the effect size. All other statistics are *t*-test values with an *eta* listed for the effect size.Table 3.2. ANOVA Results for five Myths of Nature clusters at *t5*.¹

	Myth of Nature type					<i>F</i> -value ²	<i>Eta Squared</i> ³
	Benign	Tolerant	Ephemeral	Capricious	Resilient		
	<i>n</i> = 218	<i>n</i> = 575	<i>n</i> = 1984	<i>n</i> = 149	<i>n</i> = 593		
	6%	16%	56%	4%	17%		
Durable	2.51 ^a	2.16 ^b	-2.32 ^c	-1.79 ^d	2.11 ^b	8320.18	0.904
Limited/ Scarce	-1.68 ^a	0.34 ^b	1.95 ^c	1.29 ^d	-0.18 ^e	447.70	0.338
Predictable/ Ordered	2.43 ^a	1.95 ^b	-0.12 ^c	-0.98 ^d	-2.06 ^e	486.03	0.356
Accessible/ Inviting ⁴	2.41 ^a	2.21 ^b	2.40 ^a	-1.84 ^c	1.98 ^d	939.62	0.517
Needs to be protected	-1.83 ^a	2.12 ^b	2.63 ^c	1.99 ^b	0.84 ^d	916.72	0.511

¹ Differing supercripts indicates significant differences at $p < 0.05$ using a Sheffe post hoc test. In most cases, significant differences were at the $p < .001$ level. Cell entries are means ranging from -3 to +3. A positive number indicates slight (1), moderate (2), or extreme (3) agreement with the phrase listed out of a pair of phrases, whereas a negative number indicates agreement with the opposite phrase in the pair (not listed).² *F*-values are significant at $p < 0.001$.³ Eta squared indicates the amount of variance explained.⁴ Due to a violation of the homogeneity of variance assumption, a Dunnett's T3 post hoc test was conducted.

Table 3.3. Reliability results for wildlife value orientation dimensions.

Wildlife Value Orientations	Cronbach's alpha
<i>Belief Dimensions</i>	
Belief Items	
Domination	0.79
<i>Appropriate Use Beliefs</i>	0.66
Humans should manage fish and wildlife populations so that humans benefit.	
The needs of humans should take priority over fish and wildlife protection.	
Fish and wildlife are on earth primarily for people to use.	
<i>Hunting Beliefs</i>	0.81
We should strive for a world where there's an abundance of fish and wildlife for hunting and fishing.	
Hunting is cruel and inhumane to the animals. ¹	
Hunting does not respect the lives of animals. ¹	
People who want to hunt should be provided the opportunity to do so.	
Mutualism	0.87
<i>Social Affiliation Beliefs</i>	0.83
We should strive for a world where humans and fish and wildlife can live side by side without fear.	
I view all living things as part of one big family.	
Animals should have rights similar to the rights of humans.	
Wildlife are like my family and I want to protect them.	
<i>Caring Beliefs</i>	0.76
I care about animals as much as I do other people.	
I feel a strong emotional bond with animals.	
I value the sense of companionship I receive from animals.	

¹ Item was reverse coded prior to analysis.

Table 3.4. Mean differences for Myths of Nature type on wildlife value orientation dimensions.¹

	Myth of Nature type					<i>F</i> -value ²	Eta
	Benign	Tolerant	Ephemeral	Capricious	Resilient		
<i>Belief Dimensions</i>							
Use	5.09 ^a	4.33 ^b	3.56 ^c	4.28 ^b	4.54 ^b	112.93	0.338
Hunt	6.12 ^a	5.31 ^b	4.54 ^c	4.24 ^c	5.60 ^b	96.77	0.315
Social	2.81 ^a	3.70 ^b	4.82 ^c	4.10 ^b	3.53 ^b	198.27	0.429
Care	4.05 ^a	4.16 ^a	4.92 ^b	4.65 ^b	4.01 ^a	71.66	0.275
<i>Wildlife Value Orientation</i>							
Domination	5.60 ^a	4.82 ^b	4.05 ^c	4.25 ^c	5.07 ^d	150.79	0.383
Mutualism	3.43 ^a	3.93 ^b	4.87 ^c	4.38 ^d	3.77 ^b	149.77	0.382

¹ Means with different letters denote statistical differences at the $p < 0.001$ as reported by Sheffe's post hoc test.

² All *F*-tests were significant at the $p < 0.001$ level.

Table 3.5. Reliability results for lethal control scales.

Acceptability of lethal removal...	Mean ¹	Standard Deviation	Corrected Item-total Correlation	Alpha if Item Deleted
<i>Coyote Scale</i> ²				
... of a coyote observed near your home	3.30	2.27	0.653	0.817
... of a coyote that is a nuisance	3.86	2.22	0.748	0.785
...of a coyote that has a disease	6.11	1.49	0.582	0.833
...of a coyote who attacks a pet	5.16	1.97	0.757	0.782
...of a coyote who attacks a human	6.27	1.53	0.566	0.835
<i>Black Bear Scale</i> ³				
... of a black bear observed near your home	3.40	2.25	0.683	0.834
... of a black bear that is a nuisance	4.09	2.22	0.791	0.800
...of a black bear that has a disease	6.10	1.50	0.617	0.849
...of a black bear who attacks a pet	5.31	1.97	0.760	0.809
...of a black bear who attacks a human	6.33	1.47	0.597	0.853

¹ Means range from 1 'Extremely Unacceptable' to 7 'Extremely Acceptable'.

