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I am submitting herewith a thesis written by Cynthia Liane Longmire entitled "Natural Resources in the Northern Cumberlands: A Determination of Residents' Values." I have examined the final paper copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Forestry.

David M. Ostermeier, Major Professor

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Natural Resources in the Northern Cumberlands: A Determination of Residents' Values

A Thesis Presented for the
Master of Science Degree
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Cynthia Liane Longmire
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DEDICATION

This thesis is dedicated to my parents, William and Lianne Longmire, who have always encouraged me to follow my heart and pursue my dreams.

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ABSTRACT

In the process of governance, political power has often become the primary tool for influencing decisions. Objective information about policy values and interests regarding natural resources and their use and conservation is often incomplete, biased or simply not available. Democratic governance requires that natural resource agencies, public officials, natural resource stakeholders, and the public at large have a good understanding of these values and interests. The values and interests of residents of Cumberland, Fentress, Morgan and Scott counties in Tennessee regarding scarce natural resources are identified and analyzed in this thesis. This region of Tennessee has experienced increased interest in both economic development and environmental protection in the last decade. Using a mail survey, residents' values and the relative strength of these values were identified regarding the use and protection of natural resources linked with threatened and endangered species. Residents in this area indicate strong conservation values and moderate use (non-recreation) values, and expressed preferences for policy strategies involving education and regulation. Adding to what is already known about the multiple values that people hold regarding natural resources, the obtained information can help those involved in the governance process better understand how to address the use and conservation of natural resources in the study area.

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CHAPTER I: INTRODUCTION

Introduction

Natural resource degradation and depletion have become an increasingly international concern, as our global society races to achieve economic wealth at the expense of environmental and social issues. Our world population is projected to reach 10 billion by the century's midpoint, and meeting human needs in a world of finite resources poses serious environmental, social and economic challenges. In an effort to meet these challenges, much study, debate, and reflection have occurred regarding the goals and means for both socioeconomic and natural resource sustainability. As human population grows, natural resources are often used in quantities exceeding natural rates of renewal, leading to resource depletion. Additionally, natural habitats are degraded through conversion to more profitable land uses such as residential/commercial development. These problems have led to increasing pressure to address resource depletion and habitat loss through various means, i.e., education, technology, financial assistance, and regulation.

To address these problems effectively, the lack of accurate information about citizens' environmental values must first be addressed. This information is a vital piece that has historically been missing from the natural resource governance process. Developing a means to obtain this information accurately and objectively is a key step in improving the natural resource governance process. The purpose of this thesis is to develop a replicable means of

objectively measuring the relative strength of citizens' environmental values, and to apply this to a natural resource governance case study.

Natural Resources Historically

Historically, natural resource governance in the United States has been influenced by utilitarian values and anthropocentric means of controlling and subduing nature. Early American land policy was characterized by unbridled exploitation of the land's natural resources. During the early years of the country, the government was not only eager to acquire lands, but it was also eager to sell or give land to landowners and firms to promote development and generate revenues for the burgeoning government. This "taming" of the frontier fostered the self-reliant, individualistic, independence that can still be found throughout American society (Cortner and Moote 1999).

The Progressive Era—late 1800s and early 1900s—was characterized by a major shift in societal values. Reformers sought to eliminate corruption in government, regulate business practices, and address health hazards. This period also saw a push for more participatory governance in the forms of the direct election of senators, the initiative, the referendum, and the recall (Cortner and Moote 1999). Within this setting, natural resource management evolved from the wanton exploitation of resources to the scientific and technical management characteristic of the conservation movement. The waste resulting from exploitative and inefficient natural resource uses led to the demand for a program of scientific management of natural resources in the latter part of the

19th century (Hays 1959). This shift toward applied science heralded in a century that saw the establishment of forest reserves, national parks, lands within the public domain, water reclamation, bag limits on hunting, forest regeneration, professional agencies to manage the resources, and schools to train the professional resource managers (Cortner and Moote 1999).

Natural Resources Today

To date, the goal of natural resource management has been to order nature so that it is more predictable and commodities can be harvested, all to the short-term benefit of humans (Holling and Meffe 1996). These short-term benefits often come at the expense of long-term needs of the natural environment (WRI 2003). Often decisions regarding the natural environment are made that are poorly informed or myopic in scope. This kind of decision-making has left society facing the daunting task of not only managing our natural resources in a more sustainable manner, but also correcting the mistakes of past management. In the rush to find solutions to environmental problems, the interconnections between components of an ecosystem are often missed or overlooked.

The demands of an exponentially growing population place increasing pressure on our ecosystems. A simple model developed by Ehrlich and Holdren in the early 70s illustrates that the human population's environmental impact is equal to the number of people multiplied by the amount of resources used by each person and the amount of degradation/pollution caused by the use of each

resource (Ehrlich and Holdren 1971; Miller 2000). Accordingly, land use for human benefit constitutes the most substantial change to ecosystems with an estimated one-third to one-half of the earth's land area having been disturbed by human actions (Vitousek et al. 1997).

Recently, urban sprawl, the rapid expansion of urban areas into previously rural areas, has created a patchwork of land uses on the fringe of cities. This expansion can be problematic from both a socioeconomic and an environmental perspective. The costs of providing infrastructure and services to low-density areas on urban fringes are often borne by the majority of a city's residents who do not live in these outlying areas (Torrens 2006). Additionally, the outward expansion of urban areas often leaves the urban center impoverished creating social injustices for the area's residents. A major environmental problem caused by urban sprawl is the loss and fragmentation of habitat for many animal and plant species.

Land use changes and disturbances are the number one cause of species extinction (Vitousek et al. 1997). Species extinction is a naturally occurring event, but conservative estimates of the current rate of extinction show it to be 100 to 1000 times greater than any of the previous natural extinction events in the Earth's history (Vitousek et al 1997; IUCN 2007). Less conservative estimates are 1000 to 11,000 times natural extinction rates (IUCN 2007). At the current rates of extinction, it is estimated that half of the world's species will be extinct within the time span of one human life (Wilson interview 2002 http://www.actionbioscience.org/biodiversity/wilson.html).

In the 1960s and 70s, the growing social concern for environmental degradation led to many environmental laws being enacted by Congress. One of the most significant environmental laws passed during this period was the Endangered Species Act of 1973 (ESA). The ESA was developed in response to the growing concern over the loss of some of the country's most charismatic species: bald eagle, peregrine falcon, American alligator, wolves, and grizzly bears (Curtis and Davison 2007). The ESA provides a legal mandate to protect species that have met the requirements to be listed as threatened or endangered, as well as to protect their critical habitat. As of February 2007, 1,310 species have been listed as threatened or endangered under the ESA; 566 animal species and 744 plant species (USFWS 2007). While the ESA has the potential to address the problems of habitat fragmentation, the law has failed to live up to expectations in large part due to problems of implementation.

As seen today, the transition from legal listing of threatened and endangered species to on-the-ground recovery efforts is wrought with conflict, as the economic values of some people have become pitted against the social and/or environmental values of others. While economic development interests have traditionally excluded environmental interests from decision-making processes, the same can be said for environmental issues. Environmental laws like the ESA have traditionally excluded the economic interests and rights of the individual (Ostermeier 1999). This economic/environmental conflict can been seen in well publicized cases such as the spotted owl controversy of the late 1980s and early 90s and the Columbia River Basin salmon policy in the 1990s.

The ESA and other federal environmental statues, when implemented, have created rigid policies that fail to consider variations in the values of local communities. A major difficulty of implementation with all environmental policy is the conflicting values that people have regarding the natural environment, and the lack of available information about these conflicting values within the context of specific communities or regions. The availability of accurate information about these values and their relationship, if any, with preferred methods of implementation is a necessary step in building dialogue based on similarities and not on differences. Such dialogue has the potential to ease the difficulties of environmental policy implementation since it enables citizens to become more informed and involved in the process, which may ultimately lead to a consensual method of policy implementation for the area.

Research Problem

In the process of governance, political power has often become the primary tool for influencing decisions. A historical way to determine the values and interests of citizens has been to assume that they will surface during the normal political process. However, the positions of political candidates on environmental issues are not the only factors that voters must consider when choosing for whom to cast their ballot. Often candidates' environmental positions take a backseat to other social and economic concerns. Additionally, the values and interests of the public are often overshadowed by the self-interests of the politically powerful.

In their book *The Politics of Ecosystem Management*, Cortner and Moote sum up a century of natural resource management as "politics of expertise, of maximum sustained yield, and of interest" (1999; 15). An important ingredient missing from natural resource management of the twenty-first century is the citizen. Decisions have been made based on decision makers' definitions of public interest, and agency policies have limited the public's participation to more formal methods that do not foster two-way information exchange (Cortner and Moote 1999). Objective information about people's values and interests is needed to inform the natural resource governance process and all involved in the process, including all sectors of the public.

The problem addressed through this research is the lack of information, within the governance process, about citizen values and interests regarding scarce natural resources. Natural resource agencies, elected and appointed public officials, various natural resource stakeholders, conservation and utilitarian groups, and the public at large need to understand these values and interests better. Only through such understanding can natural resource governance occur in a democratic manner, balancing these diverse values and interests.

Research Purpose

The purpose of this research is to develop and apply a means of objectively measuring the multiple values, and their relative strength, that citizens have regarding natural resources to inform governance processes. Conflicts over environmental issues (e.g. natural resources) often involve fundamental

disagreements in the human relationship to the natural environment, resulting in competitions between participants' value systems (Layzer 2006). Opposing sides in these value contests often utilize scientific research, economic costs and benefits, or risk assessments to further their interests in the decision-making process. Rarely do the participants attempt to achieve their goals using arguments based on their values (p. 2). The composition of these value systems consist of multiple values that are formed in the presence of one another. That is, it is possible for individuals to value economic growth and natural resource protection simultaneously. While it is true that individuals hold multiple values, it is especially true that groups hold multiple values. To inform governance processes regarding natural resources, a measure of the relative strength of these multiple values is needed. Decisions affecting the utilization and/or protection of these resources should be informed by this information.

Natural resource governance decisions are often made by individuals who are far removed from the local community where the resource is located and are unaffected by the short-term outcomes of their decisions. Natural resources are place-based, and the use of the objective measurement of individuals' multiple values can provide consistent place-based governance. Increasing decision-makers' awareness of the local community's values can help move the governance process one step closer to being a more balanced and democratic process.

Research Objectives

The objectives of this research are threefold. First, develop an instrument to measure the multiple values citizens have regarding natural resources in their community, and their relative importance. Second, apply the instrument to a relevant case study involving the governance of natural resources. Third, identify the relative strength of natural resource values and management preferences of citizens within the case study area. Below are brief descriptions of each of the research objectives.

Development of Survey Instrument

The first objective of this research is to develop a survey instrument that will allow for objective measurement of the multiple values and their relative strengths that survey respondents have regarding scarce natural resources. Winter et al. (2003) assert that natural resource governance decisions based on the knowledge of individual's values are desirable outcomes of the decision-making process. To achieve these desirable outcomes, it is necessary to develop an instrument that can objectively identify individuals' values. For this to be possible, the instrument must be able to identify and measure the complexities of multiple values and their relative strengths, while still being easily read and understood by the lay public. Additionally, since environmental issues are often polarized value clashes, it is important the instrument be non-biased, to avoid defensive posturing resulting in non-response.

Application of Survey Instrument

The second objective of this research is to apply the survey instrument to an area currently experiencing an increase in the demands placed upon their finite supply of natural resources. The case study chosen for the application of the survey is a four county (Cumberland, Fentress, Morgan, and Scott Counties) area in the Northern Cumberlands in Tennessee. There is a long history of natural resource use in this area. As both economic and residential development pressures increase in the area, the demand for water availability, a limited resource, continues to increase. The presence of both aquatic and terrestrial wildlife species, listed as threatened or endangered under the Endangered Species Act of 1973, increases the complexity of natural resource management in this area as well. Local government officials, state and federal resource agencies, non-governmental organizations and university researchers are currently working on the development of a region-wide plan that would protect threatened and endangered species and balance private economic interests with environmental interests (www.cumberlandhcp.org).

Identification of Values and Choices

The third objective of this research is to identify the relative strengths of the values residents in the case study area have regarding natural resources, and the management choices they prefer in situations involving scarce natural resources. An understanding of how residents' values and concerns are prioritized within their lives can help identify other areas of concerns that may be

keeping people from supporting natural resource policies within the region. Having an understanding of the relative strengths of residents' values will place these values in context and give policymakers and resource managers a better understanding of why certain decisions may or may not have the public's support. Dissatisfied citizens hinder many public policies with litigation; knowledge about residents' preferences can help to mitigate the possibility of lawsuits. Therefore, knowledge about what manner of policy implementation residents prefer can help lead to programs that are more effective and garner the support of the public.

Significance of Research Project

This research is focused on natural resource values to inform governance processes. Values drive beliefs and attitudes and influence decision-making and behavior, making their objective measurement an important part of governance (Rokeach 1973; Stern and Dietz 1994; Schwartz 1994; and Axelrod 1994). Given the increasing human population and the increasing scarcity of natural resources, improvement of natural resource governance is paramount. The availability of objective information concerning how individuals value these resources is important to the improvement of the governance process. Because of this importance, developing and applying ways of measuring the relative strength of these values is needed. In addition to informing the governance process, this research will also contribute to the somewhat limited literature regarding the relative strengths of natural resource values. Finally, through the

application to a case study, the findings will contribute to the information base of a specific, current natural resource governance process.

CHAPTER II: LITERATURE REVIEW

Introduction

As populations continue to grow, more pressures are placed on natural resources, increasing the importance of effective and socially acceptable decisions about natural resource use and protection. Clashes between value systems are often at the heart of environmental conflicts, making it desirable for decision makers to have effective tools for measuring and identifying natural resource values. Values vary across individuals, groups, and cultures and are not mutually exclusive (Stern and Dietz 1994). The relative strengths of values are often affected by current situations and may vary across scenarios, making it difficult for absentee decision makers to enact socially acceptable policies which can be generalized across many environmental situations.

Natural resource values are predominantly studied within the disciplines of psychology, philosophy and economics. Both traditional (market related) and non-traditional techniques have been employed to identify people's valuations of natural resources. A review of the bodies of literature in psychology, philosophy and economics pertinent to natural resource values is discussed relative to how natural resource values are categorized. Additionally, measurement techniques that are commonly used will be identified and discussed. This chapter will conclude with several cases where these techniques have been employed, and the outcomes of these studies will be discussed.

Particular attention is paid to how effective the techniques are in illustrating participants' values and the relative strength of these values. The purpose of this is to identify the benefits and drawbacks of various valuation methods, and to identify the method or combination of methods most suitable for addressing this study's research objectives of survey design and measurement of the relative strength of individuals' values regarding natural resources. This focus on the measurement of values and their relative strength guided this literature review.

Values

The conceptual definition of values is that they are important standards that act as guiding principles in an individual's life (Rokeach 1973). Because values function as an organized system, they are considered distinct from attitudes or beliefs and are commonly believed to be determinants of attitudes and behaviors (Olson & Zanna 1993; Schultz and Zelezny 1999). Stern and Dietz (1994) present a value-basis theory that links values, beliefs, attitudes and behaviors with environmental concern. Results from Shultz and Zelezny's (1999) multinational study supported this value-basis theory of environmental concern, finding predicted relationships between values and environmental attitudes (p. 262). These studies along with others related to natural resource management show empirical evidence for the link between values, attitudes and behavior (Manning et al. 1999; Schultz and Zelenzy 1999; Schwartz 1994; Stern and Dietz 1994).

Environmental philosophies can be grouped into anthropocentric beliefs and non-anthropocentric beliefs. Anthropocentric philosophies hold a human-centered view of the world, that nature should be managed to the benefit of humans, even at the expense of other species. Non-anthropocentric philosophies hold that all life is equally valuable, and humanity is not the center of existence. The natural environment provides support for all life, and no single organism is more important than other organisms. Within these two broad categorizations of environmental philosophies, two primary classifications of values are particularly relevant to natural resource management: instrumental values and intrinsic values (Winter 2005). An object's instrumental value typically refers to its usefulness to humans, and intrinsic value refers to its value independent of humans.

Instrumental values are often further divided into use (active) or non-use (passive) values. Current use values are simply the value of the current use of natural resources by humans and include both consumptive and non-consumptive uses (Cicchetti and Wilde 1992). Examples of consumptive uses are resource extractions such as timber, minerals, agriculture, and hunting and fishing. Examples of non-consumptive uses are hiking, rock climbing, wildlife and wildflower viewing, and ecotourism. Future use or expected use is the value of intended human use of a natural resource (Cicchetti and Wilde 1992; McConnell 1983; Field 2001; Winter 2005). Non-use values occur when humans place value on resources independent of their actual use of the resource. These values include bequest value, existence values, and option values. Bequest

refers to the value of knowing that future generations will live in a world where the particular resource is present. Existence refers to the value of maintaining resources even though future use of those resources is not likely. Option values refer to individuals knowing that the resource will be available for use in the future (Field 2001; Cicchetti and Wilde 1992; McConnell 1983; Winter 2005). While option value is typically placed within non-use value, some researchers have considered option value synonymous with future use value (Winter and Lockwood 2003). The idea that non-use values contributed significantly to the overall value of natural resources was first introduced by Weisbrod in 1964 and further developed by Krutilla in 1967, leading to the eventual development of the environmental economics body of literature in the 1970s (Cicchetti and Wilde 1992).

While the environmental economics literature focuses on the instrumental values of nature, the environmental philosophy literature looks more at the intrinsic value of nature. In classical philosophy, an entity that is intrinsically valuable is said to be an "end-in-itself" and not simply a "means" to another's end (Callicott 1986). O'Neill (1992) states that intrinsic value is a synonym to non-instrumental value and that intrinsic value is an end in itself (Winter and Lockwood 2003). Callicott (1989) poses a subjective argument of intrinsic value saying that a person holds the value of nature, while Rolston (1989) argues that the nature's intrinsic value was inherently in natural objects (objective argument). O'Neill avoids this subjective/objective argument with the belief that if nature's

intrinsic value is acknowledged, the location of this value (whether subjective or objective) is irrelevant (Winter and Lockwood 2003; O'Neil 1992).

The psychology literature has focused less on defining nature's intrinsic value and more on whether or not people believe such a value exists (Winter and Lockwood 2003). Gagnon Thompson and Barton (1994) developed scales to measure the anthropocentric and ecocentric attitudes—valuing nature for its own sake, and therefore believing in the protection of nature for its intrinsic value. Their research found that ecocentric and anthropocentric attitudes independently affected environmental apathy, conservation and memberships in environmental organizations (Gagnon Thompson and Barton 1994). The general implication of their findings, as reported by the researchers, is that not only is it important to understand environmental attitudes, but also the values that form the basis of those attitudes (p.156).

Value Measurements

The traditional mechanisms for measuring natural resource values are market-based measurements. The concept behind the utilization of market-based measurements for resource use or protection is the idea that markets already have the institutions and procedures in place for making these valuations, and if the market for a particular good does not exist, then an artificial one should be created (Williams 2002). Techniques used to make resource valuations tend to be indirect measures of the market. Examples of these indirect measures are hedonic price analysis and the travel-cost approach.

Hedonic price analysis indirectly estimates resource value by looking at price, quantity and quality of associated goods/services (Field 2001). Essentially this technique tries to determine the value of environmental resources relative to goods with traditional market value (Harris 2002). A common example of this technique is determining the value of open space in suburban developments by looking at the breakdown of housing prices. The travel-cost approach involves measuring the costs incurred by individuals as they travel to natural resource sites (Field 2001). The idea is that people's willingness to pay to visit resources such as National Parks can be determined by evaluating the relationship between visitation choices and travel costs (Harris 2002). A person's willingness to pay (WTP) is simply the maximum amount of money they are willing to pay for a good. The more a person values the good, in this case natural resources, then the more they would be willing to pay.

Values that people have for goods not traded in markets are referred to as non-market values. Economists have developed techniques to measure non-market values, which primarily look at individuals' non-use value—option, bequest and existence values—and exclude intrinsic value. These techniques attempt to estimate the value of natural resources by putting non-market values into monetary terms (Harris 2002). A popular non-market technique that is used to estimate resource value is the contingent valuation method (CVM), which involves the measurement of WTP. The conceptual basis for this technique is that an individual's WTP can be determined by asking them directly, using surveys where respondents estimate what the natural resource is worth to them

(Field 2001). An example would be asking individuals how much money they would pay to preserve an endangered species. Another approach used in CVM is to measure people's willingness to accept (WTA). WTA is the minimum amount of money a person would except as compensation for the loss or reduction of a resource. Such as, the amount of money they would accept for the loss of rafting opportunities because of dam construction (Harris 2002). The amount of money people associate with WTA is typically much higher than the amount associated with WTP. This pricing discrepancy raises some concerns.