² N = 4085; Cronbach's alpha = 0.844

³ N = 4078; Cronbach's alpha = 0.860

Table 3.6. Reliability results for wolf items.

Acceptability...	Mean ¹	Standard Deviation	Corrected Item-total Correlation	Alpha if Item Deleted
...of moving wolves from one area to another once they've reached a certain population size ²	2.88	1.95	0.360	0.727
...of allowing wolves to recolonize and establish new populations on their own ²	2.89	1.82	0.499	0.674
...of limiting the number of wolves in certain areas if they caused declines in deer and elk	5.01	1.72	0.437	0.697
...of capturing and lethally removing a wolf it is known to have caused loss of livestock	4.94	1.97	0.607	0.628
...of allowing a limited recreational hunt of wolves once they have reached a certain population size that exceeds WDFW recovery goals	4.73	2.14	0.535	0.658

¹ N = 3947; Cronbach's alpha = 0.725. Means range from 1 'Extremely Unacceptable' to 7 'Extremely Acceptable'.

² Item was reverse coded.

Table 3.7. Mean differences for Myths of Nature type on species-specific scales.

	Myth of Nature type					<i>F</i> -value ²	Eta
	Benign	Tolerant	Ephemeral	Capricious	Resilient		
Coyote	5.15 ^{ac}	5.01 ^a	4.71 ^b	5.24 ^{ac}	5.30 ^{ac}	22.39	0.158
Black Bear	5.27 ^{acd}	5.09 ^{ac}	4.77 ^b	5.43 ^{acd}	5.44 ^{ad}	28.52	0.179
Wolf	4.62 ^a	4.22 ^b	3.78 ^c	4.17 ^b	4.27 ^b	40.49	0.212

¹ Means with different letters denote statistical differences at the $p < 0.05$ as reported by Sheffe's post hoc test and Dunnett's T3 post hoc test where equal-variances assumptions were violated.

² All *F*-tests were significant at the $p < 0.001$ level.

Table 3.8. Mean differences by wildlife value orientations for each Myths of Nature type on computed scales for different wildlife species.

Species	Myth of Nature	Wildlife Value Orientation		<i>t</i> -value	<i>p</i> -value	Eta
		Domination	Mutualism			
<i>Coyote</i>						
	Benign	5.35	4.93	2.73	0.100	0.120
	Tolerant	5.57	4.63	55.23	<0.001	0.341
	Ephemeral	5.40	4.46	117.40	<0.001	0.260
	Capricious	5.85	4.95	9.66	0.002	0.266
	Resilient	5.74	5.21	17.38	<0.001	0.187
<i>Black Bear</i>						
	Benign	5.54	4.78	19.10	0.002	0.227
	Tolerant	5.65	4.70	49.14	<0.001	0.323
	Ephemeral	5.41	4.51	99.85	<0.001	0.242
	Capricious	5.93	5.17	6.49	0.012	0.220
	Resilient	5.79	5.35	12.93	<0.001	0.162
<i>Wolf</i>						
	Benign	4.83	4.49	2.15	0.144	0.104
	Tolerant	4.71	4.00	33.53	<0.001	0.272
	Ephemeral	4.59	3.52	269.21	<0.001	0.381
	Capricious	5.08	3.89	25.69	<0.001	0.410
	Resilient	4.72	4.24	17.13	<0.001	0.186

¹ This approach excludes people who do not express a particular wildlife value orientation (*n* = 743); however, there are 3,425 respondents included in this analysis.

Table 3.9. Chi-square results for Myths of Nature type on wildlife-related recreation participation.

	Myth of Nature type					X^2	p -value	$Cramer's V$
	Benign	Tolerant	Ephemeral	Capricious	Resilient			
<i>Past participation</i>								
Hunting	71.03	50.44	43.61	51.02	48.73	62.35	<0.001	0.134
Fishing	89.40	84.22	83.16	81.88	83.22	6.12	0.190	0.042
Viewing	87.38	91.01	92.91	87.84	90.88	12.75	0.013	0.061
<i>Current (in the last 12 months) participation</i>								
Hunting	16.50	12.79	12.44	12.68	17.64	11.21	0.024	0.060
Fishing	47.32	40.22	33.78	23.74	45.52	47.46	<0.001	0.120
Viewing	76.06	79.71	83.88	67.13	75.35	42.69	<0.001	0.112
<i>Future participation</i>								
Hunting	45.27	35.33	22.25	31.03	36.80	93.84	<0.001	0.170
Fishing	67.80	73.76	63.22	60.96	68.37	24.42	<0.001	0.086
Viewing	84.83	86.89	93.40	92.09	83.98	60.47	<0.001	0.134

IV. CONCLUSION

In an effort to provide a foundation for agencies recognizing the importance of understanding the diversity of publics they represent, we set about exploring how ideology as depicted by Cultural Theory and wildlife value orientation theory influences human thought regarding natural resource and wildlife use. Such human-nature and human-wildlife relationships can help managers understand the basis for different types of social conflict related to the conservation challenges they aim to solve (Milton, 1996). Manfredo (2008) further suggests that theories related to ideology can help natural resource managers engage people through new conservation techniques, anticipate future recreation trends, and attain a deeper understanding of management issues by providing a solid, generalizable foundation for exploring such notions. With this in mind, we specifically investigated how broad conceptions of nature stemming from ideology can be examined through an exploratory clustering approach and, furthermore, how these varied perspectives regarding the natural environment relate to wildlife value orientations and responses to wildlife management issues.

Cultural Theory, which draws from the field of anthropology, provides a basis for understanding the influence of ideology on individual-level thought (Douglas & Wildavsky, 1982; Thompson, Ellis, & Wildavsky, 1990). Furthermore, five specific ideologies (hierarchy, fatalism, individualism, egalitarianism, and autonomy) identified in Cultural Theory relate to distinct Myths of Nature, or ways to explain individual's beliefs about natural resource use (Douglas & Wildavsky, 1982; Thompson, Ellis, & Wildavsky, 1990). Carlisle and Smith (2005) indicate that particular ideologies have merit and that continued research in this area is promising for understanding people's reactions to environmental issues. Past measurement approaches for capturing the ideologies outlined by cultural theorists largely rely on agree/disagree statements that have some limitations and often have little predictive power (e.g., Sjöberg, 1996; Tansey, 2004). Due to a need for understanding human-nature relationships to address conservation

management challenges, we responded to suggestions in the literature by exploring the ways in which people think about nature.

Both Cultural Theory and wildlife value orientation theory suggest that ideology influences individual beliefs regarding natural resource and wildlife use; thus, we determined a need to investigate how these theories might be integrated in a natural-resource and wildlife context. Wildlife value orientation theory indicates that mutualism and domination value orientations are reflective of broader cultural ideologies related to egalitarianism and domination, and has already proven useful in explaining differences in a host of wildlife-related attitudes and behaviors (e.g., Manfredi, Teel, & Henry, 2009; Bright, Manfredi, & Fulton, 2000; Zinn, Manfredi, Vaske, & Wittman, 1998). Information collected in the investigation was intended to expand prior applications of wildlife value orientation theory by placing the theory in a broader context (i.e., exploring its relationship to the Myths of Nature) and elaborating on the different types of wildlife-related interests that have been identified in past research.

Summary and Integration of Findings

Consistent with our objectives in Chapter II, we tested a new approach eliciting people's thoughts about nature and found through cluster analysis that five distinct perspectives existed in three study areas consistent with the Myths of Nature literature. Four of the myths (Ephemeral, Benign, Perverse, and Capricious) are more often cited due to their link to specific "ways of life" outlined in Cultural Theory by Douglas' grid/group typology (Douglas & Wildavsky, 1982; Douglas, 1992); however, we found that five distinct myths are warranted and that future research should consider the myth of *Nature is Resilient* (and likely, the autonomist way of life). We also determined it was necessary in future research capitalizing on this approach to "force" particular myths to appear by setting initial cluster centers based on the literature; otherwise, particular beliefs about nature may be overlooked. For example, those believing in a myth of *Nature is Capricious* represented a very small portion of the public in all three study areas (~2-6%). Other

research has indicated that the particular beliefs of Fatalists (who are theorized to hold a myth of *Nature is Capricious*) are often not statistically different than the beliefs of other myth holders or have been difficult to detect altogether (e.g., Grendstad & Selle, 1990; Stern, Dietz, Abel, Guagnano, & Kalof, 1999; Oltedal & Rundmo, 2007). Although these approaches use different approaches, it is an important for future efforts to consider the full range of beliefs related to how people think about nature.

Our exploratory approach was able to capture distinct beliefs about nature; however, there were some limitations. First, we did not ask residents indicating nature needed protection to specify from *what* (e.g., people, nothing) it needs protection and *who* (e.g., government agencies, localized groups) is most capable of doing the protection. We believe our approach would further help classify the Myths of Nature if residents were asked to indicate their beliefs on such questions. Second, our approach did not attempt to address from which ideologies each myth holder draws. For example, believers of our typing for *Nature is Ephemeral* do not necessarily indicate egalitarianism or a preference for sectarian forms of management. As noted by Grendstad and Selle (1990), a central debate in Cultural Theory is whether the grid/group approach is simply a heuristic device (Douglas & Wildavsky, 1982) or whether it can help to explain particular social patterns or “ways of life” (Thompson, Ellis, & Wildavsky, 1990). Milton (1996) further suggests that Cultural Theory is not clear as to whether cultural perspectives or “ways of life” motivate social change or if social change can influence cultural perspectives. Our approach circumvents this discussion by capturing individual beliefs related to nature and applying those beliefs in a wildlife-related context, which can help managers understand the breadth of public opinion about natural resource use. Further research would be necessary to determine whether our approach has predictive power in explaining particular ways of life (or that particular ways of life can predict our groupings).