While indirect market and non-market measurement techniques have become popular tools for measuring resource values, they are not without controversy. There are concerns about the validity of these methods (e.g. hypothetical bias of CVM), their failure to account for the fact that some individuals are unwilling to make trade-offs relative to natural resources, and their limitation to assessing only exchange values (Lockwood 1999; Harris 2002; Field 2001). There is danger of natural resource values being underrepresented or ignored if measurement techniques do not adequately represent all values associated with the resource. The failure of economic measures to provide adequate representation of non-market values highlights the need to utilize alternative (non-economic) means of measuring non-use and intrinsic values.

Alternative Measures

Since the 1960s, the volume of research attempting to measure individual's environmental concern has grown considerably. Dunlap et al. (2000)

explain environmental concern as a broad concept ranging from awareness of environmental problems to protection of the environment. Environmental concern measurement techniques most often utilize various kinds of psychometric measures. Some of these scales are the Environmental Concern Scale (Weigel and Weigel 1978), the Ecology Scale (Maloney and Ward 1973), and the New Environmental Paradigm (Dunlap and Van Liere 1978).

The most popular and widely used scale for measuring environmental concern is Dunlap and Van Liere's New Environmental Paradigm published in 1978 and later revised and renamed the New Ecological Paradigm (NEP) in 2000 (Hunter and Rinner 2004; Winter and Lockwood 2003). The NEP has been used by researchers in various geographic and cultural contexts (Dunlap et al. 2000). The NEP and other similar scales are designed to measure general attitudes of environmental concern. Their frequent use to measure specific attitudes regarding specific behaviors has resulted in lower predictive validity (Fransson and Garling 1999). Winter and Lockwood (2003) note that while the NEP is a significant instrument for measuring general environmental concern and is useful for broad policy and planning, it does not identify distinct values or specifically address natural areas and their management (p.12).

From a policy perspective, there is little advantage to identifying broad value orientations such as anthropocentric and ecocentric (Winter and Lockwood 2003). Empirical evidence has shown that different groups (i.e. loggers, farmers, biologists, and environmentalists) hold similar broad ecocentric value orientations, but differ significantly when the values are defined more narrowly

(Kempton et al. 1995; Bjerke and Kalternborn 1999). For example, loggers and environmentalist may both have similar broad value orientations, but have extremely different views on how forests should be managed (Kempton et al. 1995). In order to have a scale that not only identified distinct values, but also intrinsic, use, and non-use values as well, Winter and Lockwood (2003) developed the Natural Area Values Scale (NAVS). The NAVS was developed to identify use, non-use, recreation and intrinsic values of natural areas. In addition to identifying distinct values, the developers took into consideration the non-mutually exclusive nature of values and used the NAVS to measure relative strength among the four value types.

Another alternative approach to traditional measures of natural resource values is the use of narratives. Communication theory suggests that narratives are distinct contexts that have the potential to evoke different ideas than simple belief statements (Shanahan et al. 1999; Fisher 1987). Shanahan et al. (1999) showed that narrative responses could add significantly to environmental concern models, such as the NEP, predicting variance in environmental activism. The apparent multidimensionality of environmental values suggests that a single approach to measuring these values may not be sufficient. Shanahan et al. (1999) suggest the use of a narrative measurement approach, in addition to psychometric scales, may increase the effectiveness of studies looking to explain environmental attitudes and behaviors (p. 406). In the use of narratives, the assumption is made that environmental beliefs, values and behaviors are developed through the context of communication. Therefore, individuals'

environmental ideas may vary depending upon the context in which they form their beliefs. For this reason, it is believed that narrative study can add to what is already gained from previous studies within the environmental concern literature (Shanahan et al. 1999).

Cases

In the remainder of the chapter, several cases that have used either traditional or non-traditional approaches to measuring nature's instrumental and intrinsic value will be discussed. Additionally, two studies that use an integrated measurement technique—traditional and non-traditional approach or two non-traditional approaches—will be reviewed. The intent of these reviews is to look at whether or not the techniques used in these studies have the capability to provide a good indication of policy outcomes people would like to see implemented.

Case 1: Contingent Valuation Method

In 1973, Congress passed the Endangered Species Act (ESA), and it was signed into law by the President. The ESA is a legal mandate to protect species that have been listed as threatened or endangered (T&E) under the law's requirements. Additionally, the ESA requires that species' critical habitat—the environment necessary for survival—is delineated and protected. Efforts to protect both T&E species and their critical habitat can be expensive and conflict with economic development. Therefore, benefit-cost analysis is likely to play an

increasingly important role in decision-making concerning wildlife recovery programs (Stevens et al. 1990). However, there are many problems associated with this valuation technique: 1) Wildlife recovery efforts may produce benefits that traditional measurement techniques are unable to capture. 2) There are questions about people's ability to assign dollar value to animals they may never see, and 3) there are questions about the sensitivity of the estimates to the methodology (Stevens et al. 1990).

The bald eagle population in New England drastically declined in the 1960s due to insecticide use. Additionally, land use change in the late 1800s eliminated wild turkeys from the area (Stevens et al. 1990). Interested in the economic valuation of wildlife and the questions this raised, Stevens et al. (1990) applied the contingent valuation method (CVM) to wildlife recovery programs in New England. A survey employing CVM measures about the value of bald eagles and wild turkeys was mailed to New England residents (Stevens et al. 1990). The survey included introductory information, questions about outdoor activities, wildlife importance, and questions on valuation (p. 329).

Over half of the respondents indicated the presence of bald eagles was very important. When asked why, the majority of respondents reported external values: intrinsic value, existence value, or bequest value (Stevens et al. 1990). The majority of the respondents indicated that the presence of wild turkeys was important, but no questions of why they were important were asked (p. 329). Economic valuation questions were asked for bald eagles, wild turkeys, or both eagles and turkeys. Of those respondents who thought bald eagles or turkeys

were important, Stevens et al. (1990) found the majority would not pay money for species recovery efforts. The two major reasons given for this unwillingness to pay were 1) the belief that the necessary money should come from taxes of license fees, and 2) ethical reasons: wildlife should not be valued in terms of dollars (p. 331).

Respondents' answers on the wildlife importance questions and the willingness to pay questions indicate the average values for wildlife recovery may be underestimated (Stevens et al. 1990). The researchers also found that benefit estimates were sensitive to the species being valued individually or together (p. 333). The researchers concluded that CVM might have forced people to pick between income and moral principle, which may lead to avoidance. Additionally, benefits of wildlife recovery can be difficult to quantify, and small changes in information have the potential to create large changes in values (Stevens et al. 1990). Overall, the researchers concluded that "benefit-cost analysis should not be used to make decisions about wildlife recovery programs" (p. 333).

Case 2: Travel Cost Method

The 2001 National Survey on Recreation and the Environment estimates that 97% of the U.S. population participates in outdoor recreation each year (Cordell et al. 2002). Many people in the U.S. use natural areas for recreation. While walking is the most popular outdoor activity, birding is the fastest growing activity (p.36). The rising number of people who use outdoor recreation facilities

poses many challenges to site managers: accessibility, resource impacts, crowding, and incompatible uses (p. 14). The increase in visitors to natural areas for recreation purposes places great emphasis on understanding the value visitors have for natural areas.

Outdoor recreation provides individuals with the chance to meet their needs for recreation while simultaneously upholding an area's natural and cultural resources (Shrestha et al. in press). People often travel long distances to recreate in natural areas, indicating a high demand for these resources. The travel cost method (TCM) is based on the premise that the number of visits to a recreation site is inversely correlated to travel distance (Loomis and Walsh 1997; Ward and Beal 2000; as cited by Shresta et al. in press). TCM survey measures estimate the number of people who are willing to visit a natural area at different total trip costs.

Recognizing the growing interest for tourism in Florida's natural areas, Shrestha et al. (in press) analyzed the demand for nature-based recreation in the Apalachicola River region. Their analysis focused on sites where recreation is motivated by the naturalness of the area. The researchers used TCM to analyze outdoor recreation demand and estimate the economic value of the natural resources (Shrestha et al. in press). The results of the analysis indicated a high demand for recreation in pristine natural areas. Shrestha et al. (in press) concluded that when managing for the economic value of outdoor recreation in the Apalachicola River area increased development is not necessarily needed.

While this study was able to estimate the economic value of recreation in natural areas, TCM is not able to represent the total ecological value of the area. Additionally, it cannot measure the intrinsic and non-use values of the area. If only the economic value of an area is considered when making management decisions, the risk of under valuing the resource is significant. This risk highlights the importance of additional measures of natural area values to supplement economic values.

Case 3: New Ecological Paradigm

The New Environmental Paradigm scale (Dunlap and Van Liere 1978), revised in 2000 and renamed the New Ecological Paradigm (NEP), is a widely used psychometric measure of environmental concern. The NEP was revised to address a broader ecological worldview, better balance between anti- and pro-attitudes, and to replace outdated terminology (Dunlap et al. 2000). The scale consists of 15 items that range from an ecocentric worldview to an anthropocentric worldview. Individuals who endorse the NEP display an ecocentric worldview, while those who do not endorse the NEP tend to display an anthropocentric worldview.

Hunter and Rinner (2004) used the NEP scale to determine the relationship between a person's knowledge and concern with species diversity and their environmental perspective (either ecocentric or anthropocentric). The researchers argue that a greater understanding of public perspectives on species conservation allows for the identification of more effective ways of environmental

education and communication (p.518). Results indicate those holding ecocentric worldviews do not exhibit a greater knowledge of species relative to people with anthropocentric views (p. 528). Additionally, results indicate people with ecocentric perspectives place higher priority on species preservation than those with anthropocentric perspectives, and species knowledge does not appear necessary for prioritizing species preservation in local land management decisions (Hunter and Rinner 2004). Individuals' NEP scores were not associated with prior knowledge of species. However, prior knowledge of species appeared to supplement individual's environmental perspectives (p. 528). Strong positive correlations were present between NEP scores and species preservation priorities in local land management decisions (p. 529).

The researchers' findings highlight the need for greater understanding of individuals' environmental values. Hunter and Rinner (2004) suggest that when engaging the public in land management decisions, it may be useful to have knowledge about the public's understanding of local biodiversity and their level of concern with species protection. As mentioned previously, the NEP scale is of great use when measuring broad value orientations and Hunter and Riner's study demonstrates its usefulness in predicting individuals' stance on broad policies such as species preservation. However, their study did not address specific management options for achieving the broader goal of species preservation. Techniques designed with the measurement of specific management issues in mind may be more useful for providing indications of policy implementations desired by the public.

Case 4: Public Values of Forests

Recent studies lend support to a trend in the declining importance of market-based forest values on national forests among the public and the increasing importance of non-market based forest values on national forests (Tarrant et al. 2003). A trend in the literature pertaining to natural resource values is the apparent lack of use of social values in decision-making. Traditional value measures (i.e. monetary value or board feet) appear to be easier and more comfortable for decision-makers to justify than nontraditional social measures (Schuster et al. 2003). However, traditional measures typically fall short of the total value of resources because of the non-specific nature of indirect measures (p. 357).

Tarrant et al. (2003) developed a 12-item scale designed to address the 12 values central to national forest management. The intent of the Public Values of Forests (PVF) scale is to measure the relative importance of national forest resources to the public (Tarrant et al. 2003). Results of the study showed additional support for the increase in multiple forest value orientation, where non-economic values are at least as important as traditional forest uses (p.28). The researchers reported a hierarchy of the public's complementary forest values that place forest protection as top priority, followed by amenity management and finally, by forest output management (p. 29).

The PVF demonstrated internal reliability and predictive validity. Tarrant et al. (2003) indicate that additional research might be necessary to expand the PVF scale to include use and non-use values, both economic (timber) and non-

economic (carbon sequestering). Additionally, the national forest system covers a diverse geographic area and the PVF scale may not be equally applicable in all national forests as management objectives of western national forests are often different from those located in the eastern half of the U.S. (Tarrant et al. 2003). The PVF scale, developed specifically for U.S. national forest management, may be limited to the national forest system in application. Value measurements that are designed more generally for natural areas may be more appropriate for locations outside of the USDA National Forest System, since management of natural areas is not subject to the same management criteria as national forests.

Case 5: Narrative Valuation

Satterfield et al. (2000) define narrative valuation as "the act of situating a valuation and decision problem in the context of a narrated story" (p. 315). Shanahan et al. (1999) argue that the environmental beliefs of individuals greatly depend on the communication contexts that generate meaning for environmental occurrences (p. 406). An argument that stems from symbolic interactionism, which suggests that people act toward objects based on the meaning those objects have for them. These meanings are derived from social interactions and modified through interpretation (Blumer 1986). Due to the multidimensionality of communication contexts, Shanahan et al. (1999) point out that what a person does in one situation does not necessarily have to match what they do in another situation.

Narratives have a beginning, middle, and end and the main goal of a narrative is to structure meaning (Shanahan et al. 1999). Walter Fisher proposed the *narrative paradigm* stating that people are storytellers and that all human rationality is structured by narratives (Shanahan et al. 1999; see Fisher 1987). Results from an exploratory study done by Shanahan et al. (1999) indicate that narratives as a form of measurement can touch on different constructs than traditional attitude measurements such as the NEP scale.

Satterfield et al. (2000) explore the use of narrative valuation as an alternative to willingness to pay (WTP) measurements. Additionally, the researchers explore the use of narratives for measuring the diverse social, ethical, scientific, and economic values of environmental problems and linking these diverse values to a specific policy (Satterfield et al. 2000). The use of narrative valuation may be an effective way of helping individuals work through complex, interconnected environmental problems and think through the specifics of environmental decisions (p. 316).

The efficacy of two formats of narratives in the policy context of salmon and hydroelectric power production was tested. The first format, "narrative mode," uses everyday language, first-person perspective and character development. The second format, "utilitarian mode," is characterized by passive language, abstract reasoning, and scientific thought (Satterfield et al. 2000). The results indicate that the "narrative mode" seemed to be better suited for helping people consider relevant value information, allowing them to apply the information to a complex policy decision (p. 324). While the results of the study

lend support to the use of narratives in measuring values in specific policy contexts, additional research is needed to explore more completely the contribution of narratives to decision making contexts.

Narratives may provide a method for creating manageable decision processes that are flexible enough to encompass diverse values. Shanahan et al. (1999) point out an individuals' decision-making context is rarely one where thoughts are easily separated and reduced to individual elements. As such, narratives may present a format that allows for realistic assessment of environmental beliefs (p.417). While narratives have the advantage of being context specific, they are not necessarily applicable across contexts, which is an advantage of attitudinal measures.

Case 6: Contingent Valuation, Travel Cost, and Attitudinal Measures

Taylor and Douglas (1999) reported on a research project to establish not only the economic value of the Trinity River in Northern California, but also the social values. The information gathered from the research was intended to contribute to the decision on flow allocation of the Trinity River (p. 315). The researchers used two mail surveys (one of river users and one of households in the region) that used CVM to measure willingness to pay for different stream flow alternatives for the Trinity River, and TCM to determine the number of trips and associated costs to the Trinity River each year. In addition to the traditional measurement techniques, non-traditional measurement methods (attitudinal statements) were used. Survey respondents were asked to rate the importance

of their recreational experience and their satisfaction with the overall experience. Finally, respondents were also asked to decide the best allocation of Trinity River flows, and give priority ratings for five river uses (Taylor and Douglas 1999).

The willingness to pay results indicate that the water allocated to the Trinity River and its associated benefits has economic value that exceeds the values of alternative water uses (p. 330). The overall importance of recreation on the Trinity River was ranked higher than users' satisfaction with their overall experience. These ratings suggest that users place high value on river recreation, but believe there is room for improvement in the conditions of the river (p.331). Respondents of both surveys indicated a desire for increased water flows in the Trinity River and were willing to pay the most for higher flows. Natural steelhead and salmon runs were ranked the highest water-use importance by both river users and area households, indicating a high existence value for anadromous fish (Taylor and Douglas 1999).

The researchers in the Trinity River study concluded that the increased understanding resulting from the integration of economic and social value measurements was more than worth the extra effort required (p.333). The combination of the traditional economic measures with the attitudinal measures allows decision-makers to not only know what individuals are willing to pay for a resource, but also the factors that contribute to that willingness-to-pay (Taylor and Douglas 1999). These results support the thought that the combination of CVM and attitudinal measures can be complementary methods, as they each measure different aspects of values.

Case 7: Natural Area Value Scale and Narrative Valuation

An Australian study combined the use of a value scale with narratives to determine natural area values based on intrinsic and instrumental values (Winter and Lockwood 2003; Winter 2005). The Natural Area Value Scale (NAVS) consists of 20-items designed to measure individuals' intrinsic, use (non-recreation), non-use, and recreation values regarding natural areas. In addition to the NAVS, two narratives were developed: a conflict between logging and forest protection, and a conflict between irrigation and wetland protection. In reference to the two narratives, individuals were asked to indicate their preference for protection in the form of a park and what Winter and Lockwood termed "willingness to sacrifice" to achieve there preference (Winter and Lockwood 2003; Winter 2005).

The NAVS proved to have good reliability at the sub-scale level (intrinsic, use, non-use, and recreation) and evidence of construct validity (Winter and Lockwood 2003). Results indicate that the NAVS can measure individuals' intrinsic, use, non-use, and recreation value regarding natural areas (p. 19). Results also indicate that the use of the NAVS can aid in distinguishing between and measuring the relative strength of individuals' intrinsic, use, non-use and recreation values regarding natural areas. The NAVS appears to be a simple means for decision-makers to evaluate natural area values.

Relationships between individuals' NAVS responses, their protection preference, and willingness to sacrifice indicate that intrinsic value is an important factor in the way that people perceive natural areas. Those who held

higher intrinsic values chose higher levels of protection, and those with higher use values opted for greater levels of use (Winter 2005). The researchers also compared results across three population samples: environmentalists, farmers, and the general public. Environmentalists consistently indicated higher intrinsic values and greater levels of protection than farmers did, and results from the general public sample fell between environmentalists and farmers (Winter 2005).

The integration of the value scale and narrative valuation gives insights into why individuals choose some levels of protection over others. The inclusion of intrinsic value in the NAVS is significant, as many of the aforementioned measurement techniques failed to consider the possibility of the value of nature for its own sake. Additionally, the identification of similar values among individuals of different groups (e.g. environmentalists and farmers) suggests opportunities for decision-makers to build on common ground.

Conclusion

Finding effective ways to measure individuals' natural resource values is essential to developing socially responsible resource management decisions. This chapter has evaluated several empirical studies that utilized different measurement techniques for understanding environmental values. Both traditional and non-traditional techniques were examined. While each method has its drawbacks, each method also has positive attributes.

The Contingent Valuation Method (CVM) was found to underestimate the economic value of wildlife recovery. Results from the study indicate that

individuals might have had difficulty choosing between income and moral principle. However, CVM does have the advantage of assigning market value on non-market goods. This is important since the literature indicates that policy makers are better able to understand and more easily defend market valuations.

The Travel Cost Method (TCM) was successful at determining the economic value of recreation for natural areas, but it does not measure the total ecological value of an area. Nor does the TCM measure the areas' non-use and intrinsic value. Like CVM, the Travel Cost Method has the advantage of assigning market value to non-market goods such as natural areas. Knowledge about the economic value of recreation has the potential to allow for the fulfillment of individuals recreation needs and the community's economic needs, while maintaining the natural and cultural heritage of an area.

The New Ecological Paradigm scale (NEP) is widely used as a measure of broad ecological worldviews. The scale's ability to identify broad value orientations may work well with general policy formulation, such as species preservation. However, the literature surrounding the application of the NEP scale suggests that the scale's predictive ability is not as great when applied to specific cases. Therefore, when making decisions on specific applications of general policy (i.e. the best way to manage a forest for species protection) the NEP alone may not be adequate for measuring the social values surrounding the natural resource.

The Public Value of Forests scale (PVF) indicate that the public holds multiple values for national forests. This scale was able to determine a hierarchy

of values for protection and use. However, this scale was designed specifically for use in studying the values of USDA National Forest lands. The scale may not be as applicable to forestlands outside of the National Forest System. Additionally, this scale may not be equally applicable across the many national forest units, as each region faces different management conflicts, possibly making the transferability of this scale problematic.

The use of narratives has the advantage of placing environmental values into context specific cases. However, this specificity may make it difficult to transfer across contexts. The combination of narratives with other measurement techniques may increase the efficacy of natural resource decision-making as it allows for the measurement of individuals' values and an provides indication of the interaction between multiple values in specific management contexts. The combination of the traditional and non-traditional methods (Trinity River case), and the combination of value scales and narratives (NAVS case) indicates that multiple measurement techniques can be complementary. This integration of methods not only measures what decision contexts people support, but also why they support it.

Increasing our knowledge of people's natural resource values will lead to resource protection and use decisions that more accurately reflect the desires of the public. The diversity of values and interests involved in natural resource management creates a complex and volatile atmosphere for decision-making. Identifying the methods that give decision-makers the best opportunity for

accurate and objective measurement of these diverse values is vital to a more democratic process of natural resource management.

CHAPTER III: METHODS

The measurement of the relative strengths of citizens' values regarding scarce natural resources is an important step in improving natural resource decision-making processes. There are four major steps for objectively gathering this much-needed information: 1) development of a scale that measures the relative strength of citizens' natural resource values; 2) administration of the measurement instrument; 3) analyses of resultant data; and 4) development of policy to govern scarce natural resources based on the results. In this chapter, the case study for which the survey instrument was developed and applied is introduced. Detailed descriptions of the techniques used for developing the survey instrument are presented, as are the methods used in administering the survey within the study area. The chapter closes with a discussion of the methods used to identify residents' values and management preferences.

The Case

The Appalachian Plateau is the westernmost physiographic province within the Southern Appalachian Hardwood Region, and consists of four sections (Barrett 1995). The northern portion, north of the Kentucky River Watershed in Kentucky, consists of the Allegheny Mountains in Pennsylvania and West Virginia, and to their west, the Allegheny Plateau in Pennsylvania, West Virginia, Ohio and Kentucky. The southern portion consists of the Cumberland Mountains in Virginia, Kentucky, and a small portion of Tennessee, and to their west, the Cumberland Plateau in Kentucky, Tennessee and Georgia (Fenneman 1938; as

cited by Clatterbuck et al. 2006; Barrett 1995; see Figure 1). The geographical focus of this research is the northern portion of the Cumberland Plateau in Tennessee—Cumberland, Fentress, Morgan and Scott Counties (Figure 2). For the purposes of this research, the term "plateau" will be used in reference to the Cumberland Plateau and the portion of the Cumberland Mountains in Tennessee.

The western and eastern borders of the plateau are defined by steep cliffs referred to as the escarpment. The plateau is drained by two major rivers, the Tennessee and the Cumberland, which have been dammed for hydroelectric power, flood control, transportation, waterfowl habitat and recreation (Clatterbuck et al. 2006). The forests of the plateau have a history of human disturbance and consist of a variety of stand conditions. The plateau forests are of varying age classes and depending upon the topography, the composition is mixed oak, mixed hardwood, mixed hardwood and pine, or pine. These forests have been identified by environmental organizations as some of the most diverse temperate forests in the world, and are home to a wide variety of fauna and flora, many of which are endemic to the area (NRDC 2006; TNC 2006). Several of the species found in this region are listed by the federal and Tennessee state governments as threatened or endangered. Some of the public land forest areas within this region provide significant habitat for at least two high priority neo-tropical migrant birds: the cerulean warbler, *Dendroica cerulean* and the golden-winged warbler, *Vermivora chrysoptera* (TWRA 2006).

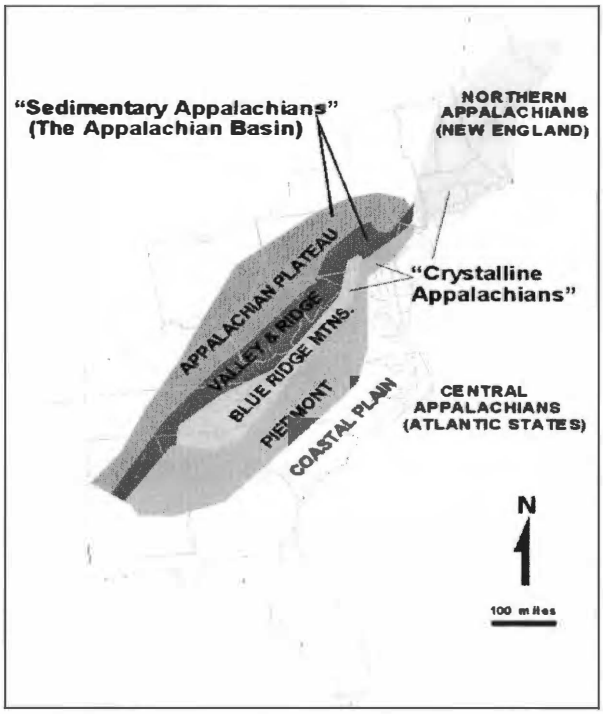


Figure 1 Appalachian Plateau Physiographic Province (Source: USGS http://3dparks.wr.usgs.gov/nyc/images/fig51.jpg)

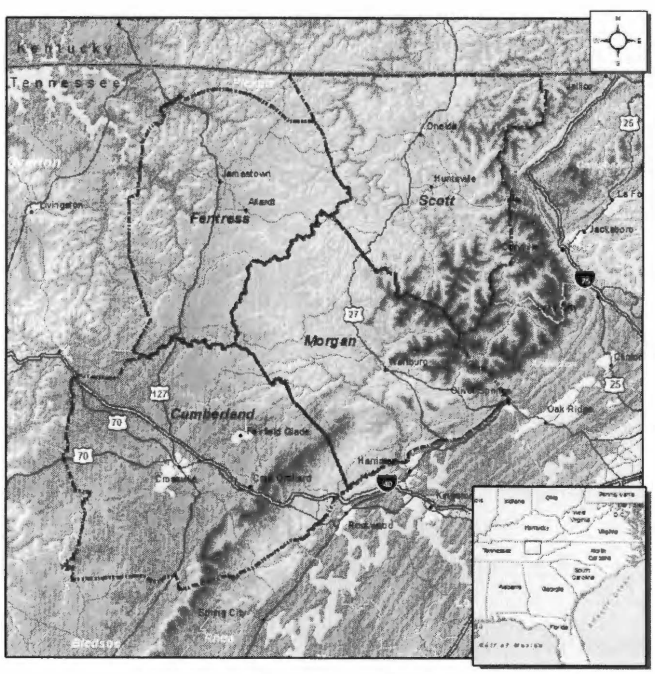


Figure 2 Four county study area.

Privately owned forests not associated with forest industry (non-industrial private forests) account for approximately 71% of the total timberland—forest land not withdrawn from timber utilization—in the study area (Schweitzer 2000). The study area is experiencing population growth and development, due in part to relatively inexpensive land prices, desirable location near natural settings, and a relatively mild climate. Increased housing density and decreased tract size in forest areas has been associated with decreased native wildlife populations, alterations to forest structure and function, long-term changes to and reductions in water quality and aquatic diversity, and decreases in timber production and management (Stein et al. 2005). Between the years 2000 and 2020, the Northern Cumberlands study area's population is projected to increase between 12.7 and 27.3% (Macie and Hermansen 2002). Additionally, increases in housing density are forecasted to occur on private forests in 5 to 20% of the watershed (Figure 3; Stein et al. 2005). Moderately heavy to heavy pressures from populations surrounding public lands in the study area are projected to occur by the year 2020 (Macie and Hermansen 2002). As population pressures on water resources increase, water is likely to become the most critical limiting natural resource in the study area (p. 31).

Four-County Site Description

The four county focal area of this research has experienced population growth in the past decade, and is projected to continue growing over the next

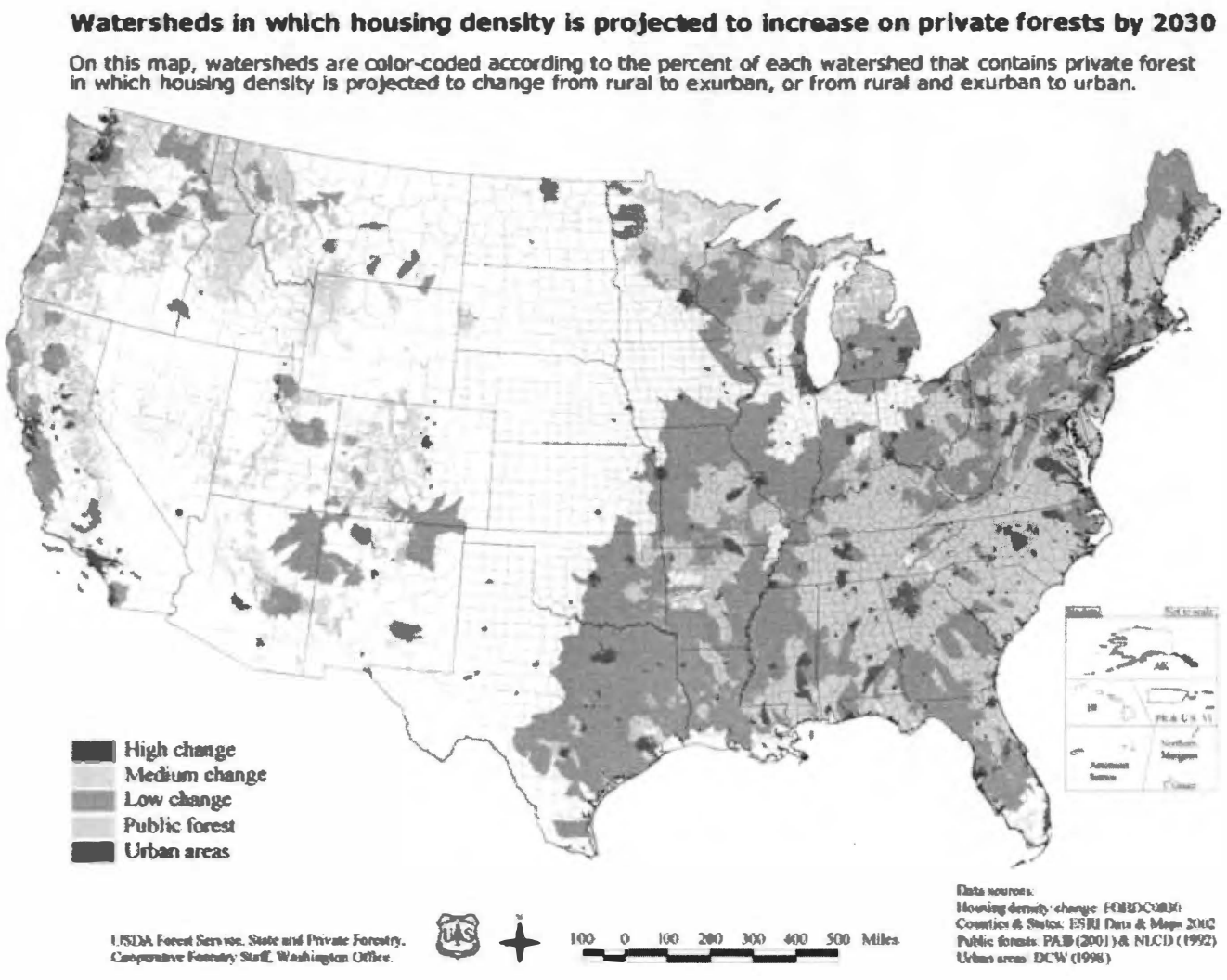


Figure 3 Housing Density Projections on Private Forests (Source: Stein et al. 2005)

two decades. The Emory, Obed, and New River Watersheds are all located within the study area. The Emory and Obed Rivers are two principal tributaries for the Tennessee River system in the area, which drains the east, south, and southwest portions of the Cumberland Plateau. The New River, via the Big South Fork of the Cumberland River, flows into the Cumberland River, which drains the western portion of the Cumberland Plateau. The watersheds also contain critical habitat for several aquatic and terrestrial threatened and endangered plant and animal species. A brief description of each county within the study area follows.

Cumberland County

Cumberland County's total land area is approximately 436,000 acres (681 square miles) and approximately 74% is classified as forestland. Additionally, 67% of the forestland available for timber use is owned by non-industrial private forest (NIPF) landowners, 15% is owned by the state, and 4% is owned by county/municipal governments (Schweitzer 2000). Within the county, outdoor enthusiasts have many options for hunting, fishing, hiking and other outdoor activities in state managed natural areas such as Catoosa Wildlife Management Area, Cumberland Mountain State Park, Ozone Falls and portions of the Justin P. Wilson "Cumberland Trail" State Park. In addition, Cumberland County, with 17 golf courses, has become well known for golf.

Fentress County

The total land area within Fentress County is approximately 319,000 acres (498 square miles), of which, approximately 74% is classified as forestland. Additionally, 76% of the forestland available for timber use is owned by NIPF landowners and 5% is owned by the state (Schweitzer 2000). Fentress County has several options for outdoor recreation with Pickett State Park, Twin Arches, Colditz Cove State Natural Area, and the Big South Fork National River and Recreation Area located in the county. Trail riding enthusiasts refer to the county as the "Trail Riding Capital of the Southeast" and the Chamber of Commerce boasts hundreds of acres of horse trails, campgrounds and stables around the county. With all the horse trails and natural areas within the county available for public recreation, tourism has become a large part of the local economy (http://www.jamestowntn.org).

Morgan County

Morgan County's total land area is approximately 334,000 acres (522 square miles), and almost 87% of this total area is classified as forestland. Of the forestland available for timber use, 86% is owned by NIPF landowners and 1% is owned by the state (Schweitzer 2000). A portion of the county contains parts of the Cumberland Mountains. Morgan County also offers a wide variety of activities for outdoor enthusiasts to enjoy, such as the Obed Wild and Scenic River, Lone Mountain State Forest, Catoosa Wildlife Management Area, Frozen Head State Park, and portions of the Cumberland Trail.

Scott County

Scott County's total land area is approximately 341,000 acres (533 square miles), and 87% of this total area is classified as forestland. NIPF landowners own approximately 76% of the forestland available for timber usage, while the state controls 4% of the available timberlands. Scott County is the most mountainous of the four counties, with portions of the Cumberland Mountains found within the county lines. As with the other three counties, Scott County offers a variety of locales for outdoor recreation. Portions of the Cumberland Trail, Big South Fork National River and Recreation Area, Twin Arches, and Honey Creek are found in Scott County.

Four- County Demographics

Residents who are 18 years and older and live in Cumberland, Fentress, Morgan and Scott Counties in Tennessee are the target population for this research. This choice for a target population is due to the current collaborative efforts to develop a habitat conservation plan for this portion of the Plateau. Since participation in decision-making processes is generally restricted to those community members who are of voting age or older, only residents who are 18 years or older made up the target population. The sample frame, meeting the above criteria for the target population, was randomly chosen. The list was purchased from Survey Sampling Inc., a company specializing in compiling sample lists for survey use. All county demographic information is from the U.S.

Census Bureau's 2000 Census and Census Bureau estimates for 2003 and 2005, which can be found at http://www.census.gov.

The four counties in the study area have similar demographic characteristics. The four counties are predominantly white. The educational attainment level is below Tennessee's state average, and the percentage of residents living below the poverty level is above the Tennessee state average. The four counties are all rural counties with Cumberland County having the micropolitan area (an area containing an urban core with a population of at least 10,000 but no more than 50,000 people) of Crossville. Additionally, the natural resource industries—agriculture, forestry, fishing and hunting, and mining—employ only a small percentage of each county's available workforce.

Cumberland County

The U.S. Census Bureau estimates that Cumberland County's population increased by approximately 10% from April 01, 2000 to June 01, 2005. Known for its retirement communities, Cumberland County's population 65 years and older in 2005 is estimated to have increased by 2%, representing approximately 21% of the total population. The 2005 Census estimates show the county's racial make-up to be predominantly white, with < 2% reporting a race other than white. The educational attainment for residents in the county, with 73% having a high school diploma or higher, is slightly lower than the state average of 76%. Almost half of the county's workforce listed sales/office (25%) or management/professional (24%) as their occupation. The manufacturing

industry reported the greatest percentage of employees in the workforce (19%), and natural resource industries (agriculture, forestry, fisheries, hunting and mining) only employed 4% of the county's workforce. Finally, an estimated 14% of the county's residents were living below the poverty level in 2003 (www.census.gov).

Fentress County

Fentress County's population is estimated by the U.S. Census Bureau to have increased by approximately 3% from April 01, 2000 to June 01, 2005. The county experienced a less than 1% increase in its population of residents 65 years and older, with an estimated 14% of the total population in 2005. The racial make-up of Fentress County is predominantly white, with 2005 estimates showing 99.4% of the residents as white. The 2000 Census reports the educational attainment of county residents to be well below the state's average; 57% of residents 25 years and older were high school graduates or higher, compared to the state average of 76%. Industries accounting for almost half of the workforce are manufacturing (25%), retail trade (13%), and construction (11%). Natural resource industries within Fentress County only account for approximately 5% of the county's workforce. Finally, 2003 Census Bureau estimates show that about 20% of the county's residents live below the poverty level; higher than the state's average of 13.5% (www.census.gov).

Morgan County

The U.S. Census Bureau estimates that the county's population increased 2% from April 01, 2000 to June 01, 2005. The population of residents 65 years and older is estimated to have increased 1.5% from the 2000 to 2005, for a total of 13% of the population. The racial make-up of the county population is predominately white (96.8%) with 2.5% of the residents reported as black and <1% as a race other than white or black. The county falls below the state average (76%) in educational attainment with 64% of the population 25 years and older having completed at least high school. The manufacturing, construction and educational/health/social services industries account for over half of the county's workforce with 25%, 12%, and 15% of the population, respectively. Only 4% of the workforce is employed by natural resource industries in Morgan County. Finally, 2003 U.S. Census Bureau estimates show 16.5% of the county's residents live below the poverty level, which is 3% higher than the state's average (www.census.gov).

Scott County

Scott County's total population is estimated to have increased by 3.5% for the period of April 2000 to June 2005. There was a small change in the county's population 65 years and older during this same time (+0.4%). In 2005, Scott County was predominantly white (98.5%). As with the other three counties, Scott County falls below the state average for educational attainment, with approximately 61% of the residents 25 years and older with at least a high school

diploma. Scott County has almost 7% more of its residents living below the poverty level (20%) than the state's average, 13.5% (www.census.gov).

Survey Development

Conflicts over the use and protection of natural resources have become central in many land use decisions faced by residents on the Plateau. Since these decisions should account for the values and interests of resident communities, effective measurement of the relative strength of natural resource values is desirable. Measuring relative strength of values takes into account the knowledge that people hold multiple values that are not mutually exclusive and each person attributes different levels of importance to individual values (Winter et al 2003).

Various determinants of behavior have been researched and integrated into theoretical models designed to explain environmental behavior (Stern and Dietz 1994; Fransson and Garling 1999; Bamberg 2003; Dunlap et al 2000). Using these models, broad classifications of people's values (e.g. biocentric or anthropocentric) have been identified. For the purposes of this research, it was necessary to utilize a measurement technique that not only identifies a person's individual values, but also measures the relative strengths of these values.

After reviewing the literature, a model developed by Winter and Lockwood (2003) which addresses multiple values and their relative strengths was identified. A mail survey to identify residents' values on scarce natural resources and their preferred management approach to a specific resource issue was

developed based on Winter and Lockwood's model (Appendix A). The first section of the survey instrument utilizes a value scale based heavily on the Natural Area Value Scale. Following the value scale, the next section involves a short scenario and questions concerning management preferences. Finally, the survey concludes with a short section of demographic questions.

Value Scale

The Natural Area Value Scale (NAVS) was designed to be applicable across a wide range of natural environments and developed for use in mail surveys of general public samples in developed, Western economies (Winter and Lockwood 2003). It was the developers' intent that the NAVS would provide decision-makers with information on the public's values towards natural environments. Among the specific uses for the NAVS is the "identification of the relative importance of intrinsic, non-use and use values for a given population" (2003, p. 17).

A review of the bodies of literature pertaining to natural resource values reveals multiple definitions and classifications of values. In their research, Winter and Lockwood adopted John O'Neill's definition of intrinsic value and a system used by economists which divided instrumental value into use and non-use (2003, p.11-12). O'Neill defined intrinsic value as:

> Intrinsic value is used as a synonym for non-instrumental value. An object has instrumental value insofar as it is a means to some other end. An

object has intrinsic value if it is an end in itself (as cited by Winter and Lockwood 2003, p. 11).