The focus of Chapter III was to investigate the relationship between the Myths of Nature and wildlife value orientation theory by investigating the effect of broader level cognitions (i.e., ideology) on wildlife-related attitudes toward species-specific management actions. Our exploratory approach to identifying and defining groups of people in regards to their beliefs about nature was used to determine relationships between such groupings and wildlife-related belief dimensions as outlined by the theory of wildlife value orientations (Manfredo, Teel, & Henry, 2009). Results indicated there is likely some overlap in the ideologies from which both theories draw. For example, *Nature is Benign* myth holders exhibited a strong domination wildlife value orientation, likely indicating that both (i.e., *Nature is Benign* myth holders and those holding a domination wildlife value orientation) may draw from values of domination and mastery. We also found that the other two myths (*Nature is Resilient* and *Tolerant*) who hold a domination orientation, largely scored this way because of the hunt belief dimension (rather than both the hunt and use belief dimensions), indicating that such myth holders are likely to believe hunting is appropriate in certain situations, but that wildlife do not necessarily exist for human purposes only. Consistent with past literature on wildlife value orientations, we also found that value orientations were better predictors of wildlife-related attitudes. Additionally, we found that examining wildlife value orientations in conjunction with the Myths of Nature, we can begin to understand the variation that exists within each value orientations.

Management Implications

Findings from our study showed that there is a large concern for a fragile and limited nature that is in need of protection. For example, more people believed in the *Nature is Ephemeral* myth than any other myth in all three study areas (including more than 50% of people in Arizona and Washington). If *Nature is Ephemeral* myth holders draw from an egalitarian ideology, agencies may need to consider smaller, local-level approaches to addressing conservation challenges to ensure they have continued support from the public. Future research

should address the questions of whether people believing different myths are likely to support the current infrastructure for solving conservation challenges as well as how such myths effect individual behavior and beliefs related to managing institutions. Results from Washington indicate that certain management actions will be less acceptable to a large percentage of the state population. When wildlife value orientations are used in conjunction with the Myths of Nature, we can begin to understand the differences in beliefs related to the acceptability of different wildlife management strategies as well as the variability within value orientations on such measures. For example, people who believe a myth of *Nature is Ephemeral* and hold a mutualism value orientation were less accepting than any other myth type on predator-related management actions. This group is likely to be a source of social conflict if WDFW chooses a particularly invasive management action such as lethal control.

We used two social science theories drawing from similar ideologies to provide a foundation for understanding how broader-level cognitions influence individuals' wildlife-related attitudes and behavior. With any exploratory approach, there are many avenues for future research. The approach we used here would benefit from an investigation into whether the myths are influenced by particular ideologies as depicted by Cultural Theory, the effect of such ideologies *and* their related attitudes on behavioral intention, and the motivations for each myth type in regards to their wildlife-related participation. Our exploration of social science theories related to human-wildlife relationships has provided a foundation for understanding diverse publics in three study areas and linked such beliefs to acceptability of different management actions for various predator species in the state of Washington. We believe continued collaborative efforts and the resulting findings from such efforts will help ensure successful wildlife management into the future by providing a generalizable framework for which to understand a diversity of public opinion.

LITERATURE CITED

- Bright, A., Manfredo, M. J., & Fulton, D. (2000). Segmenting the public: An application of value orientations to wildlife planning in Colorado. *Wildlife Society Bulletin*, 28(1), 218-226.
- Carlisle, J., & Smith, E. R. A. N. (2005). Postmaterialism vs. egalitarianism as predictors of energy-related attitudes. *Environmental Politics*, 14(4), 527-540.
- Douglas, M., & Wildavsky, A. (1982). *Risk and culture: An essay on the selection of technical and environmental dangers*. Berkeley, CA: University of California Press.
- Grendstad, G., & Selle, P. (1997). Cultural Theory, Postmaterialism, and environmental attitudes. In R. J. Ellis & M. Thompson (Eds), *Culture matters: Essays in honor of Aaron Wildavsky* (pp. 151-168). Boulder, CO: Westview Pres.
- Manfredo, M. J. (2008). *Who cares about wildlife? Social science concepts for exploring human-wildlife relationships and conservation issues*. New York: Springer.
- Manfredo, M. J., Teel, T. L., & Henry, K. L. (2009). Linking society and environment: A multi-level model of shifting wildlife value orientations in the western United States. *Social Science Quarterly*, 90(2), 407-427.
- Milton, K. (1996). *Environmentalism and Cultural Theory: Exploring the role of anthropology in environmental discourse*. New York: Routledge.
- Olstedal, S., Rundmo, T. (2007). Using cluster analysis to test the cultural theory of risk perception. *Transportation Research*, 10, 254-262.
- Sjöberg, L. (1996). A discussion of the limitations of the psychometric and Cultural Theory approaches to risk perception. *Radiation Protection Dosimetry*, 68, 219-225.
- Stern, P. C., Dietz, T., Abel, T., Guagnano, G. A., & Kalof, L. (1999). A value-belief-norm theory of support for social movements: The case of environmentalism. *Human Ecology Review*, 6(2), 81-97.
- Tansey, J. (2004). Risk as politics, culture as power. *Journal of Risk Research*, 7(1), 17-32.
- Thompson, M., Ellis, R., & Wildavsky, A. (1990). *Cultural Theory*. Boulder, CO: Westview Press.
- Zinn, H. C., Manfredo, M. J., Vaske, J. J., & Wittmann, K. (1998). Using normative beliefs to determine the acceptability of wildlife management actions. *Society & Natural Resources*, 11, 649-662.

APPENDIX A

2009 Survey of Washington Residents Regarding Place and Wildlife

We greatly appreciate your opinions!

Even if you know little about wildlife in your area,
your input is needed!

A study conducted cooperatively by:



Knowledge to Go Places



*Washington
Department of*
**FISH and
WILDLIFE**

SECTION I.

This survey begins with a list of paired phrases representing different ways that people might think about nature. We want to know which phrase out of each pair below best describes **how you think about nature**.

There are two parts to this question.



PART 1. Circle one phrase for each pair below.

I think nature...

PART 2. Circle one number for each phrase circled in Part 1.

To what extent does the phrase to the left represent how you think about nature?

			<u>Slightly</u>	<u>Moderately</u>	<u>Extremely</u>
is fragile	or	is durable	1	2	3
is unlimited, abundant	or	is limited, scarce	1	2	3
is unpredictable, chaotic	or	is predictable, ordered	1	2	3
is remote, uninviting	or	is accessible, inviting	1	2	3
can take care of itself	or	needs to be protected	1	2	3

We are now interested in knowing more about **how you think about the area near your home** (including your place of residence and the area within a few miles of it).

There are two parts to this question.



PART 1. Circle one word/phrase for each pair below.

I think the area near my home is...

PART 2. Circle one number for each word/phrase circled in Part 1.

To what extent does the word/phrase to the left represent how you think about the area near your home?

			<u>Slightly</u>	<u>Moderately</u>	<u>Extremely</u>
ugly, unattractive	or	beautiful, attractive	1	2	3
safe	or	dangerous	1	2	3
common	or	unique	1	2	3

SECTION II.

In this section, we're interested in knowing **whether you participate in outdoor activities near your home** and what factors might influence your participation. Again, for this survey, we're defining "near your home" as your place of residence and the area within a few miles of it. *Circle one number for each statement below.*

Do you disagree or agree with the following?	<u>Strongly Disagree</u>	<u>Moderately Disagree</u>	<u>Slightly Disagree</u>	<u>Neither</u>	<u>Slightly Agree</u>	<u>Moderately Agree</u>	<u>Strongly Agree</u>
I often participate in outdoor activities near my home.	1	2	3	4	5	6	7
I avoid participation in outdoor activities near my home due to fear of strangers.	1	2	3	4	5	6	7
My job requires that I spend a lot of time outside near my home.	1	2	3	4	5	6	7
I participate in outdoor activities near my home mainly to get exercise.	1	2	3	4	5	6	7
I am afraid of being harmed by wildlife if I participate in outdoor activities near my home.	1	2	3	4	5	6	7

In which season(s) do you **spend the most time participating in outdoor activities near your home**? If you spend a similar amount of time in more than one season, check all that apply, OR check the box indicating that you don't spend much time participating in outdoor activities near your home.

☐ Spring ☐ Summer ☐ Fall ☐ Winter ☐ I don't spend much time participating in outdoor activities near my home.

Now we would like to learn about the **specific outdoor activities you participated in near your home in the last 12 months**. Check all that apply in the list below.

- ☐ Gardening ☐ Walking/Hiking/Running ☐ Feeding Wild Birds ☐ Fishing (non-commercial) ☐ Boating (motorized)
- ☐ Camping ☐ Horseback Riding ☐ Feeding Other Wildlife ☐ Dirt-Biking or OHV/ATV use ☐ Sailing (non-motorized)
- ☐ Climbing ☐ Nature Photography ☐ Hunting ☐ Downhill Skiing/Snowboarding ☐ Cross-Country Skiing
- ☐ Biking ☐ Wildlife Viewing ☐ Trapping ☐ Kayaking/Canoeing/Rafting ☐ Snowmobiling

☐ **OTHER (describe):** _____

☐ **NONE, I did not participate in outdoor activities near my home in the last 12 months.**

If you checked more than one activity above:

Which activity do you currently participate in **the most near your home**? (write response) _____

Which activity are you **most likely to continue** in the future **near your home**? (write response) _____

Are there any activities listed above that you **would** participate in **near your home** but don't due to **limited access** to local lands?