Winter and Lockwood also adopted the definitions for use and non-use from natural resource economists. Use values are defined as the benefits humans receive by contact with the resource (e.g. timber and ecotourism) and can be both consumptive and non-consumptive (Field 2001, p.152). Non-use values are defined as values individuals place on a resource separate from their use of it, and include option value, existence value, and bequest value (p. 153). For their purposes, Winter and Lockwood considered option value to be a use value. Keeping existence and bequest values classified as non-use (Winter and Lockwood 2003).

The NAVS contains 20 items divided into four sub-scales: intrinsic value, use (non-recreation) value, non-use value and recreation value. The intrinsic, use (non-recreation), and non-use sub-scales each consist of six questions. The recreation sub-scale only consists of two questions. During development of the NAVS, Winter and Lockwood found that people had an easier time deciding what did not constitute intrinsic value. Therefore, the six intrinsic items were written in a manner that agreement with them would exclude a belief in the intrinsic value of nature. Winter and Lockwood also identified a recreation sub-scale as separate from the use sub-scale. Since recreation was not originally intended to be separate from the use sub-scale, it was not thoroughly developed and the developers suggest that additional items are necessary to increase the validity of the recreation sub-scale (2003, p.18).

Outdoor recreation is an important component to natural resource management on the Plateau; therefore, additional items for the recreation sub-scale were developed. Other modifications were made as necessary to reflect the resource concerns on the Plateau. Many items within the NAV scale contain the phrase "natural areas." This phrase was further defined as "woods, wildlife and streams" in the survey instrument presented here. Additional word choice changes (e.g. "films" to "movies"; "forests" to "woods") were made to reflect the vernacular of the Plateau. Two NAVS items were dropped from the Plateau survey and two new items were added, bringing the number of items on the value scale to 23 (Table 1).

Narrative

In addition to the value scale, the survey continues to follow Winter and Lockwood's model with the inclusion of a scenario. The scenario included describes a possible natural resource management concern on the Plateau and asks respondents to answer questions about their preferred management approach. Communication research and theory suggests that people's ideas about the environment may differ depending on the communication context within which those ideas are assessed (Shananhan et al. 1999; see also Fisher's narrative paradigm 1984). The use of narratives may add to the understanding already gained from prior studies that utilized measures of belief statements. Through narratives, it will be possible to combine competing issues in ways that simple belief statements do not (p. 412).

Table 1 Value Scale

Value	Item
Use	Woods are valuable because they produce wood products, jobs and income for people. *
	To say woods, wildlife and streams have value just for themselves is a nice idea, but we can't afford to think that way; the welfare of people has to come first. *
	All plants and animals are precious and worth preserving but human needs are more important than their preservation. *
	Our children will be better off if we spend money on attracting jobs and industry instead of on the environment. *
	I don't like industries destroying parts of nature, but it is necessary for human survival. *
Non-Use	Woods, wildlife and streams are important to me because they are essential parts of the Plateau's overall character.
	Woods, wildlife and streams are valuable to keep for future generations of humans. *
	I'm seeing woods, wildlife and streams future generations of children may not see, and that concerns me. *
	We have to protect the environment for humans in the future even if it means reducing our standard of living today. *
	Even if I don't have first hand experience with woods, wildlife and streams, I can enjoy them by looking at books or seeing movies. *
	There are plenty of woods and streams that are not very nice to visit, but I'm glad they exist. *
	It is important to maintain healthy woods, wildlife and streams because what happens to one not only affects the others but also the overall health of the environment on the Plateau.
Intrinsic	The value of nature exists only in the human mind. Without people, nature has no value. *
	The only value woods, wildlife and streams have is what humans can make from them. *
	Places like wetlands have no value and should be converted to uses that are more productive. *
	Ugliness in nature indicates an area has no value. *
	The value of the natural environment only depends on what it does for humans. *
	Only humans have intrinsic value—that is value for their own sake. *
Recreation	Woods, wildlife and streams are important to me because I use them for recreation. *
	Woods, wildlife and streams are important because I might want to hunt or use them for recreation in the future. *
	Woods and streams are important because they provide settings in which I can share in activities like picnics and camping with groups of people (families, church groups, communities, etc.).
	Recreation in woods and streams is important because it provides me with physical, emotional and/or spiritual benefits.
	Woods and streams are important because they are good places for me to be physically active by hiking, climbing, camping, biking, paddling, etc.

* items taken from NAVS with only minor changes (2003, p.14; Winter 2005, p. 546)

The narrative utilized in this study presents respondents with a scenario that frames management concerns for the water usage and the presence of aquatic threatened and endangered species on the Plateau. The scenario includes brief descriptions of the river systems on the Plateau, the management dilemma, and the pros and cons of land development. It was designed for easy reading and understanding, to be brief, and to reflect the conflicting nature of instrumental and intrinsic values (Winter 2005). A focus group (discussed later)was used to test a draft scenario and determine what changes would be necessary to achieve the scenario design goals.

Following the scenario were four questions to gauge respondents management preferences regarding the scenario presented. First respondents were asked to indicate on a Likert Scale their level of agreement with five possible endings to the following: "Water supply projects are important for economic growth...." The second question forced respondents to pick the possible ending that best reflected their preferred management approach. Next, respondents were asked to indicate their level of agreement with five possible endings to the following: "Protecting aquatic life and endangered species is important enough that I ...." Finally, they were forced to pick the ending that best reflected their willingness to contribute to the successful implementation of their preferred management option.

The possible endings on the management approach questions were designed to move along a continuum from strong protection to strong use. The choices for the willingness to contribute questions were designed to range from

large sacrifice to no sacrifice. It is recognized that there are multiple ways to address personal sacrifice (e.g. monetary, volunteerism, etc.), and that it is important to be able to look at the strength of relative values in relation to possible trade-offs. Additionally, in the process of establishing possible mitigation and monitoring programs, it may be necessary to identify possible sources of funding. With this in mind, the decision was made to use monetary sacrifices as the measure of willingness to contribute.

Demographics

Several sociodemographic characteristics have been identified as significant factors in research regarding the social basis for environmental concern: age, education, employment in primary industry, political ideology and urban residency. In general, young adults who are well educated, liberal, not employed in primary industries and living in urban areas show more environmental concern than their counterparts (Jones and Dunlap 1992). Recently, research shows consistency with previous findings, with the exception of rural-urban differences (Jones et al. 1999). Jones et al. (2003) found that domestic in-migration of urban residents to rural communities may be one reason for seeing no significant difference between rural and urban residents in environmental concern.

The final section of the mail survey consists of 12 demographic questions. The first five questions are located at the beginning of the survey and the final seven questions are place at the end of the survey. The first five questions

pertain to the respondent's residency on the Plateau: length of residency, land ownership, and rural/urban characteristics. The remaining questions are general sociodemographic questions (e.g. gender, age, education, income, etc.). Demographic responses will be compared to the U.S. Census Bureau data to verify proportional representation. Additionally, characteristics related to environmental concern will be compared to the value sub-scales.

Focus Group

Focus groups are commonly used in research settings where perspectives differ between researchers and those they work with. Morgan (1996) defines a focus group as a data collection method for a predetermined topic using group interaction (p. 130). Prior to mailing the survey, a focus group was held to test the survey content for errors or difficulties. The focus group was held in August 2006 at the Morgan County Courthouse in Wartburg, TN, and consisted of eight participants who were residents of the study area. The sociodemographic characteristics of participants reflected the target population, and consisted of both males and females, education levels from less than high school through graduate degrees, and ages from mid-twenties to over 60.

Participants were asked to read the survey and determine if the survey was easy to read, had smooth transitions between questions, had an attractive format, and was interesting and non-threatening. Additional points of interest were typos, word choices and comments or suggestions for change. Participants suggested several word choice changes (e.g. ecosystem to natural environment,

and stakeholders to public, etc.). Suggestions were also made to rearrange the order of items on the value scales to avoid respondents becoming defensive. It was also felt that the scenario was too long and that respondents would not read it or possibly not respond to the survey as a result.

Prior to having the survey printed and prepared for mailing, changes were made in consideration of comments received. Word choices were changed to reflect a more general knowledge base, typos were corrected, and the scenario was altered. Participants felt that the scenario should either be taken out of the survey or moved to the back so respondents could read it if they chose. These comments reflected a research concern that response rates would be lowered due to the scenario. The importance of the scenario's function of placing management concerns in the context of a specific natural resource issue dictated that the scenario remain in the survey. However, in response to participant concerns, the scenario was shortened to convey only the information necessary to put the management issue into context.

Survey Application

The target population for this study is residents of Cumberland, Fentress, Morgan and Scott Counties in Tennessee who are 18 years or older. The U.S. Census Bureau estimates for 2005 indicate approximately 87,110 individuals 18 years and older living in these four counties (http://quickfacts.census.gov). At a 95% confidence level and a sampling error of ±2.5%, the survey sample size was 1600. A quota sample of 400 randomly selected names from each county was

used to prevent over sampling caused by population differences between counties. The sample list for this study was purchased commercially from Survey Sampling, Inc. in Connecticut. For the results of the survey to accurately represent the views of adults in the study area, recipients were asked to have an adult (18 years and older) who lived in the household and who had the most recent birthday complete the survey.

Survey design followed Salant and Dillman's (1994) Total Design Method. A four-wave mailing was used to administer the survey. The first mailing occurred on September 29, 2006, and consisted of a cover letter (Appendix B), a survey, and a self-addressed stamped envelope. The cover letter informed the individual what the survey was for, why they had received the survey, who should fill out the survey and the importance of their participation. This letter also explained the confidentiality of their answers and their informed consent to participate in the study. The second mailing was sent out two weeks later on October 13, 2006, and consisted of a follow-up postcard (Appendix C). The postcard was sent to thank those who had completed and returned the survey, and asking those who had not to please take the time to do so. Two weeks following the postcard, the third mailing was sent on October 27, 2006. This consisted of a second cover letter, a second survey, and another self-addressed stamped envelope. The final mailing was sent on November 10, 2006 and consisted of a second postcard reminder (Appendix C), which once again thanked those who had completed and returned their surveys and encouraged those who had not to please do so.

As surveys were returned, the survey identification code was recorded along with the date received and the respondents name was removed from the database. This was done to ensure that respondents' answers could not be linked to their names, ensuring the confidentiality of their responses. Of the 1600 surveys mailed, 85 surveys were undeliverable, leaving 1515 eligible surveys. 541 surveys were completed and usable; a total response rate of 36% with a 95% confidence level and ±4.2% sampling error. There were at least 100 completed and usable survey responses from each county: Cumberland County (160), Morgan County (135), Fentress County (132), and Scott County (114).

While every effort was made to ensure that all parts of the survey instrument were non-biased, a small percentage of respondents indicated that they felt the survey was either biased towards the environment or designed to polarize viewpoints. The survey instrument was not intentionally designed to create an "us versus them" feeling, but rather was designed to capture the conflicts inherent in discussions of the use and protection of natural resources. It is recognized that when the value sub-scales are placed on a continuum, use value would be expected to fall at the opposite end from intrinsic value. Since no follow-up to non-response was performed, it is impossible to know if this polarization and perceived bias was an important factor in why some survey recipients did not respond.

Data Management

All data were entered into a database using SPSS 14.0 (Statistical Package for the Social Sciences) and cleaned prior to analysis. Responses were coded with numbers to facilitate ease of management and analysis. Items utilizing Likert scales were coded 1 thru 5, with 1 meaning strongly disagree. Since the six items within the intrinsic value sub-scale were written in a negative manner, a strongly disagree with an item would mean that the respondent strongly agreed with the intrinsic value of nature. Therefore, these six items were reverse coded, so that if a respondent answered a question with a 1 then the reverse coded item would show a 5.

Value sub-scale reliability was tested using Cronbach's alpha. Correlations were run to verify that the assumed relationships between value sub-scales existed. A factor analysis was performed on the value scale items using maximum likelihood extraction with varimax rotation to confirm individual items' grouping onto the expected sub-scale. A cluster analysis was performed using respondents' summated sub-scale scores in order to classify individuals by their indicated values. Finally, descriptive statistics were used to summarize survey responses, and relationships between variables were tested using non-parametric statistical tests.

CHAPTER IV: ANALYSES AND RESULTS

Introduction

In the fall of 2006, a survey of residents 18 years or older in Cumberland, Fentress, Morgan and Scott Counties, Tennessee was administered. The purpose of this survey was to determine the relative strength of residents' values regarding scarce natural resources. Governance decisions based on individuals' values are a desirable outcome of the natural resource decision-making process. For this reason, the survey was designed to address the complexities of multiple values and their relative strength, while also ensuring that it was easily read and understood.

This chapter is divided into four main sections: demographics, value scale, management preference, and willingness to contribute. Within each of these sections, the analyses performed and their results will be presented. Additionally, a nominal discussion of these results will be included, with a more in-depth discussion of the prominent themes to follow in chapter V.

Demographics

Responses to the demographic questions included at the beginning and end of the mail survey provide a broad overview of the characteristics of survey respondents. As compared with the U.S. Census Bureau's 2000 data for the study area, the survey respondents tended to be older, better educated, and have higher incomes. Additionally, the gender composition of residents in the

study area is close to a 50/50 split, while the gender characteristics of respondents were approximately a 62/38% split male/female. Overall, 62.3% of respondents were male and 37.7% were female. Seventy-eight percent (78%) of respondents were between the ages of 40 and 79 years, with 40.4% of those being between the ages 40 and 59 years. Cumberland County had the highest percentage of respondents between the ages of 60 and 79 years (55.3%). This result is not surprising, as Cumberland County is well known for its retirement communities, and based on U.S. Census data from 2000, has the highest proportion of residents 65 and over of the four counties. The majority of respondents (50.1%) indicated an education level of high school/GED (27.5%) or some college (22.6%). An additional 12.1% of respondents have attained a graduate degree. Only 12.3% of respondents indicated that they had less than a high school diploma or GED. The majority of respondents (70%) indicated a household yearly income of $49,999 or less, and 27.5% of respondents indicated that income from natural resources was important relative to their total household yearly income (includes both "important" and "very important" responses).

The majority of residents (86.9%) in the study area live out in the country, and 20.2% of those living in the country lived on a farm. Fentress County and Morgan County had the highest percentage of residents living in the country with 96.1% and 93.9%, respectively. Cumberland County had the highest percentage of residents living in a town with 21.1%. The majority of respondents (69.1%) have lived most of their lives in the country, while approximately 9% of residents have lived the majority of their lives in cities with populations of 100,000 or more.

These results are consistent with the fact that the counties in the study area are rural counties, with the exception of Crossville located in Cumberland county being the one urban area.

The majority of residents (54.7%) were not life-long residents of the study area. Cumberland County had the greatest percentage of in-migrants to the study area with 80.5%. The majority of the life-long residents (74.4%) were younger than 60 years, while the majority of those residents who were in-migrants (59.9%) were 60 years of age or older. Additionally, the majority of in-migrants (57%) have lived within the study area for 20 years or less. Again, these results appear consistent with the 2000 U.S. Census data indicating population growth in all four counties, with Cumberland County having the highest percentage of population growth.

Since this survey targeted residents in general and not just landowners, there was no minimum acreage associated with questions about landownership. The majority of residents (87.2%) indicated that they own land within the study area. The U.S Census data from 2000 shows that between 78% and 83% of residents in the study area own their homes. The amount of total acres individuals' owned ranged from 0.25 acre to 3000 acres. The average acreage owned was 29 acres. However, when the 3000 acre-tract was removed from the calculation, the acreage owned ranged from 0.25 acre to 400 acres with an average of 21.7 acres. Almost two-thirds of the landowners own ten acres or less (64.7%).

Value Scale

The twenty-three value scale items were grouped into four sub-scales: use value, non-use value, recreation value, and intrinsic value. Value scale questions were measured using a Likert Scale. Responses were coded with integers ranging from 1 to 5, with 1 meaning strongly disagree and five meaning strongly agree, indicating agreement with the value being measured. A neutral value of 3 means the respondent neither agreed nor disagreed with the statement. The six questions designed to measure intrinsic value of nature were originally written in a manner that agreement with them would exclude a belief in the intrinsic value of nature. These items were reverse coded to make interpretation of the intrinsic sub-scale scores consistent with the interpretation of scores for the other value sub-scales. After recoding, the scale for the intrinsic value items was consistent with all other sub-scales. This means respondents who "strongly disagreed" or "disagreed" (originally coded as 1 and 2 respectively) with the statement as written were coded as 5 or 4 respectively, and interpreted as agreement with the intrinsic value of nature. The "agree" and strongly agree" responses (originally coded as 4 and 5, respectively) were also recoded as 2 and 1 respectively, and interpreted as disagreement with the intrinsic value of nature. All subsequent data analyses used the six recoded intrinsic value sub-scale items.

Cronbach's alpha was used to determine sub-scale reliability. A minimum reliability coefficient of 0.70 was used, as it is a widely accepted social science

threshold for scale reliability. Factor analysis was used to confirm individual items' grouping onto the expected sub-scale. First, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity were run to determine whether the data were suitable for factoring. The commonly accepted guideline is that the KMO value should be greater than 0.5 and Bartlett's test of sphericity should be significant ($p<0.05$) in order to generate a satisfactory factor analysis. Results from both the KMO (0.880) and Bartlett's test of sphericity ($p = 0.000$) indicate that the data are suitable for factor analysis. A factor analysis using maximum likelihood extraction and varimax with Kaiser Normalization rotation methods was performed. Individuals' summated sub-scale scores were used to determine any relationships between the four value sub-scales. Spearman's rho correlation coefficients were used to determine significant relationships. Finally, Mann-Whitney U Tests were used to compare differences in mean sub-scale scores at the county level.

Results

Scale reliability tests were performed for each of the four value sub-scales. Three of the four sub-scales had alpha coefficients ≥ 0.70, which indicates that the items within each sub-scale measure the same latent variable. However, the non-use value sub-scale, originally consisting of seven items, had an alpha of 0.63. In order to increase the alpha coefficient to a level ≥ 0.70, the scale statistics for "items deleted" were reviewed. By removing question 23 ("Even if I don't have first hand experience with woods, wildlife and streams, I

can enjoy them by looking at books or seeing movies") from the sub-scale it was possible to raise the alpha coefficient to a level ≥0.70. As a result, the non-use sub-scale reliability was within acceptable limits, giving all four sub-scales alpha coefficients ≥0.70 (Table 2). Question 23 was not used in any further analyses.

Four factors (Table 3) were identified based on the Kaiser criterion and Cattell scree test plots. Factors with eigenvalues <1.0 and factors located on the scree plot after the point where the curve begins to "flatten" were dropped from the analysis. Both techniques for determining the number of factors confirmed that the twenty-two items in the value scale could be grouped into four factors. Additionally, individual items that comprised each value sub-scale were grouped together in the factor analysis. Along with the results of Cronbach's alpha reliability tests, the factor analysis confirmed the presence of four separate value sub-scales.

Spearman's rho correlation coefficients indicate weak to moderate relationships between residents' scores on each of the four sub-scales. All reported correlations are significant at the p≤0.01 level. Scores on the use sub-scale were inversely correlated with scores on the non-use and intrinsic value sub-scales. Therefore, as respondents' scores increased on the use sub-scale, indicating greater level of agreement with use values, their scores on the non-use and intrinsic sub-scales decreased, indicating lower level of agreement with non-use and intrinsic values. In addition to the inverse relationship with the use value

Table 2 Value Sub-Scale Reliability

Value Sub-Scale	Cronbach's Alpha	Number of items
Use Value	0.729	5
Non-Use Value	0.724	6
Recreation Value	0.827	5
Intrinsic Value	0.751	6

Table 3 Rotated Factor Matrix[ab]

		Factor			
		1	2	3	4
Use	**Q7**			.384	
Use	**Q8**			.776	
Use	**Q16**			.595	
Use	**Q20**		-.337	.369	-.365
Use	**Q24**			.443	
Rec	**Q9**	.661			
Rec	**Q13**	.741			
Rec	**Q17**	.759			
Rec	**Q21**	.652			
Rec	**Q25**	.619	.338		
Int	**rQ6**			-.447	.362
Int	**rQ10**				.504
Int	**rQ14**				.612
Int	**rQ18**				.630
Int	**rQ22**			-.387	.518
Int	**rQ26**				.386
Non	**Q11**		.451		
Non	**Q12**		.611		
Non	**Q15**		.647		
Non	**Q19**		.439		
Non	**Q27**		.326		.318
Non	**Q28**		.646		

Extraction Method: Maximum Likelihood
Rotation Method: Varimax with Kaiser Normalization
a. Rotation converged in 7 iterations.
b. Absolute values ≤ 3.0 suppressed.

sub-scale, scores on the non-use sub-scale were positively related to scores on the recreation and intrinsic value sub-scales. Therefore, as respondents' scores on the non-use sub-scale increased, their scores on the recreation and intrinsic value sub-scales increased. Scores on the recreation sub-scale were also positively correlated with scores on the intrinsic value sub-scale, although the correlation coefficient indicates a weak correlation. Table 4 shows the correlation coefficients for each value sub-scale.