☐ Yes ☐ No (if yes, write activities here) _____

Below is a series of statements to learn more about **access to lands near your home**. Circle one number for each statement.

Do you disagree or agree with the following?	<u>Strongly Disagree</u>	<u>Moderately Disagree</u>	<u>Slightly Disagree</u>	<u>Neither</u>	<u>Slightly Agree</u>	<u>Moderately Agree</u>	<u>Strongly Agree</u>
I wish I had access to more land areas near my home to participate in outdoor activities.	1	2	3	4	5	6	7
I would pay a fee to have access to more land areas near my home to participate in outdoor activities.	1	2	3	4	5	6	7
Limited access to land areas is the primary reason for why I do not participate in outdoor activities near my home often.	1	2	3	4	5	6	7
The Washington Department of Fish & Wildlife (WDFW) should work with private landowners to provide more access to land areas near my home for outdoor activities.	1	2	3	4	5	6	7

There's been a lot of talk recently about climate change and its potential impacts. We are interested in learning **your views about climate change in relation to the area near your home**. Circle one number for the statement below.

	<u>Strongly Disagree</u>	<u>Moderately Disagree</u>	<u>Slightly Disagree</u>	<u>Neither</u>	<u>Slightly Agree</u>	<u>Moderately Agree</u>	<u>Strongly Agree</u>
I believe that climate change is currently	1	2	3	4	5	6	7

affecting the area near my home.

SECTION III.

Below are statements representing different ways that people might think about fish and wildlife. We're interested in knowing ***your* views about fish and wildlife**. *Circle one number for each statement.*

Do you disagree or agree with the following?	<u>Strongly Disagree</u>	<u>Moderately Disagree</u>	<u>Slightly Disagree</u>	<u>Neither</u>	<u>Slightly Agree</u>	<u>Moderately Agree</u>	<u>Strongly Agree</u>
Humans should manage fish and wildlife populations so that humans benefit.	1	2	3	4	5	6	7
Animals should have rights similar to the rights of humans.	1	2	3	4	5	6	7
We should strive for a world where there's an abundance of fish and wildlife for hunting and fishing.	1	2	3	4	5	6	7
I view all living things as part of one big family.	1	2	3	4	5	6	7
Hunting does not respect the lives of animals.	1	2	3	4	5	6	7
I feel a strong emotional bond with animals.	1	2	3	4	5	6	7
The needs of humans should take priority over fish and wildlife protection.	1	2	3	4	5	6	7
I care about animals as much as I do other people.	1	2	3	4	5	6	7
Fish and wildlife are on earth primarily for people to use.	1	2	3	4	5	6	7
Hunting is cruel and inhumane to the animals.	1	2	3	4	5	6	7
We should strive for a world where humans and fish and wildlife can live side by side without fear.	1	2	3	4	5	6	7
I value the sense of companionship I receive from animals.	1	2	3	4	5	6	7
Wildlife are like my family and I want to protect them.	1	2	3	4	5	6	7
People who want to hunt should be provided the opportunity to do so.	1	2	3	4	5	6	7
Fishing is cruel and inhumane to the fish.	1	2	3	4	5	6	7
Fishing allows people to enjoy the outdoors in a positive manner.	1	2	3	4	5	6	7
Fish are valuable only if people get to use them in some way.	1	2	3	4	5	6	7

Now we're interested in ***your* views about the wildlife near your home**. *Circle one number for each statement below.*

The wildlife near my home...	<u>Strongly Disagree</u>	<u>Moderately Disagree</u>	<u>Slightly Disagree</u>	<u>Neither</u>	<u>Slightly Agree</u>	<u>Moderately Agree</u>	<u>Strongly Agree</u>
...are generally a nuisance (cause problems).	1	2	3	4	5	6	7
...are enjoyable to have around.	1	2	3	4	5	6	7
...pose a dangerous risk to people.	1	2	3	4	5	6	7
...provide valuable opportunities for recreation.	1	2	3	4	5	6	7
I rarely see any wildlife near my home.	1	2	3	4	5	6	7

In the past 12 months, have you or your neighbors had **problems with wildlife**? *Check one box for each category below.*

I PERSONALLY have experienced problems near my home:

MY NEIGHBORS have experienced problems:

☐ yes ☐ no

☐ yes ☐ no ☐ I don't know

If you answered yes above for either category, **please briefly explain the problem(s)**, the wildlife that caused it, and how often it occurred (once during the year, once a month, once a week, etc.). *Write your response below.*

SECTION IV.

The Washington Department of Fish and Wildlife (WDFW) has a variety of responsibilities when it comes to conserving the state's fish and wildlife resources and providing residents with fish and wildlife-related recreation opportunities. Below is a list of examples of services that WDFW may provide. Some of these services are currently offered by WDFW, while others are either new activities or ones provided by other organizations (for example, private businesses) that could be considered as possible future partnership opportunities for WDFW. New services may require WDFW to take funding away from other existing responsibilities. Given limited funds, we're interested in **your opinions about the importance of these services** and **whether you feel they should be WDFW's responsibility**.