Use Value Sub-Scale

The use value sub-scale consists of five items designed to measure residents' level of agreement with valuing natural resources for their direct use by humans (Table 5). Residents in the study area scored lower, on average, on the use value sub-scale than on the other sub-scales. Their mean score for the use sub-scale was 2.83, indicating a neutral level of agreement with the use value of natural resources. Results of the Mann-Whitney U tests indicated that residents of Fentress and Morgan Counties differed significantly (p=0.019) in their mean

Table 4 Sub-Scale Correlations[ab]

		Use	Non-Use	Recreation	Intrinsic
Use	Spearman's rho	1	-.321	-.029	-.536
	Sig. (2-tailed)	-	.000	.500	.000
Non-Use	Spearman's rho	-.321	1	.402	.418
	Sig. (2-tailed)	.000	-	.000	.000
Recreation	Spearman's rho	-.029	.402	1	.119
	Sig. (2-tailed)	.500	.000	-	.006
Intrinsic	Spearman's rho	-.536	.418	.119	1
	Sig. (2-tailed)	.000	.000	.006	-

a. Listwise N=541
b. Summated sub-scale scores used.

scores. On average, residents of Morgan County had higher scores on the use value sub-scale than residents of Fentress County, indicating a stronger level of agreement with the use value of natural resources. However, residents of all four counties indicated a neutral level of agreement, on average (Table 6). A description of residents' responses to each item of the use value sub-scale follows below.

The majority of residents (72.3%) either agreed or strongly agreed with item Q7: *woods are valuable because they produce wood products, jobs and income for people.* The mean response for this item was 3.68, indicating that on average residents agree with this statement. On average, residents indicated neutral agreement (2.73) with item Q8: *to say woods, wildlife and streams have value just for themselves is a nice idea, but we can't afford to think that way; the welfare of people has to come first.* A slight majority of residents (53.3%) either

Table 5 Use Value Sub-Scale Items

Number	Item	Mean Response
Q7	Woods are valuable because they produce wood products, jobs and income for people. *	3.68
Q8	To say woods, wildlife and streams have value just for themselves is a nice idea, but we can't afford to think that way; the welfare of people has to come first. *	2.73
Q16	All plants and animals are precious and worth preserving but human needs are more important than their preservation. *	2.69
Q20	Our children will be better off if we spend money on attracting jobs and industry instead of on the environment. *	2.34
Q24	I don't like industries destroying parts of nature, but it is necessary for human survival. *	2.82
	Mean Use Value Sub-Scale Score (all counties)	**2.83**

*Items taken from the NAVS with only minor changes

disagreed or strongly disagreed with this statement. The slight majority of residents (52.7%) either disagreed or strongly disagreed with item Q16: *all plants and animals are precious and worth preserving but human needs are more important than their preservation*. However, the mean response for this item was 2.69, indicating, overall, a neutral level of agreement with the statement. 64.9% of residents either disagreed or strongly disagreed with item Q20: *our children will be better off if we spend money on attracting jobs and industry instead of on the environment.* The mean response (2.34) indicates that on average residents disagreed with this statement. There were no significant differences ($p<0.05$) in mean responses at the county level for each of the above items.

The mean response (2.82) indicates that on average residents were neutral in their level of agreement for item Q24: *I don't like industries destroying parts of nature, but it is necessary for human survival.* 47.7% of residents either disagreed or strongly disagreed with this statement and 39.5% either agreed or strongly agreed with this statement. There were significant differences ($p<0.05$) in mean responses between residents of Fentress County and Morgan County,

Table 6 Mean Scores on Use Value Sub-Scales

County	Adjusted Mean Score[a]	Mean Score[b]
Cumberland	2.80	13.99
Fentress	2.71	13.54
Morgan	2.95	14.76
Scott	2.87	14.36

a. mean score ÷ number of sub-scale items (range 1-5)
b. non-adjusted mean score (maximum possible score is 25)

and between residents of Fentress County and Scott County. The mean response for Fentress County residents was 2.58, indicating disagreement with this statement. The mean responses for Morgan County residents and Scott County residents (2.93 and 2.97, respectively) indicated a neutral level of agreement with this statement. On average, Fentress County residents have a stronger level of disagreement than Morgan County and Scott County residents do. Figure 4 illustrates the frequency of responses for Q24 at the county level.

Non-Use Value Sub-Scale

The non-use value sub-scale consists of six items designed to measure residents' level of agreement with valuing natural resources separate from their use of them: option value, existence value, and bequest value (Table 7). There were no significant differences ($p<0.05$) in residents' mean scores at the county

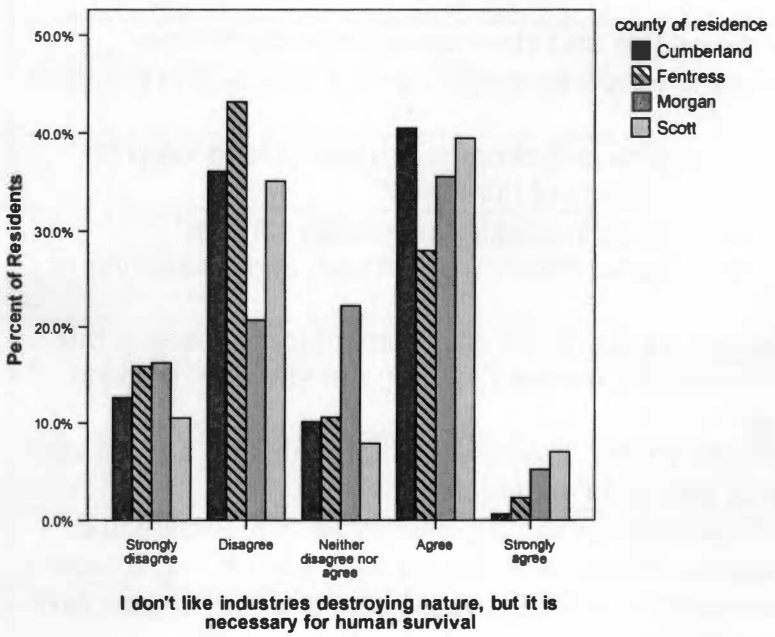


Figure 4 Use Item Q24 Frequencies at County Level

level (Table 8). On average, residents in the study area scored highest on the non-use value sub-scale than on the other sub-scales. Their mean score was 4.27, indicating strong agreement with the non-use value of natural resources. A description of residents' responses to each item of the non-use value sub-scale follows below.

The vast majority of residents (94.2%) either agreed or strongly agreed with item Q11*: woods, wildlife and streams are important to me because they are essential parts of the Plateau's overall character*. Residents' mean response (4.43) indicates strong agreement with this statement, on average. The majority of residents (65.1%) indicated that they strongly agreed with item Q12: *woods, wildlife and streams are valuable to keep for future generations of humans.*

Table 7 Non-Use Value Sub-Scale Items

Number	Item	Mean Response
Q11	Woods, wildlife and streams are important to me because they are essential parts of the Plateau's overall character.	4.43
Q12	Woods, wildlife and streams are valuable to keep for future generations of humans. *	4.60
Q15	I'm seeing woods, wildlife and streams future generations of children may not see, and that concerns me. *	4.36
Q19	We have to protect the environment for humans in the future even if it means reducing our standard of living today. *	3.69
Q27	There are plenty of woods and streams that are not very nice to visit, but I'm glad they exist. *	4.05
Q28	It is important to maintain healthy woods, wildlife and streams because what happens to one not only affects the others but also the overall health of the environment on the Plateau.	4.54
	Mean Non-Use Value Sub-Scale Score (all counties)	**4.27**

*Items taken from the NAVS with only minor changes.

Additionally, 32.5% of residents agreed with this statement, indicating that the vast majority of residents (97.6%) were in agreement with Q12. The mean response for this item was 4.60, indicating strong agreement on average. Residents' mean response (4.05) indicates agreement with item Q27*: there are plenty of woods and streams that are not very nice to visit, but I'm glad they exist.* The majority of residents (87.2%) either agreed or strongly agreed with this statement. 97% of residents either agreed or strongly agreed with item Q28*: it is important to maintain healthy woods, wildlife and streams because what happens to one not only affects the others but also the overall health of the environment on the Plateau.* The mean response (4.54) indicates that on average residents strongly agree with this statement. There were no significant differences ($p<0.05$) in residents' mean responses to the above items at the county level.

The majority of residents (92.6%) indicated that they either agreed or strongly agreed with item Q15*: I'm seeing woods, wildlife and streams future generations of children may not see, and that concerns me*. The mean response was 4.36, indicating strong agreement with this statement. However, there were

Table 8 Mean Scores on Non-Use Value Sub-Scales

County	Adjusted Mean Score[a]	Mean Score[b]
Cumberland	4.21	25.25
Fentress	4.30	25.77
Morgan	4.30	25.77
Scott	4.28	25.66

a. mean score ÷ number of sub-scale items (range 1-5)
b. non-adjusted mean score (maximum possible score is 30)

significant differences ($p<0.05$) in Cumberland County residents' mean response (4.21) and the mean responses of residents in Fentress (4.48), Morgan (4.40) and Scott (4.39) counties. On average, Cumberland County residents indicated a lower level of agreement with this statement than residents of Fentress, Morgan and Scott counties. However, residents of all four counties indicated strong agreement with this statement on average. Figure 5 illustrates the frequency of responses for item Q15 at the county level.

Residents' mean response of 3.69 indicated agreement with item Q19: *we have to protect the environment for humans in the future even if it means reducing our standard of living today*. The majority of residents (70.2%) either agreed or strongly agreed with this statement. There were significant differences ($p<0.05$) in Cumberland County residents' mean response (3.51) and those of

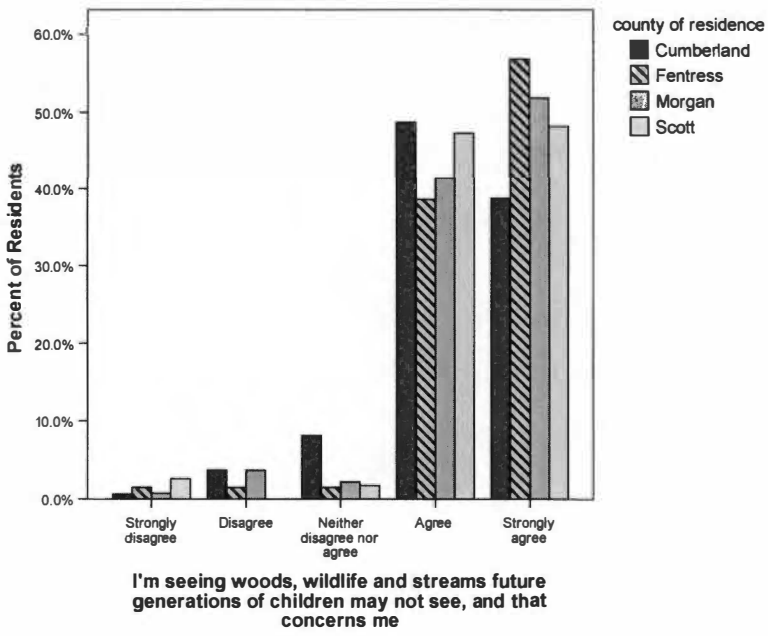


Figure 5 Non-Use Item Q15 Frequencies at County Level

residents in Fentress (3.77) and Morgan (3.83) counties. On average, Cumberland County residents indicated a lower level of agreement with this statement than residents of Fentress and Morgan counties. Figure 6 shows the frequency of residents' responses to Q19 at the county level.

Recreation Value Sub-Scale

The recreation value sub-scale consists of five items designed to measure residents' level of agreement with valuing natural resources for their recreational use by humans (Table 9). Residents' mean score for the recreation value sub-scale was 3.99, indicating agreement with the recreational value of natural resources. Results of the Mann-Whitney U tests indicated that residents of Cumberland County differed significantly ($p<0.05$) from residents of Fentress,

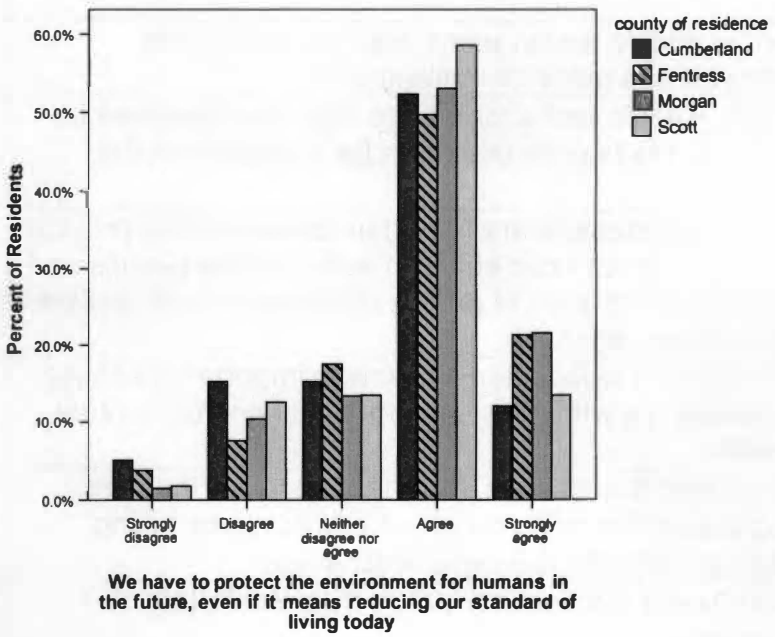


Figure 6 Non-Use Item Q19 Frequencies at County Level

Morgan and Scott counties in their mean scores. On average, residents of Cumberland County had lower scores on the recreation value sub-scale than residents of Fentress, Morgan and Scott counties (Table 10). While Cumberland County residents indicate a lower level of agreement with the recreational value of natural resources, all four counties' mean scores indicated agreement with this sub-scale. A description of residents' responses to each item of the use value sub-scale follows below.

The majority of residents (83.9%) either agreed or strongly agreed with item Q21: *woods and streams are important because they provide settings in which I can share in activities like picnics and camping with groups of people (families, church groups, communities, etc.)*. Residents' mean response (4.01)

Table 9 Recreation Value Sub-Scale Items

Number	Item	Mean Response
Q9	Woods, wildlife and streams are important to me because I use them for recreation. *	3.95
Q13	Woods, wildlife and streams are important because I might want to hunt or use them for recreation in the future. *	3.96
Q17	Woods and streams are important because they provide settings in which I can share in activities like picnics and camping with groups of people (families, church groups, communities, etc.).	3.95
Q21	Recreation in woods and streams is important because it provides me with physical, emotional and/or spiritual benefits.	4.01
Q25	Woods and streams are important because they are good places for me to be physically active by hiking, climbing, camping, biking, paddling, etc.	4.14
	Mean Score Recreation Value Sub-Scale (all counties)	**3.99**

*Items taken from the NAVS with only minor changes

indicates agreement with this statement. There are no significant differences in mean response between counties. Residents' mean response of 3.95 indicates agreement with item Q9: *woods, wildlife and streams are important to me because I use them for recreation.* The majority of residents (78.2%) either agreed or strongly agreed with item Q9. There were significant differences ($p=0.027$) in mean responses to Q9 between residents of Cumberland County and Fentress County. Residents of Cumberland County had a lower mean response (3.84) than residents of Fentress County (4.08). On average, Cumberland County residents had a lower level of agreement with this statement, although mean responses for both counties indicated agreement with item Q9. Figure 7 illustrates the frequency of residents' responses at the county level.

The majority of residents (79.9%) either agreed or strongly agreed with item Q13: *woods, wildlife and streams are important because I might want to hunt or use them for recreation in the future.* Residents' mean response (3.96) to this item indicates agreement with this statement, on average. There were

Table 10 Mean Scores on Recreational Value Sub-Scale

County	Adjusted Mean Score[a]	Mean Score[b]
Cumberland	3.87	19.36
Fentress	4.07	20.37
Morgan	4.00	20.01
Scott	4.04	20.22

a. mean score ÷ number of sub-scale items (range 1-5)
b. non-adjusted mean score (maximum possible score is 25)

significant differences ($p<0.05$) in mean responses to item Q13 between residents of Cumberland County and residents of Fentress and Scott Counties. Residents of Cumberland County had a lower mean response (3.81) than residents Fentress County (4.05) and Scott County (4.08). While the mean responses of all three counties indicate agreement with this statement, Cumberland County residents indicated a lower level of agreement than residents of Fentress and Scott counties, on average. Figure 8 shows frequency of responses at the county level for item Q13.

Study area residents' mean response of 3.95 indicates agreement with recreation sub-scale item Q17: *woods and streams are important because they are good places for me to be physically active by hiking, climbing, camping, biking, paddling, etc.* The majority of residents (78.7%) either agreed or strongly

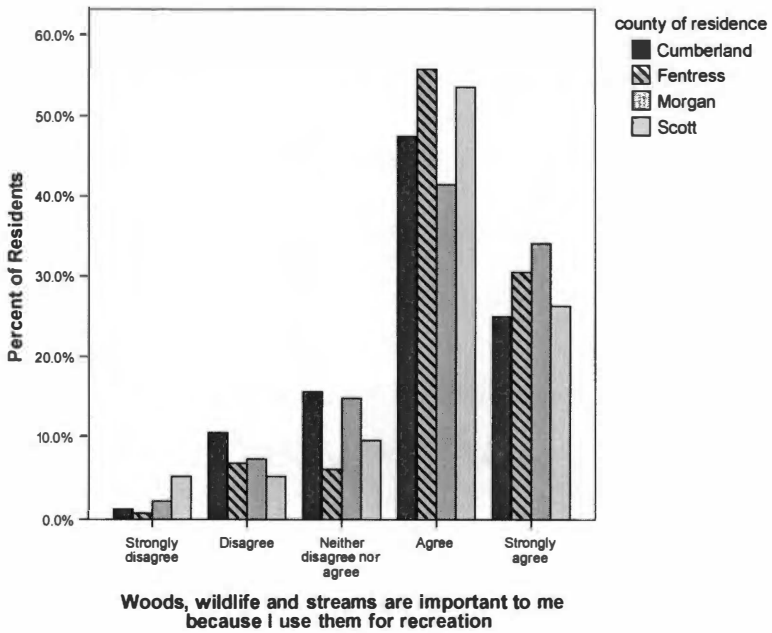


Figure 7 Recreation Item Q9 Frequencies at County Level

agreed with this statement. There were significant differences ($p<0.05$) in mean responses to item Q17 between residents of Cumberland County and residents of Fentress and Scott counties. Cumberland County residents had a lower mean response (3.83) to this item compared to residents of Fentress County (4.02) and Scott County (4.05). On average, Cumberland County residents indicated a lower level of agreement with this statement, although, the mean responses for all three counties indicate agreement with this statement. Figure 9 illustrates the frequency of responses for item Q17 by county.

The majority of residents (87.1%) either agreed or strongly agreed with recreation sub-scale item Q25: *recreation in woods and streams is important because it provides me with physical, emotional and /or spiritual benefits.* The mean response of 4.14 indicates agreement with this statement. There were

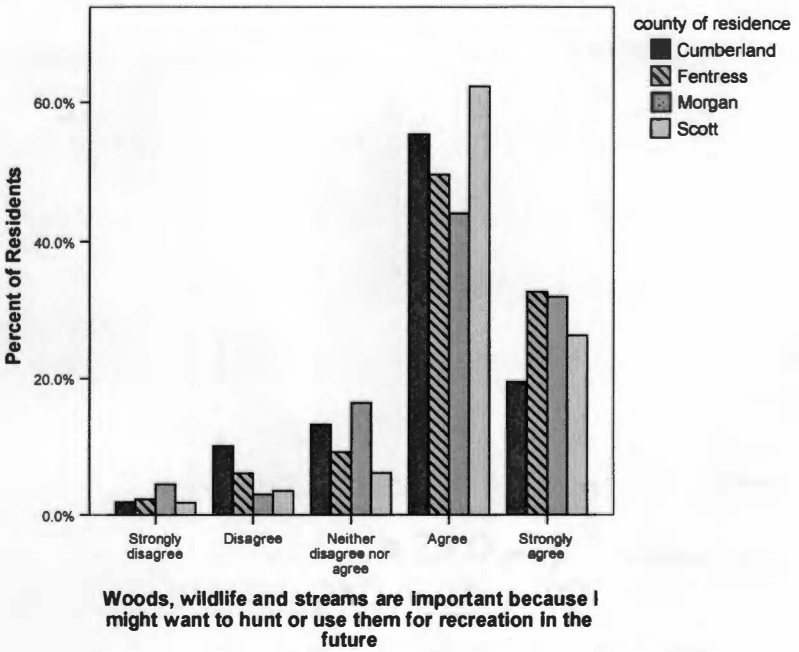


Figure 8 Recreation Item Q13 Frequencies at County Level

significant differences ($p<0.05$) in mean responses between Cumberland County residents and Fentress County residents. Cumberland County residents' mean response (4.06) was lower than Fentress County residents' (4.23), indicating a lower level of agreement with this statement. On average, Fentress County residents strongly agreed with item Q25, while Cumberland County residents agreed with this statement. Figure 10 depicts the response frequencies at the county level.

Intrinsic Value Sub-Scale

The intrinsic value sub-scale consists of six items designed to measure residents' level of agreement with belief that nature has value in and of itself (Table 11). Residents' mean score for the intrinsic value sub-scale was 3.92, indicating agreement with the intrinsic value of nature. Results of the Mann-

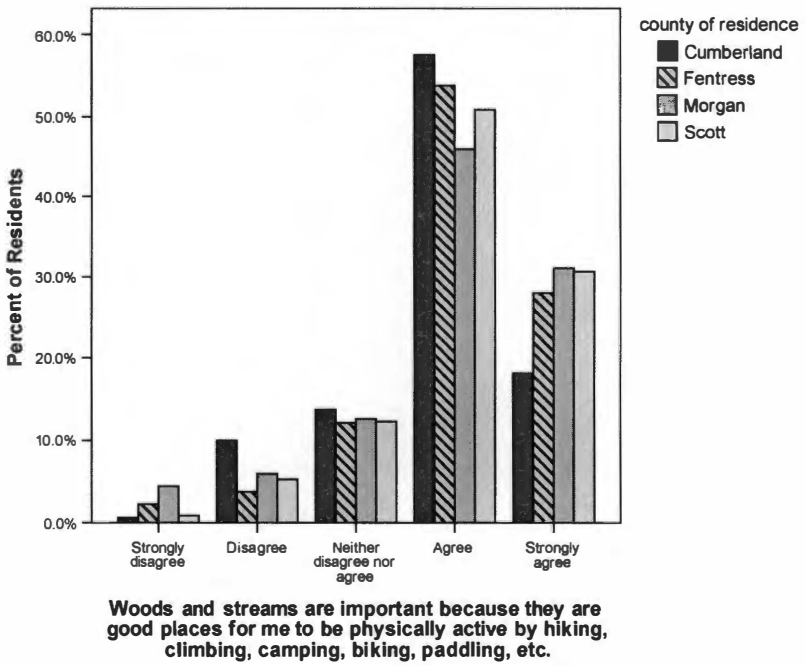


Figure 9 Recreation Item Q17 Frequencies By County

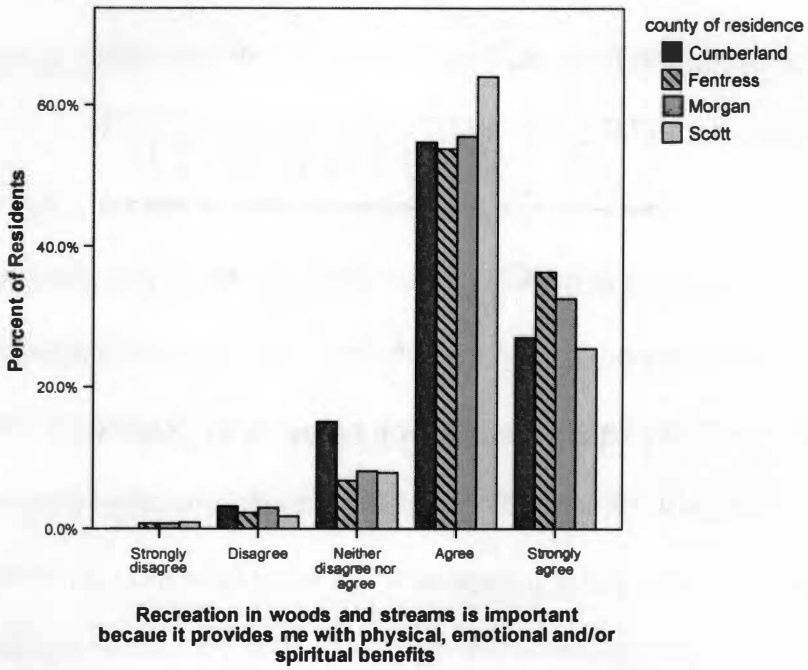


Figure 10 Recreation Item Q25 Frequencies by County

Table 11 Intrinsic Value Sub-Scale Items

Number	Item	Mean Response[a]
Q6	The value of nature exists only in the human mind. Without people, nature has no value. *	4.06
Q10	The only value woods, wildlife and streams have is what humans can make from them. *	4.16
Q14	Places like wetlands have no value and should be converted to uses that are more productive. *	3.97
Q18	Ugliness in nature indicates an area has no value. *	3.96
Q22	The value of the natural environment only depends on what it does for humans. *	3.89
Q26	Only humans have intrinsic value—that is value for their own sake. *	3.74
	Mean Score for Intrinsic Value Sub-Scale (all counties)	**3.92**

*Items taken from the NAVS with only minor changes
a. mean response for item after reverse coding

Whitney U tests indicated that there were no significant differences ($p<0.05$) in mean scores between the four counties (Table 12). A description of residents' responses to each item of the use value sub-scale follows below.

The majority of residents (79.3%) either agreed or strongly agreed with the recoded item Q6 (recoded items will be denoted with an "r" preceding the item number). The mean response for item rQ6 was 4.06, indicating agreement with the belief that nature has value independent of humans. Residents' mean response to rQ10 was 4.16, indicating agreement with the belief that woods, wildlife and streams have value independent of what humans can make from them. The majority of residents in the study area (86.2%) either agreed or strongly agreed with this statement. In response to item rQ18, residents' mean response was 3.96; indicating agreement with the belief that "ugliness in nature" does not indicate an area is valueless. 82.7% of residents indicated that they either agreed or strongly agreed with rQ18. The majority of residents (78.8%) also either agreed or strongly agreed with rQ22: the value of nature does not depend on what it does for humans. The mean response for rQ22 was 3.89 indicating agreement with the above statement, on average. 68.5% of residents in the study area also either agreed or strongly agreed with item rQ26: nonhuman species have intrinsic value. The mean response for rQ26 was 3.74, indicating agreement with this item. There were no significant differences ($p<0.05$) in the above items mean responses at the county level.

There were significant differences in mean responses to rQ14 (Figure 11). The majority of residents in the study area (76.3%) either agreed or strongly

Table 12 Mean Scores for Intrinsic Value Sub-Scale

County	Adjusted Mean Score[a]	Mean Score[b]
Cumberland	3.99	23.91
Fentress	3.97	23.80
Morgan	3.81	22.87
Scott	3.74	22.44

a. mean score ÷ number of sub-scale items (range 1-5)
b. non-adjusted mean score (maximum possible score is 30)

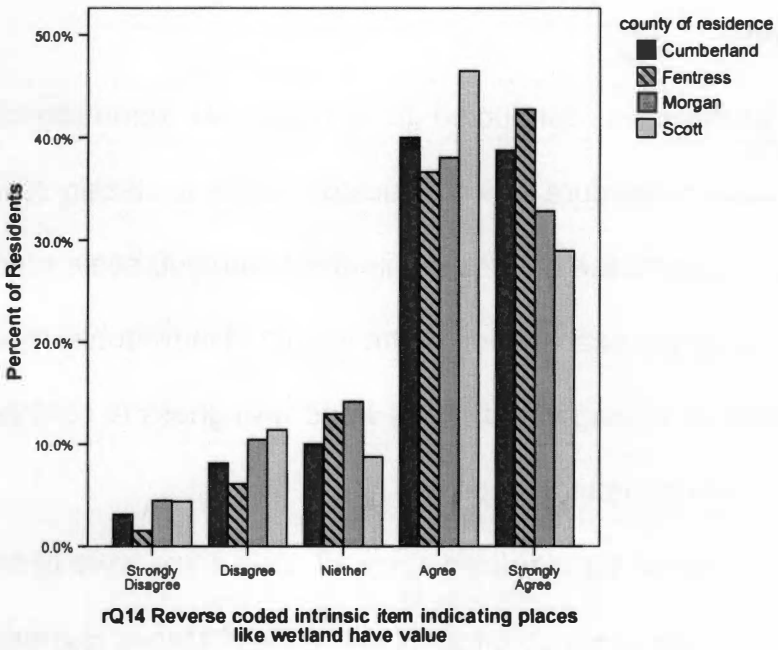


Figure 11 Intrinsic Item rQ14 Frequencies by County

agreed with item rQ14: places such as wetlands have value. The mean response for this item was 3.97, indicating agreement with rQ14. Residents of Fentress County had a higher mean response (4.13) compared to residents of Morgan County (3.84) and Scott County (3.84), indicating a higher level of agreement with rQ14. While Fentress County residents' average response is higher than residents of Morgan and Scott counties, all three counties' mean responses indicate agreement with the belief that places like wetland have value.

Value Clusters

Cluster analysis was conducted using individuals' summated sub-scale scores. The cluster procedure was conducted in order to classify residents into homogeneous groups based on their summated value sub-scale scores. This grouping allowed for the examination of the impact of individuals' relative strength of values on management choices and willingness to contribute to the management of scarce natural resources.

The data was not standardized since all scale items were of equal length. Since the data set was relatively large (N=541), the K-Means clustering procedure was used. The number of clusters to be used was determined by taking a random sample of 200 cases and running a hierarchical clustering procedure. Review of the output from this procedure indicated the possibility of three clusters. To confirm the use of three clusters, K-Means clustering was performed on all 541 cases, first specifying three clusters and then again specifying four clusters. The test with three clusters produced groups large

enough to be statistically valid, while the four cluster procedure produced one group with only a small number of cases in it. Therefore, the K-Means clustering procedure with three clusters was used. Results of the cluster analysis produced three value clusters that were of sufficient size for statistical analysis.

Results

Use of demographic variables in characterizing cluster membership was done only for descriptive purposes. All three clusters had similar distribution of where cluster members lived currently, lived most of their lives, length of residency, land ownership, and importance of income from natural resources. The majority of residents in each cluster lived in the country (both on a farm and not on a farm), and had lived most of their lives in the country. Additionally, the majority of residents in each cluster had lived within the study area for 20 years or longer and owned their own land. Finally, the percentage of residents who indicated that income from natural resources was important ranged from 26 to 32% between the 3 clusters, with roughly 38% of residents in each cluster not having income from natural resources. Table 13 illustrates the differences in demographic characteristics between clusters.

Each value cluster has a unique combination of scores for the four value sub-scales (Table 14). Members of value cluster 1 displayed high scores for intrinsic, non-use and recreation values, and low scores for use value. Cluster 1 was the largest of the three value clusters and represented 44% of the sample. This group had the youngest membership with 18% of its members younger than

Table 13 Demographic Characteristics of Value Clusters[a]

Demographic	Cluster 1	Cluster 2	Cluster 3
Gender	%	%	%
Male	58	57	69
Female	42	43	31
Age	%	%	%
< 40 yrs	18	9	14
40-59 yrs	44	23	42
≥ 60 yrs	38	68	44
Education	%	%	%
< High School	4	22	6
Some High School	3	11	5
HS Diploma/GED	24	28	31
Technical	11	10	14
Some College	27	10	22
Undergrad degree	15	5	5
Some Grad School	5	8	2
Grad degree	11	7	15
Household Yearly Income	%	%	%
< $10,000	6	27	5
$10,000 – $29,999	26	30	28
$30,000 -$49,999	37	18	37
≥ $50,000	31	25	30

a. Percentages may not total 100% due to rounding.

Table 14 Value Scores for Clusters[a]

Cluster	N	% total	Use Value	Non-Use Value	Recreation Value	Intrinsic Value
1	238	44.0	Disagree (11.10)	Strongly Agree (27.23)	Agree (20.49)	Strongly Agree (26.79)
2	76	14.0	Agree (19.43)	Agree (23.80)	Agree (19.47)	Disagree (15.36)
3	227	42.0	Neutral (15.58)	Agree (24.48)	Agree (19.54)	Agree (22.84)

a. mean sub-scale scores in parentheses

40 years old. This group also had the greatest percentage of members with an undergraduate degree or higher (31%). Incomes for members of cluster 1 were similar to members of cluster 3, with both groups having 30% of their members with a household yearly income of $50,000 or higher.

Cluster 2 members displayed moderate use, non-use, and recreation values, in addition to low intrinsic values. Cluster 2 was the smallest of the three clusters and represented 14% of the sample. This group had the highest percentage of members 60 years or older (68%). Members of value cluster 2 tended to have lower educational attainment than the cluster 1 or cluster 3, with 33% of its members having education level less than a high school diploma/GED. The majority of cluster 2 members had household yearly incomes of less than $30,000; the highest percentage of the three value clusters.

Cluster 3 members displayed moderate use, recreation and intrinsic values, as well as, high non-use value. This value cluster had the lowest frequency of women in its membership with 31.1%. Members tended to fall between clusters 1 and 2 in terms of age, education levels, and household yearly income variables. This was the second largest cluster, accounting for 42% of the total sample.

Management Preferences

Residents were provided with a brief description of a possible water issue on the Cumberland Plateau. After reading the water issue, residents were given an unfinished statement and asked to indicate their level of agreement with each

of the five possible endings. Finally, they were asked to indicate their preferred management choice. Figure 12 illustrates the water issue and Figure 13 shows the five possible endings that residents were provided.

Mann-Whitney U tests were used to compare the mean responses for management options between pairs of value clusters. Pearson Chi-Square test for independence was used to determine the relationship between cluster membership and management preference. Since both variables in the tested relationship are nominal and the contingency table is larger than two-by-two, Cramer's V was used to measure the association between cluster membership and management preference. The Chi-Square approximations meet general validity guidelines for larger than two-by-two contingency tables: no expected count less than 1, and no more than 20% of the expected cell counts were less than 5 (Sirkin 2006).

Results

Members of all three value clusters differed significantly (p=0.000) from one another in their level of agreement with the first management option: *no restrictions to water supply projects regardless of harm to endangered species*. Cluster 1 (CL1) members had the lowest mean response (1.89) to this option, indicating disagreement. Cluster 2 (CL2) members had the highest mean response (3.50) of any cluster, indicating agreement with this option. Cluster 3 (CL3) members' mean response (2.69, indicating neutrality) fell in between both

Cumberland Plateau River Systems

The dams on the Tennessee and the Cumberland Rivers have resulted in water conditions no longer capable of supporting some endangered fish and mussels historically present. The streams flowing into these two rivers (Obed and Emory Rivers, Dunlop, Piney, Roaring and Suck Creeks, Cane Creek, Caney Fork, Obey River and the Big south Fork of the Cumberland) have remained closer to their natural, unaltered state and can, if protected and managed well, still support the endangered species currently living in them.

What is the issue?

Water is an important resource in the Cumberlands, and further economic growth of the region will require increased water supplies and addressing the increased impacts of altering water quality or waterway habitat. If not done with considerable care, continued commercial/residential development, and dam and road related construction could damage water quality and the habitat of these aquatic (water-based) species.

What are the benefits of land development?

Economic growth through commercial and residential development can be valuable in many ways. New developments have the potential to increase the area's tax base, create jobs, and improve public services.

What are the costs of land development?

Altering streams to meet increased water supply demands, along with residential/commercial development and road construction, can negatively affect aquatic life. These changes or disruptions affect aquatic habitat and species, often preventing them from carrying out necessary life functions.

Figure 12 Possible Water Issue on the Plateau

	Water supply projects are important for economic growth ...	**Strongly Disagree**	**Disagree**	**Neither**	**Agree**	**Strongly Agree**
29a.	...and should <u>not</u> be restricted even if endangered species are harmed.	1	2	3	4	5
29b.	...and <u>voluntary</u> guidelines should be established to minimize harm to endangered species.	1	2	3	4	5
29c.	...and educational programs should be established along with technical/financial assistance to minimize harm to endangered species.	1	2	3	4	5
29d.	...and should have <u>limited</u> regulations to prevent only the most serious harm to endangered species.	1	2	3	4	5
29e.	...but should be <u>restricted</u> if they harm endangered species, and other options sought.	1	2	3	4	5

Figure 13 Management Options

clusters 1 and 2. A small majority (54.5%) of CL3 members either disagreed or strongly disagreed with this option.

There were no significant differences ($p<0.05$) between value clusters in mean response to the second management option: *establishment of voluntary guidelines to minimize harm to endangered species*. The majority of members in all three clusters either agreed or strongly agreed with this option. The mean responses for this option were 3.46 (CL1), 3.72 (CL2), and 3.71 (CL3), all indicating agreement with this option.

CL1 membership differed significantly ($p=0.000$) from both CL2 and CL3 members in their mean response to the third management option: *establishment of educational programs, technical and financial assistance to minimize harm to endangered species*. There were no significant differences ($p<0.05$) between CL2 and CL3 in their mean responses to this option. CL1 members had the highest mean (4.26), indicating strong agreement with this option. The majority of CL1 members (92.2%) either agreed or strongly agreed with this statement. Members of CL2 and CL3 indicated a more moderate level of agreement with this management option, with mean responses of 3.65 and 3.96, respectively.

Members of each value cluster showed significant differences in their mean responses to the fourth management option: *establishment of limited regulations for water supply projects to prevent only the most serious harm to endangered species*. CL1 members displayed significant differences with CL2 and CL3 members at the $p<0.01$ level. The mean response for members of CL1

was 2.53, indicating disagreement with this management option. Members of CL2 and CL3 displayed significant differences with one another at the $p<0.05$ level. The mean response for CL2 members was 3.52, indicating agreement. The mean response for CL3 members was 3.96, indicating a higher level of agreement to this management option than members of both CL1 and CL2.

Members of CL1 differed significantly ($p=0.000$) with members of CL2 and CL3 in their mean response to the final management option: *restrictions for water supply projects if they harm endangered species*. The mean response for CL1 members was 4.07, indicating a higher level of agreement with this management option. The mean response for CL2 was 3.22, indicating neutrality in level of agreement with this option. CL3 members' mean response was 3.51, which indicates agreement with this option. Half of the members in CL1 indicated that they "strongly agree" with this option. Table 15 illustrates the mean responses to each management option for the three value clusters.

Table 15 Mean Responses to Management Options[a]

Management Options	Cluster 1	Cluster 2	Cluster 3
No Restrictions	1.89	3.50	2.69
Voluntary Guidelines	3.46	3.72	3.71
Educational/Assistance Programs	4.26	3.65	3.96
Limited Regulations	2.53	3.52	3.96
Restrictions & other options found	4.07	3.22	3.51

a. mean response range 1-5

Results of the Chi-Square test for independence show that there was some degree of relationship between cluster membership and management preference (Table 16). Results of the Cramer's V measure of association indicate that there was a strong association between value cluster and management preference. Table 17 shows a breakdown by value cluster the percentage of residents that selected each management option, when asked to indicate the option they would select if they could choose only one. CL1 members selected the fifth option (50%) and third option (36.1%) more frequently than members in CL2 and CL3. CL2 members selected the first and second management option, 23.7% and 24.3 % respectively, more frequently than members in CL1 and CL3. The most frequent selection by members of CL3 was the third option calling for educational, technical, ad financial programs to be established.

Willingness to Contribute

To determine how strongly residents felt about their preferred management option, residents were asked to indicate the extent they would be willing to contribute to the successful implementation of their preferred management option by agreeing or disagreeing with five possible endings. Similar to the setup of the management option questions, residents were given the beginning of a statement, and were asked to indicate the possible ending they would select if they could choose only one (Figure 14).