<i>There are multiple parts to this question.</i>	PART 1. How important is each of the following <u>to you</u> ? <i>Circle one number for each service (A through I).</i>					PART 2. Should it be WDFW's responsibility to provide...? <i>Check one box for each service.</i>	PART 3. Would you be willing to pay to support...? <i>Check one box for each service.</i>
<u>EXAMPLE SERVICES:</u>	<u>Not at all Important</u>	<u>Slightly Important</u>	<u>Moderately Important</u>	<u>Quite Important</u>	<u>Extremely Important</u>		
A. Care for injured or orphaned wildlife.	1	2	3	4	5	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
B. Response to complaints about wildlife in urban areas.	1	2	3	4	5	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
C. Incentives to private landowners who restore wildlife habitat (example: tax breaks, reimbursement for expenses).	1	2	3	4	5	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
D. Protection and recovery of threatened or endangered species.	1	2	3	4	5	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
E. Outdoor educational programs to connect youth/families to nature.	1	2	3	4	5	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
F. Hunting and fishing opportunities.	1	2	3	4	5	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
G. Wildlife viewing opportunities (example: provide information on viewing areas, build viewing platforms/boardwalks).	1	2	3	4	5	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
H. Programs that help local governments plan for protection of open space and wildlife populations in urban areas.	1	2	3	4	5	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
I. OTHER (write your response below) _____ _____	1	2	3	4	5	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No

SECTION V.

In this section, we ask **your opinions about specific fish and wildlife species and their management, particularly dealing with conflict situations, in Washington.**

COYOTES AND BLACK BEARS:

We're interested in knowing under what circumstances (if any) you think it is acceptable for WDFW to **lethally remove a coyote or black bear**. *Circle one number for each statement below.*

Is it unacceptable or acceptable for WDFW to lethally remove a <u>COYOTE</u> if it...	Highly Unacceptable	Moderately Unacceptable	Slightly Unacceptable	Neither	Slightly Acceptable	Moderately Acceptable	Highly Acceptable
...is seen near your home?	1	2	3	4	5	6	7
...is a nuisance (for example: it gets into trash or pet food containers) near your home?	1	2	3	4	5	6	7
...has a disease that may be spread to humans?	1	2	3	4	5	6	7
...attacks a <u>pet</u> near your home?	1	2	3	4	5	6	7
...attacks a <u>person</u> near your home?	1	2	3	4	5	6	7
Is it unacceptable or acceptable for WDFW to lethally remove a <u>BLACK BEAR</u> if it...	Highly Unacceptable	Moderately Unacceptable	Slightly Unacceptable	Neither	Slightly Acceptable	Moderately Acceptable	Highly Acceptable
...is seen near your home?	1	2	3	4	5	6	7
...is a nuisance (for example: it gets into trash or pet food containers) near your home?	1	2	3	4	5	6	7
...has a disease that may be spread to humans?	1	2	3	4	5	6	7
...attacks a <u>pet</u> near your home?	1	2	3	4	5	6	7
...attacks a <u>person</u> near your home?	1	2	3	4	5	6	7

DEER AND ELK:

As human populations expand, interactions between humans and deer or elk are likely to increase in certain parts of Washington. Although some people enjoy seeing these animals, interactions can sometimes result in problems such as damage to shrubbery, landscaping, and commercial crops. Below we ask about the **acceptability of different management actions** that could be used to address these problems. *Circle one number for each statement below.*

Is it unacceptable or acceptable for WDFW to...	Highly Unacceptable	Moderately Unacceptable	Slightly Unacceptable	Neither	Slightly Acceptable	Moderately Acceptable	Highly Acceptable
...capture and lethally remove problem deer or elk?	1	2	3	4	5	6	7
...use techniques designed to scare problem deer or elk away (examples: loud noises, rubber bullets)?	1	2	3	4	5	6	7
...use agency funds to compensate landowners for damage (\$10,000 or more) caused by deer or elk?	1	2	3	4	5	6	7
...contribute agency funds to a landowner cost-sharing program supporting the construction of fences around property that has been damaged by deer or elk?	1	2	3	4	5	6	7
...require landowners to accept at least 50% of the	1	2	3	4	5	6	7

responsibility in dealing with problem deer or elk?

WOLVES:

Wolves are a state and federal endangered species and have started to recolonize Washington from other surrounding states. There are a wide range of opinions and interests associated with wolves. Some residents are concerned that an increase in wolves could lead to problems like attacks on livestock and population declines in certain hunted species. Others are excited about the prospect of having wolves return to Washington (for example, the opportunity to see wolves in the wild). Below we ask about the **acceptability of different management actions** that may be considered in the future as wolves become reestablished in the state. *Circle one number for each statement below.*