Table 16 Relationship and Measure of Association b/n Management & Cluster

	Value	df	p
Pearson Chi-Square	100.302[a]	8	.000
Likelihood Ratio	91.667	8	.000
Cramer's V	.312		.000
N of valid cases	515		

a. 1 cell (6.7%) has expected count less than 5. The minimum expected count is 4.89

Table 17 Management Option Frequencies

Cluster	No restrictions (%)	Voluntary guidelines (%)	Educational, technical, and financial programs (%)	Limited regulations (%)	Restrictions and other options sought (%)
1	1.3	7.8	36.1	4.8	50.0
2	23.7	24.3	22.9	8.6	18.6
3	7.0	14.4	33.0	17.7	27.9

	Protecting aquatic life and endangered species is important enough that I	**Strongly Disagree**	**Disagree**	**Neither**	**Agree**	**Strongly Agree**
31a.	...would make whatever sacrifices are necessary.	1	2	3	4	5
31b.	...would accept limits on water supply projects and pay higher utility bills/taxes.	1	2	3	4	5
31c.	...would accept limits on water supply projects but not pay higher utility bills/taxes.	1	2	3	4	5
31d.	...would pay higher utility bills/taxes but not accept limits to water supply projects.	1	2	3	4	5
31e.	...would not pay higher utility bills/taxes, or accept limits on water supply projects.	1	2	3	4	5

Figure 14 Willingness to Contribute Choices

Mann-Whitney U tests were used to compare the mean responses for willingness to contribute options between pairs of value clusters. Pearson's Chi-Square test for independence was used to determine the relationship between cluster membership and willingness to contribute. Chi-Square approximations meet all general validity guidelines for larger than two-by-two contingency tables.

Results

Members of cluster 1 (CL1) differed significantly ($p=0.000$) with members of cluster 2 (CL2) and cluster 3 (CL3) in their mean responses to the first contribution option: *would make whatever sacrifices are necessary*. CL1 members had the highest mean response of 3.45, indicating agreement with this option. There was no significant difference ($p<0.05$) in mean responses to this option between CL2 (2.71) and CL3 (2.91). Both of which indicate a neutral level of agreement with the first contribution option.

All three clusters differed significantly ($p=0.000$) from one another in members' mean response to the second contribution option: *would accept limits on water supply projects and pay higher utility bills/taxes*. CL1 members had the highest mean response of 3.12, indicating a neutral level of agreement with this option. Members of CL2 had the lowest mean response of 2.08 indicating disagreement with this contribution option. CL3 members' mean response was 2.65, indicating more neutral agreement than members of CL2, but more disagreement than members of CL1 with this option.

Members of CL1 differed significantly (p=0.024) from members of CL2 in mean response to the third contribution option: *would accept limits on water supply projects but not pay higher utility bills/taxes*. There was no significant difference (p<0.05) in mean responses between members of CL1 and CL3 or members of CL2 and CL3. Members of CL1 had the highest mean response with 3.29 and members of CL2 had the lowest mean response with 2.92. This indicates that membership of both clusters were somewhat neutral in their level of agreement with this option. However, CL2 had a greater frequency of disagreement with this option among its membership, than CL1 did. Members of CL3 had a mean response of 3.15, indicating a neutral level of agreement.

There were no significant differences (p<0.05) between members of CL1 and CL2 or CL2 and CL3 in mean response to the fourth contribution option: *would pay higher utility bills/taxes but not accept limits to water supply projects*. However, there was a significant difference (p=0.002) between members of CL1 and CL3. The mean responses of CL1, CL2 and CL3 (2.21, 2.46, 2.48 respectively) indicate disagreement with this option. However, CL1 has a greater frequency of disagreement (strongly disagree and disagree) with this option (72%) than CL3 (58.7%).

There were significant differences (p<0.01) between members of all three clusters in their mean response to the fifth contribution option*: would not pay higher utility bills/taxes, or accept limits on water supply projects*. The mean response for CL1 (2.46) was the lowest, indicating disagreement to this option.

Members of CL2 had the highest mean response (3.27), indicating a neutral level of agreement to this option. However, CL2 members have a greater frequency of agreement (55.1%) than CL3 members (27.9%), which also had a mean response, indicating neutral agreement (2.86).

Table 18 shows a breakdown by value cluster membership of the percentage of residents that selected each contribution option, when asked to indicate the option they would select if they could choose only one. 82.7% of CL1 selected the first three contribution options, with the third option having the greatest frequency (33.2%). Members of CL2 selected the final option most frequently with 48.6%. The majority of CL3 members (59.9%) selected either the third option or the final option.

Using the Pearson Chi-Square test for independence and Cramer's V, it was determined that there was some degree of relationship between cluster membership and willingness to contribute, and that there was a moderate association between value cluster and willingness to contribute, as measured by these options (Table 19).

Table 18 Contribution Option Frequencies

Cluster	Whatever sacrifices necessary (%)	Limits on projects & higher taxes/utilities (%)	Limits on water supply projects (%)	Higher taxes/utility bills (%)	Neither higher taxes/utilities nor limits on projects (%)
1	24.3	25.2	33.2	4.0	13.3
2	16.7	11.1	15.3	8.3	48.6
3	13.7	17.0	34.0	9.4	25.9

Table 19 Chi-Square Test and Measure of Association for Willingness to Contribute

	Value	df	p
Pearson Chi-Square	55.328[a]	8	.000
Likelihood Ratio	54.513	8	.000
Cramer's V	.233		.000
N of valid cases	510		

a. 1 cell (6.7%) has expected count less than 5. The minimum expected count is 4.94.

CHAPTER V: DISCUSSION

This study has sought to develop an objective means to identify citizen values regarding the use and protection of natural resources. Toward this end, a survey was developed and applied to governance issues in a four county area of the Cumberland Plateau in Tennessee. This chapter will focus on the main conclusions that can be taken from the study's results. The discussion will be organized around each of the three research objectives for this study.

Survey Design

Residents of the study area are faced with land use decisions that are characterized by conflicts over the use and protection of natural resources. Effective measurement of the relative strength of natural resource values is vital to making informed decisions that account for residents' values. To facilitate this measurement, a survey to identify residents' values on scarce natural resources and their preferred management option to a specific resource issue was developed. It was desirable that the survey be relevant to a wide range of natural resource conditions common on the Plateau, deliverable in a mail survey, and applicable to the general public. In addition to the value scale, the survey included a narrative-style management scenario to which participants were asked to respond. This scenario was included to increase the survey's effectiveness of measuring the relative strength of their natural resource values. The scenario was designed for ease of reading and understanding, to be brief, and to reflect the conflicting nature of use and protection values.

The use of a value scale, based heavily off Winter and Lockwood's (2003) Natural Area Value Scale, and the inclusion of a narrative-style management scenario provide an alternative approach to the more traditional market-based measures for natural resource valuation. Similar to Winter and Lockwood's findings, the results of this study showed that the value scale used demonstrated good internal reliability. This confirms that the items in each value sub-scale are most likely measuring the same construct, in this case natural resource related values. Based on Winter and Lockwood's (2003) recommendation for further development, additional questions were added to the recreation value sub-scale, improving the internal reliability of this value sub-scale. Additionally, the use, non-use, recreation, and intrinsic value sub-scales demonstrated the expected correlations with one another (i.e. intrinsic value sub-scale was inversely correlated with the use value sub-scale, etc.) and with preferred management options (i.e. use value is inversely correlated with the restrictions option and positively correlated with the no restrictions option). The results of this study support Winter and Lockwood's conclusion that the Natural Area Value Scale is a simple and effective means for identifying citizens' values regarding natural resources, including intrinsic value.

The use of a narrative-style management scenario provided the ability for respondents to make their management decisions within the framework of a realistic natural resource management context. The narrative style allowed for the use of conversational language to set the frame for a complex issue in terms that could be easily understood by the layperson. However, it is difficult to

assess whether respondents actually read the scenario prior to answering the management option questions.

Survey Application

As mentioned earlier, a focus group was held in the fall of 2006 to pretest the survey instrument prior to mailing. The focus group consisted of residents from Morgan County, whose sociodemographic characteristics reflected those of the target population. Many suggests for improvement to the survey instrument were generated through this focus group. Prior to the survey application, changes based on the feedback received from the focus group were made. As a result, the final survey instrument was considered easy to read and understand, not too long, and representative of the nature of decisions regarding natural resource use and protection.

Due to time constraints, only one focus group was held in Morgan County. Additional focus groups held in Cumberland, Scott, and Fentress Counties, as well as, focus groups comprised of different user groups may have helped to identify any perceived bias prior to survey administration. In which case, further efforts to minimize any perception of bias could have been made.

As mentioned earlier, there was no follow-up to determine the reason for non-response. Determining the reasons behind the non-response could provide valuable information about residents' natural resource values and the effectiveness of the value measurement techniques utilized, in addition to possible problems with the instrument design. Additionally, no incentives for

responding were provided. It is possible that the provision of incentives could have increased the overall response rate. However, the overall response rate (36%) was acceptable, and the response was equally distributed across all four counties in the study area. The perception of bias was only indicated by a small percentage of respondents, so it is probable that it did not play a large factor in survey non-response.

Identification of Values and Management Preferences

As noted in Chapter 1, Cortner and Moote (1999) point out that natural resource decisions are often based on what decision makers believe the public wants, and not on actual indications of what the public wants. This study attempted to address this problem of a lack of objective information on citizens' natural resource values, specifically concerning scarce natural resources. The availability of this information is an important step in the improvement of the natural resource governance process. The availability of accurate information regarding citizens' values will help in informing not only decision-makers but the citizenry as well. As citizens become more informed within the process, the likelihood that they will adopt active roles within the governance process will increase.

Residents' Values

Results from the survey indicate that residents in the Northern Cumberlands hold a diverse set of values regarding natural resources. Overall,

residents in the four-county study area indicate strong conservation values and moderate use (non-recreation) values. On average, residents scored the highest on the non-use value sub-scale and the lowest on the use value sub-scale. Also on average, residents in the study area indicated that they strongly agree with the non-use value of nature, agreed with the recreation value of nature, agreed with the intrinsic value of nature, and neither agreed nor disagreed with the use value of nature. While residents did acknowledge the intrinsic value of nature, it ranked below the non-use and recreation value sub-scales in residents' mean scores. While the overall results indicate strong conservation values and moderate use value, it is important to note that some residents did indicate strong use values and relatively lower conservation values. A consideration that is important when determining specific land and natural resource uses.

These results seem to support the notion that residents of the Northern Cumberlands have long regarded the natural resources of the area as integral parts of the plateau. Additionally, the results indicate that residents acknowledge and understand the role of resource extractive industries in the area's overall economy. However, on average, residents agree less with the use value of natural resources than the other values. Employment by natural resource industries within the study area accounts for only a small percentage of the regions employment force. This may help explain that although historically use values may have been high, given today's employment, people are not connected economically to natural resources as they may once have been, hence the low use values. Residents of the four-county study area place great

importance on the protection of the Cumberland Plateau's character. While acknowledging the importance of natural resource industries to the economy, the majority of residents strongly agree with the notion of maintaining the natural character of the plateau for future generations, as tested by the non-use value sub-scale.

Respondents were classified into groups based on their overall scores on each of the value sub-scales. The reason for this classification was to measure the relative strength of the four values. As noted in the previous chapter, this grouping produced three clusters. Cluster 1 accounted for 44% of responding residents, and strongly agreed with non-use and intrinsic values. Cluster 2 accounted for 14% of responding residents, and agreed with use value and disagreed with intrinsic value. Finally, cluster 3 accounted for 42% of responding residents, and agreed with intrinsic value and neither agreed nor disagreed with use value. All three clusters were similar in composition regarding residents' current residence, where they lived most of their lives, the length of residency in the study area, land ownership, and importance of income from natural resources.

Regardless of which cluster residents were classified into, the majority of residents either agreed or strongly agreed with natural resources being essential components of the Plateau's character. This seems to indicate that regardless of whether respondents were long-term residents or relatively recent residents of the study area, there is agreement with and support for the natural heritage of the Northern Cumberlands. Further examination of the relationship between length

of residency and the natural heritage of the study area is necessary, as it is beyond the scope of this thesis.

Residents' Management Preference

The survey instrument presented residents with a narrative-style scenario, which gave residents a management issue involving conflict between various uses of natural resources (i.e. development, water supply projects, and aquatic endangered species). The management options that residents were asked to consider were designed to range along a continuum from strong resource protection to strong resource use. The relationship between residents' values and their management preferences were examined using the three value clusters identified through cluster analysis.

Results of this study showed that the relative strength of the four value types is an important aspect of residents' management preferences. The dominant value types (the values a respondent agreed or disagreed with the strongest) proved to be a good indicator of which end of the management continuum (utilization versus protection) residents would prefer. However, the strength of the non-dominant value types also played a role in residents' choice of management options.

Residents in cluster 1 (44% of sample), which strongly agreed with non-use and intrinsic value but disagreed with use value, indicated a preference for the most restrictive of the five management options. Residents in cluster 2 (14% of sample), which agreed with use value and disagreed with intrinsic value,

indicated a preference for one of the least restrictive management options. Residents in cluster 3 (42% of sample), which agreed with intrinsic value and neither agreed nor disagreed with use value, indicated a preference for a middle ground response of educational programs. However, more residents in cluster 3 preferred restrictions to no restrictions.

These results indicate that residents who score higher on intrinsic value are more likely to choose restrictions as their preferred management option, and residents who score higher on the use value sub-scale are more likely to choose non-restrictive management options. However, the agreement with non-use and recreation values indicated by residents in all three clusters may help explain the percentage of residents that scored high on use value but indicated a preference for limited regulations or restrictions. Additionally, the strength of these accompanying values may also account for the percentage of residents who scored high on intrinsic value but indicated a preference for voluntary guidelines or no restrictions. This indicates that knowledge of residents' accompanying values in addition to their dominant values is vital in understanding the management options they would support.

The fact that residents in all three clusters agreed with the non-use and recreation value of nature provides additional evidence for the idea that area residents believe natural resources are an important aspect of the Plateau's character. Regardless of whether residents' dominant value was use or intrinsic, they agreed with the ideas that it was important for the Plateau's natural resources to be available to future generations and that the Plateau's natural

resources provided important opportunities for recreation. This agreement on the non-use and recreation value of natural resources indicates the potential to build local resource policies on common ground. However, the differing opinion on the use and intrinsic value of nature dictates that it will be necessary to strike a delicate balance between the use and protection of natural resources in any local resource policies if they are to be widely accepted by residents.

Residents' Willingness to Contribute

Following the management preference questions, residents were asked to indicate their willingness to contribute in order to ensure the successful implementation of their preferred management option. The contribution options provided to residents were designed to range from large sacrifice to no sacrifice. The decision to use monetary sacrifices as a measure of willingness to contribute was made because it is often necessary to establish sources of funding for proposed mitigation and monitoring programs. The relationship between residents' natural resource values and their preferred contribution level, as measured by this survey, was determined using the value clusters identified through the cluster analysis.

Similar to residents' management preferences, the higher residents scored on the intrinsic value sub-scale the more likely they were to indicate a willingness to contribute as measured by this survey. The higher residents scored on the use value sub-scale the more likely they were to indicate unwillingness to contribute, as measured by this survey. Residents in cluster 2

(high use value score) had the highest percentage of residents who indicated that they would neither pay higher taxes/utility bills nor accept limits to water supply projects. Residents in cluster 1 (high intrinsic value score) had the highest percentage of residents who indicated that they would make whatever sacrifices were necessary.

Again, the strength of accompanying values, non-use and recreation, may account for the percentage of those residents in cluster 2 willing to make whatever sacrifices are necessary, as well as, those in cluster 1 unwilling to contribute. Regardless of which cluster residents were classified in, paying higher taxes or utilities was indicated by a small percentage of residents. The indication of unwillingness to contribute financially through these means may be due to the economic circumstances experienced by residents in the study area, and not entirely a function of their value systems.

The four counties in the study area have struggled to develop their economy. In recent months, some of the counties have experienced increases in their taxes, which may account for the unwillingness to accept higher taxes or utilities. Residents in some of the counties have expressed dissatisfaction with the fact that public land in the area does not contribute to the tax base. These possible explanations all indicate that attempts to account for mitigation costs through taxes, may be met with animosity. Additionally, if the options of higher taxes and utility bills had been separated into two distinct options, it would have been possible to determine if either one of these options had greater influence on residents' willingness to contribute.

Conclusion

The natural resource values of residents in the study area identified in this study is an important addition to the body knowledge that contributes to the decision-making process. As development increases and continues to apply pressures and stresses to the natural resources in the study area, the availability of information regarding residents' natural resource values will be important for not only decision-makers but also residents. An informed citizenry will be able to take a more meaningful and active role in the decision-making process, which in turn will generate increased trust and ownership in the decision-making process as well as the decision.

While this study does provide valuable information, it is not intended to replace the governance benefits that can be received through open dialogue between citizens and decision makers. Rather, it is intended to facilitate and supplement this two-way discourse. In facilitating the governance process, results will provide an objective platform of citizen values and management preferences. Such a platform will support the governance process by avoiding damaging conflict and debate on citizen values and preferences and proactively moving to dialogue on how to work toward those values and preferences.

As a supplement to two-way dialogue, this survey was successful in gathering information about residents' natural resource values from a large number of residents, but this information by itself is not enough to build effective resource management policy. Open dialogue between decision-makers and the

public facilitates personal growth and education for not only the public but also the decision-makers. Additionally, meaningful involvement of the public throughout the decision-making process can help delay costly setbacks during the implementation phase of management decisions.

Future research should be done to identify the natural resource values of resource managers and decision-makers. The values that the public holds regarding natural resources are just one aspect of the governance process. Understanding the values of resource managers and decision-makers as well as how these values influence the governance process is another important step in improving the overall natural resource governance process.

Perhaps most importantly, the results of this study highlight the common ground that exists among residents in the study area. All too often discussions about environmental problems focus on the differences in opinions and beliefs of the participants. This approach can only create win-lose situations and policies, which polarizes the participants and leads to distrust of the decision-making process as well as the decision-makers. The residents of the Northern Cumberlands expressed a common agreement in the importance of the natural heritage of the Plateau. Additionally, residents agreed with the importance of being able to experience the natural resources through both active and passive forms of recreation. This common ground should be highlighted and used to bring all parties together in the process to develop resource policies that are win-win. Due to the nature of the diverse values residents in the area have, any resource policy that is developed will need to balance the protection of the area's

natural resources with the use of these same resources. Finding the balance between use and protection will be much less daunting and more successful if the process is begun on common ground with cooperation, and not on opposing sides with defensive posturing.

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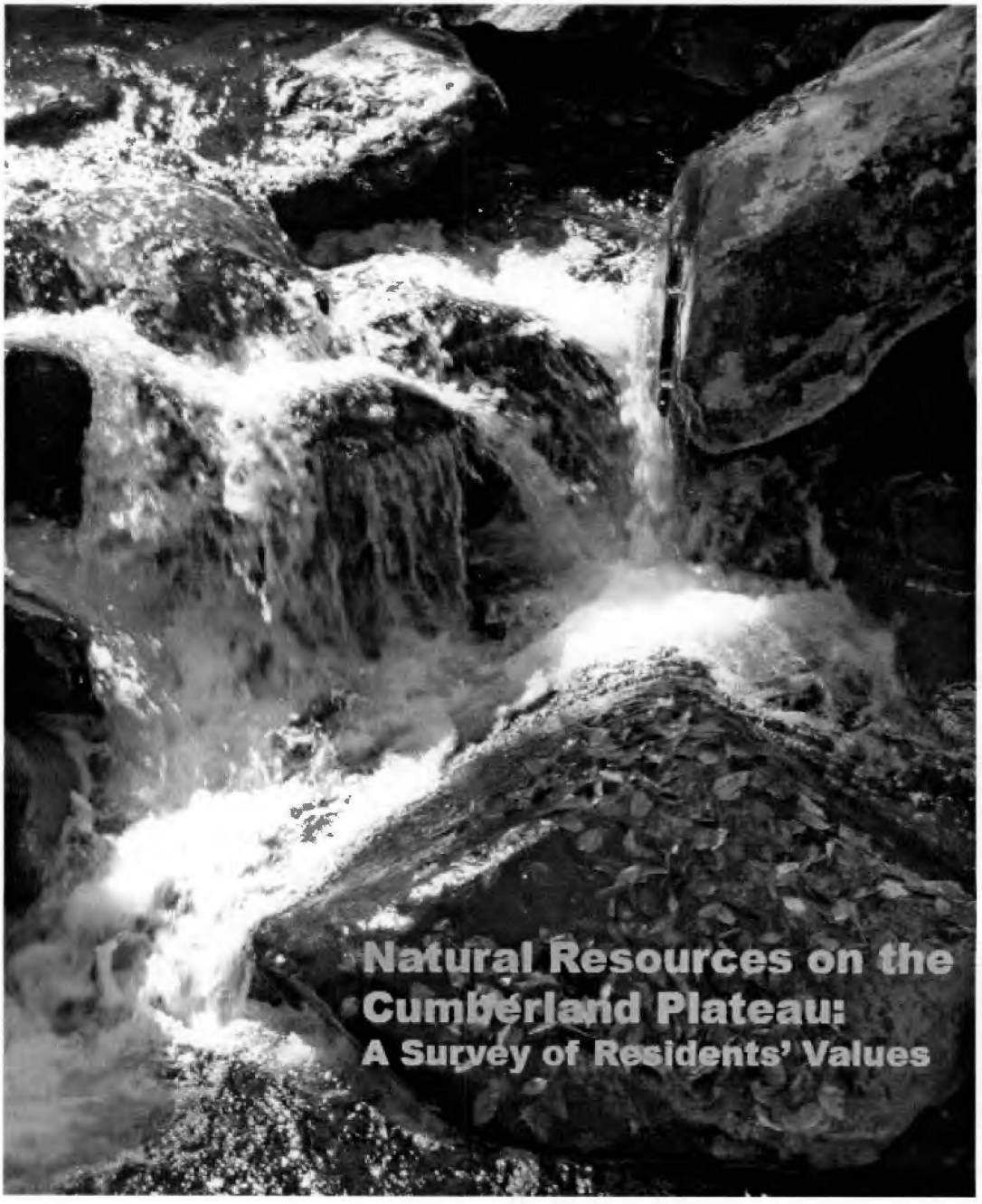
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APPENDICES

Appendix A: Survey Booklet


Natural Resources on the
Cumberland Plateau:
A Survey of Residents' Values

Interest in the residential, commercial and industrial development of the Cumberland Plateau has increased in recent years, as have calls for protection of natural resources, wildlife, and scenic beauty. The purpose of this survey is to help the public and decision makers understand the values and interests of Plateau citizens concerning the Plateau's natural resources. Your participation is very important to understanding the views of citizens in Cumberland, Fentress, Morgan and Scott counties concerning these issues. We would like to thank you in advance for your input, and greatly appreciate your time and effort. Your responses are confidential and will not be associated with your name.

1. How would you best describe where you **currently** live?
(Please check the appropriate answer)

- ☐ In town
- ☐ In the country but not on a farm
- ☐ In the country on a farm

2. Which of the following best describes where you lived **most** of your life?

- ☐ In the country on a farm
- ☐ In the country but not on a farm
- ☐ In a town with less than 10,000 people
- ☐ In a city with 10,000 to under 50,000 people
- ☐ In a city with 50,000 to under 100,000 people
- ☐ In a city with 100,000 to under 500,000 people
- ☐ In a big city (population of 500,000 people or more)

3. Have you lived on the Cumberland Plateau your entire life?

- ☐ Yes
- ☐ No

4. About how long have you lived on the Cumberland Plateau?

- ☐ Less than 1 year
- ☐ 1-5 years
- ☐ 6-10 years
- ☐ 11-20 years
- ☐ More than 20 years

5. Do you own land in Cumberland, Morgan, Scott or Fentress Counties?

☐ No
☐ Yes → (If yes) # of **total** acres_____
# of wooded acres_____
# of pasture/cropland acres _____
acres for other uses_____

Below is a list of statements about woods, wildlife and streams. Please indicate how strongly you agree or disagree with each of the statements. *(Please circle your response)*

		Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
6.	The value of nature exists only in the human mind. Without people, nature has no value.	1	2	3	4	5
7.	Woods are valuable because they produce wood products, jobs and income for people.	1	2	3	4	5
8.	To say woods, wildlife and streams have value just for themselves is a nice idea, but we can't afford to think that way; the welfare of people has to come first.	1	2	3	4	5
9.	Woods, wildlife and streams are important to me because I use them for recreation.	1	2	3	4	5
10.	The only value woods, wildlife and streams have is what humans can make from them.	1	2	3	4	5
11.	Woods, wildlife and streams are important to me because they are essential parts of the Plateau's overall character.	1	2	3	4	5

Below is a list of statements about woods, wildlife and streams. Please indicate how strongly you agree or disagree with each of the statements. *(Please circle your response)*

		Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
12.	Woods, wildlife and streams are valuable to keep for future generations of humans.	1	2	3	4	5
13.	Woods, wildlife and streams are important because I might want to hunt or use them for recreation in the future.	1	2	3	4	5
14.	Places like wetlands have no value and should be converted to uses that are more productive.	1	2	3	4	5
15.	I'm seeing woods, wildlife and streams future generations of children may not see, and that concerns me.	1	2	3	4	5
16.	All plants and animals are precious and worth preserving but human needs are more important than their preservation.	1	2	3	4	5
17.	Woods and streams are important because they are good places for me to be physically active by hiking, climbing, camping, biking, paddling, etc.	1	2	3	4	5
18.	Ugliness in nature indicates an area has no value.	1	2	3	4	5

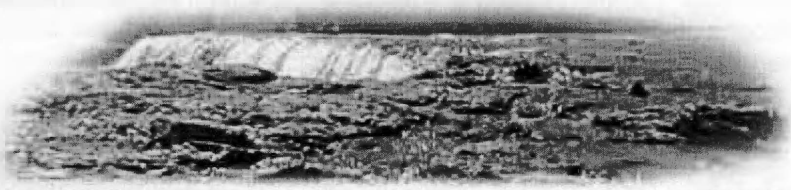
Below is a list of statements about woods, wildlife and streams. Please indicate how strongly you agree or disagree with each of the statements. *(Please circle your response)*

		Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
19.	We have to protect the environment for humans in the future even if it means reducing our standard of living today.	1	2	3	4	5
20.	Our children will be better off if we spend money on attracting jobs and industry instead of on the environment.	1	2	3	4	5
21.	Woods and streams are important because they provide settings in which I can share in activities like picnics and camping with groups of people (families, church groups, communities, etc.).	1	2	3	4	5
22.	The value of the natural environment only depends on what it does for humans.	1	2	3	4	5
23.	Even if I don't have first hand experience with woods, wildlife and streams, I can enjoy them by looking at books or seeing movies.	1	2	3	4	5
24.	I don't like industries destroying parts of nature, but it is necessary for human survival.	1	2	3	4	5
25.	Recreation in woods and streams is important because it provides me with physical, emotional and/or spiritual benefits.	1	2	3	4	5

Below is a list of statements about woods, wildlife and streams. Please indicate how strongly you agree or disagree with each of the statements. *(Please circle your response)*

		Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
26.	Only humans have intrinsic value—that is value for their own sake.	1	2	3	4	5
27.	There are plenty of woods and streams that are not very nice to visit, but I'm glad they exist.	1	2	3	4	5
28.	It is important to maintain healthy woods, wildlife and streams because what happens to one not only affects the others but also the overall health of the environment on the Plateau.	1	2	3	4	5

Water on the Cumberland Plateau



29. On the following page is a description of a possible water issue on the Cumberland Plateau for you to read. Although representative of conditions in the Cumberlands, the issue is hypothetical and not based on an actual situation currently being experienced. It is a general issue, which has the possibility of being experienced by many communities, and has been written to get your views about the use and conservation of natural resources on the Cumberland Plateau. After reading the description of the issue, please indicate your preferences on how the issue should be handled on pages 8 and 9.

Cumberland Plateau River Systems

The dams on the Tennessee and the Cumberland Rivers have resulted in water conditions no longer capable of supporting some endangered fish and mussels historically present. The streams flowing into these two rivers (Obed and Emory Rivers, Dunlop, Piney, Roaring and Suck Creeks, Cane Creek, Caney Fork, Obey River and the Big south Fork of the Cumberland) have remained closer to their natural, unaltered state and can, if protected and managed well, still support the endangered species currently living in them.

What is the issue?

Water is an important resource in the Cumberlands, and further economic growth of the region will require increased water supplies and addressing the increased impacts of altering water quality or waterway habitat. If not done with considerable care, continued commercial/residential development, and dam and road related construction could damage water quality and the habitat of these aquatic (water-based) species.

What are the benefits of land development?

Economic growth through commercial and residential development can be valuable in many ways. New developments have the potential to increase the area's tax base, create jobs, and improve public services.

What are the costs of land development?

Altering streams to meet increased water supply demands, along with residential/commercial development and road construction, can negatively affect aquatic life. These changes or disruptions affect aquatic habitat and species, often preventing them from carrying out necessary life functions.

Below is an unfinished statement about water supply projects along with 5 possible endings. To provide information on how you feel about possible ways to manage water resources on the plateau, please indicate how strongly you agree or disagree with the each of the possible endings. *(Please circle your response)*

	Water supply projects are important for economic growth ...	**Strongly Disagree**	**Disagree**	**Neither**	**Agree**	**Strongly Agree**
29a.	...and should not be restricted even if endangered species are harmed.	1	2	3	4	5
29b.	...and voluntary guidelines should be established to minimize harm to endangered species.	1	2	3	4	5
29c.	...and educational programs should be established along with technical/financial assistance to minimize harm to endangered species.	1	2	3	4	5
29d.	...and should have limited regulations to prevent only the most serious harm to endangered species.	1	2	3	4	5
29e.	...but should be restricted if they harm endangered species, and other options sought.	1	2	3	4	5

30. If you had to choose from the above options (29a-29e), which one would you select? *(Please check one box)*

☐ 29a. ☐ 29b. ☐ 29c. ☐ 29d. ☐29e.

31. Below is a statement about endangered species along with 5 possible endings. Please indicate to what extent you would be willing to contribute to the successful implementation of the management option you selected in Q30 by agreeing or disagreeing with the following: *(Please circle your response to each item)*

	Protecting aquatic life and endangered species is important enough that I	**Strongly Disagree**	**Disagree**	**Neither**	**Agree**	**Strongly Agree**
31a.	...would make whatever sacrifices are necessary.	1	2	3	4	5
31b.	...would accept limits on water supply projects and pay higher utility bills/taxes.	1	2	3	4	5
31c.	...would accept limits on water supply projects but not pay higher utility bills/taxes.	1	2	3	4	5
31d.	...would pay higher utility bills/taxes but not accept limits to water supply projects.	1	2	3	4	5
31e.	...would not pay higher utility bills/taxes, or accept limits on water supply projects.	1	2	3	4	5

32. If you had to choose from the above options (31a-31e), which one would you select? *(Please check only one box)*

☐ 31a. ☐ 31b. ☐ 31c. ☐ 31d. ☐ 31e.

Finally, we would like to learn about your background. All responses to the following questions are confidential and for statistical purposes only. No question you answer on this survey will be linked to you personally in any analysis or report.

33. What is your gender?

☐ Male ☐ Female

34. What is your age?

☐ 18 to 24
☐ 25 to 39
☐ 40 to 59
☐ 60 to 79
☐ 80 or older

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

☐ Less than High School
☐ Some High School
☐ High School/GED
☐ Technical (vocational) Certificate
☐ Some College
☐ Undergraduate Degree
☐ Some Graduate School
☐ Graduate Degree

36. What is your total household yearly income?

☐ Less than $10,000
☐ $10,000 to $29,999
☐ $30,000 to $49,999
☐ $50,000 to $74,999
☐ $75,000 to $99,999
☐ $100,000 or more

37. How important is income from natural resources to your total household income?

☐ Not important
☐ Of little importance
☐ Important
☐ Very important
☐ I have no income from natural resources

38. Which of the following activities are you involved in?
(Please check all that apply)

- ☐ ATV or 4-Wheeling
- ☐ Boating (motor)
- ☐ Camping
- ☐ Environmental activism
- ☐ Farming
- ☐ Fishing
- ☐ Hiking or backpacking
- ☐ Horseback riding
- ☐ Hunting
- ☐ Logging
- ☐ Membership in environmental group
- ☐ Mining or quarrying
- ☐ Mountain biking
- ☐ Paddling
- ☐ Rock climbing
- ☐ RVing
- ☐ Scenic drives
- ☐ Wildflower viewing
- ☐ Wildlife conservation
- ☐ Wildlife watching

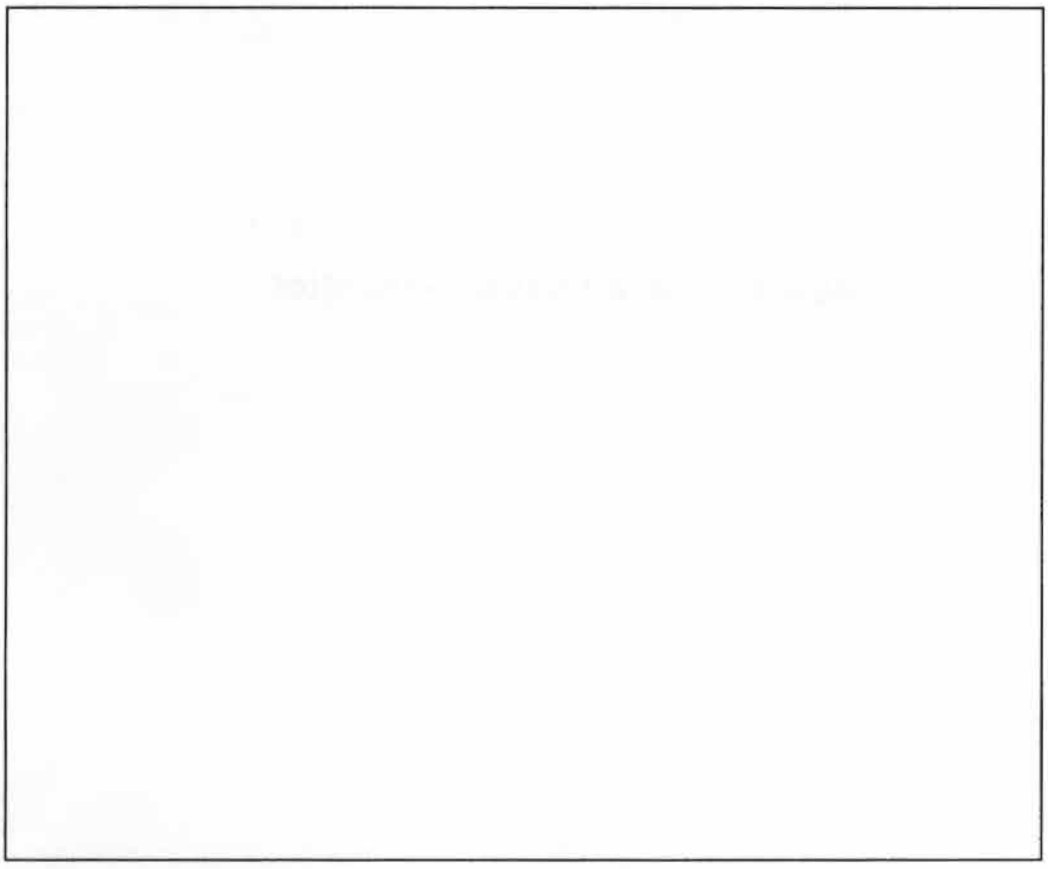
☐ None of these activities

39. Which of the following activities do you **most closely** identify with?
(Please check only one)

- ☐ ATV or 4-Wheeling
- ☐ Boating (motor)
- ☐ Camping
- ☐ Environmental activism
- ☐ Farming
- ☐ Fishing
- ☐ Hiking or backpacking
- ☐ Horseback riding
- ☐ Hunting
- ☐ Logging
- ☐ Membership in environmental group
- ☐ Mining or quarrying
- ☐ Mountain biking
- ☐ Paddling
- ☐ Rock climbing
- ☐ RVing
- ☐ Scenic drives
- ☐ Wildflower viewing
- ☐ Wildlife conservation
- ☐ Wildlife watching

☐ None of these activities

Thank you very much for participating in this study. Your responses will help us better understand residents' natural resource values on the Cumberland Plateau. At this time we would like to invite you to write ANY additional comments, in the space below, about the future of the Cumberland Plateau or this survey.



Please note that the return of this survey will constitute your informed consent to take part in this study.

Please return your completed survey in the self-addressed stamped envelope to:

Northern Cumberland Plateau Survey
Dept. of Forestry, Wildlife, & Fisheries-1075
The University of Tennessee
5723 Middlebrook Pike
Knoxville, TN 37921-9919

Appendix B: Survey Cover Letter

September 29, 2006

Fullname
Address
City, St, Zip

To the "Lastname" Household:

I am writing for your help in a research project being conducted by The University of Tennessee, Department of Forestry, Wildlife and Fisheries. The purpose of this survey is to help the public and decision makers understand the values and interests of Plateau citizens concerning the Plateau's natural resources.

This study will help local lawmakers, government agencies, interested citizens and business interests have a better and more objective understanding of citizen views of the region's natural resources. The results of this study will be published as part of my Masters thesis at The University of Tennessee. Perhaps more importantly, this study is an opportunity for your voice to be heard regarding current natural resource issues in your area.

Your household was randomly selected from a list of residents in a four county area on the Cumberland Plateau in Tennessee. This area is made up of Cumberland, Fentress, Morgan, and Scott Counties. For the results of this survey to accurately represent the views of adults in these counties, the survey must be completed by an adult (18 years and older) who now lives in your household and who had the *most* recent birthday. I appreciate you taking the time to complete and return the survey, as your participation will greatly improve the study's accuracy. If you have any questions, please feel free to contact me at (865) 974-0611.

All questionnaire responses will be confidential and will not be linked to a specific individual. Your return of the survey will constitute your informed consent to participate. If for any reason you do not wish to participate, please return the blank survey in the envelope provided.

Thank you very much for taking the time to help with this important study.

Sincerely,

Cynthia L. Longmire
Graduate Teaching Assistant

Appendix C: Postcard Reminders

Postcard #1

Dear Northern Cumberland Plateau Resident:

A few days ago, I sent you a Natural Resources on the Cumberland Plateau Survey to fill out and return by mail. If you have completed the questionnaire and mailed it back to us, I would like to express my sincere thanks. All of the responses will be very helpful in understanding the values and interests of Plateau citizens concerning the Plateau's natural resources.

If you have not returned the survey, I would appreciate you doing so at your earliest convenience. I appreciate you taking the time to complete and return the survey, as your participation will greatly improve the study's accuracy. Again, thank you for your participation. If you need more information or a new survey, please contact me at the address below.

Sincerely,

Cynthia L. Longmire, Graduate Assistant
Department of Forestry, Wildlife, and Fisheries
The University of Tennessee
274 Ellington Plant Sciences
Knoxville, TN 37996-4563
clongmir@utk.edu, (865) 974-0611

Postcard #2

Greetings Again!

I recently sent you a questionnaire for Northern Cumberland Plateau Residents for an important survey I am conducting as a part of my Master's degree. If you have already completed and returned the survey, please accept my sincere thanks. If you have not completed and returned the survey, please do so today. The higher the response rate, the more valid my research results will be.

If you do not have a copy of the questionnaire or have questions about this study, please contact me by phone or by email using the information below.

I appreciate your help!

Cynthia L. Longmire, Graduate Assistant
Department of Forestry, Wildlife, and Fisheries
University of Tennessee, Knoxville
(865) 974-0611
clongmir@utk.edu

VITA

Cynthia Liane Longmire was born in Knoxville, TN on May 23, 1978, where she was raised and attended school, graduating from Bearden High School in 1996. Cynthia attended The University of Tennessee in Knoxville, and received a BS in Forestry Resource Management in 2000. After college, she moved to Lake Mary, Florida where she attended Comair Aviation Academy, and received her Commercial Pilot's License and Certified Flight Instructor Certificate. After leaving Comair Aviation Academy in the summer of 2001, Cynthia moved back to Knoxville, TN, where she worked as a flight instructor at the McGhee Tyson Airport.

After a change in circumstances within the aviation community, Cynthia left the industry and began working for the National Park Service in the spring of 2002. While working for the Park Service, she was employed as a Forestry Technician with the Great Smoky Mountains National Park and as a Biological Science Technician with Shenandoah National Park. Cynthia's job duties ranged from non-native invasive plant management, boundary surveys, prescribed fire, wildland fire fighting, search and rescue, forest insect and disease monitoring, and native grass and bald restoration.

In the fall of 2005, Cynthia resigned her position with the National Park Service and began work on her Master of Science in Forestry at The University of Tennessee. Cynthia completed her master's program in the summer of 2007 and received her degree in August of the same year. In August of 2007, Cynthia

will begin her PhD work at The Pennsylvania State University in rural sociology and the human dimensions of natural resource management.

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