Is it unacceptable or acceptable for WDFW to...	Highly Unacceptable	Moderately Unacceptable	Slightly Unacceptable	Neither	Slightly Acceptable	Moderately Acceptable	Highly Acceptable
...move wolves from one area in Washington where they've reached a certain population size to another area in the state to establish new wolf populations?	1	2	3	4	5	6	7
...allow wolves to recolonize and establish new populations on their own in Washington?	1	2	3	4	5	6	7
...limit the number of wolves if they cause declines in deer and elk populations <i>in certain areas</i> ?	1	2	3	4	5	6	7
...capture and lethally remove a wolf if it is known to have caused loss of livestock?	1	2	3	4	5	6	7
...compensate landowners for loss of livestock caused by a wolf?	1	2	3	4	5	6	7
...use a portion of WDFW <u>hunting and fishing license</u> dollars to compensate landowners for loss of livestock caused by a wolf?	1	2	3	4	5	6	7
...use a portion of <u>state tax</u> dollars to compensate landowners for loss of livestock caused by a wolf?	1	2	3	4	5	6	7
...allow a recreational hunt of wolves once they have reached a certain population size that exceeds WDFW recovery goals?	1	2	3	4	5	6	7

SALMON:

Many salmon are federally listed under the Endangered Species Act. Salmon are also a symbol of the Pacific Northwest. Federal, state, and tribal management efforts have focused on the recovery of wild salmon for many years, and a large percentage of Washington's geography is involved in salmon-related activities. While some people feel that salmon recovery is important for the natural environment and local economies, others feel that it may interfere with their livelihoods. We are interested in **your views about salmon in the state**. *Circle one number for each statement below.*

Do you disagree or agree with the following?	Strongly Disagree	Moderately Disagree	Slightly Disagree	Neither	Slightly Agree	Moderately Agree	Strongly Agree
Salmon are important to the local economy where I live.	1	2	3	4	5	6	7
Salmon are important to the quality of life for residents where I live.	1	2	3	4	5	6	7
WDFW should continue its efforts to recover <i>wild salmon</i> throughout the state.	1	2	3	4	5	6	7
WDFW should focus more of its efforts on introduction of <i>hatchery-raised salmon</i> to enhance fishing opportunities.	1	2	3	4	5	6	7

	Decreased Greatly	Decreased Some	Remained the Same	Increased Some	Increased Greatly	No Opinion
Over the <u>past five years</u> , would you say that your support for salmon recovery has increased, decreased, or remained the same? (Circle one number OR check the box to indicate "no opinion".)	1	2	3	4	5	<input type="checkbox"/>

Would you like the following **wildlife populations in Washington** to increase, decrease, or remain at their current levels over the next five years? *Circle one number for each species below.*

	<u>Eliminate This Species</u>	<u>Decrease Greatly</u>	<u>Decrease Some</u>	<u>Remain at Current Level</u>	<u>Increase Some</u>	<u>Increase Greatly</u>
Coyote	0	1	2	3	4	5
Black Bear	0	1	2	3	4	5
Deer	0	1	2	3	4	5
Elk	0	1	2	3	4	5
Mountain lion	0	1	2	3	4	5

SECTION VI.

The following **background information** will be used to help make general conclusions about the residents of Washington. **Your responses will remain completely confidential.**

For each activity listed below, check one response for each of the three questions appearing to the right.

	<u>Have you ever participated in...</u>		<u>In the last 12 months, did you participate in...</u>		<u>Do you have an interest in future participation in...</u>	
...Hunting?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No
...Fishing (non-commercial)?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No
...Wildlife Viewing?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No

Are you...? ☐ Male ☐ Female

What is your age? (*Write response.*) _____ Years

How many people under 18 years of age _____ Person(s)
are currently living in your household?
(*Write response.*)

About how long have you lived in... Washington? _____ Years, OR ☐ Less than one year.
(*Write response or check box for less than one year.*) Your current home? _____ Years, OR ☐ Less than one year.

What is your approximate annual household income before taxes? (*Check one.*)

<input type="checkbox"/> Less than \$10,000	<input type="checkbox"/> \$35,000 - \$49,999	<input type="checkbox"/> \$100,000 - \$149,999
<input type="checkbox"/> \$10,000 - \$24,999	<input type="checkbox"/> \$50,000 - \$74,999	<input type="checkbox"/> \$150,000 - \$199,999
<input type="checkbox"/> \$25,000 - \$34,999	<input type="checkbox"/> \$75,000 - \$99,999	<input type="checkbox"/> \$200,000 or more

What is the highest level of education that you have achieved? (*Check one.*)

<input type="checkbox"/> Less than high school diploma	<input type="checkbox"/> 4-year college degree
<input type="checkbox"/> High school diploma or equivalent (GED)	<input type="checkbox"/> Advanced degree beyond 4-year college degree
<input type="checkbox"/> 2-year associates degree or trade school	

Are you...? (*Check one or more categories.*)

<input type="checkbox"/> White	<input type="checkbox"/> Asian
<input type="checkbox"/> Hispanic or Latino	<input type="checkbox"/> Native Hawaiian or Other Pacific Islander
<input type="checkbox"/> Black or African American	<input type="checkbox"/> Other (<i>Please print on line below.</i>) _____
<input type="checkbox"/> American Indian or Alaska Native	

Thank you for participating in this study!